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STEM Applications

STEM Applications

Mississippi Department of Education



2011

Course code: 000273

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The Research and Curriculum Unit (RCU), located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Standards

Standards are superscripted in each unit and are referenced in the appendices. Standards in the *STEM Applications Curriculum Framework and Supporting Materials* are based on the following:

Common Core State Standards Initiative

The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy. Copyright 2010. National Governors Association Center for Best Practices and Council of Chief State School Officers. All rights reserved. States and territories of the United States as well as the District of Columbia that have adopted the Common Core State Standards in whole are exempt from this provision and no attribution to the National Governors Association Center for Best Practices and Council of Chief State School Officers is required. Reprinted from <http://www.corestandards.org/>

National Educational Technology Standards for Students

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21st Century Skills and Information and Communication Technologies Literacy Standards

In defining 21st century learning, the Partnership for 21st Century Skills has embraced five content and skill areas that represent the essential knowledge for the 21st century: global awareness; civic engagement; financial, economic, and business literacy; learning skills that encompass problem-solving, critical-thinking, and self-directional skills; and Information and Communication Technology (ICT) literacy.

Preface

Secondary career and technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

STEM Applications Executive Summary

Course Description

Science, Technology, Engineering, and Mathematics (STEM) Applications is an innovative instructional program that prepares students to engage in future academic and vocational courses of study in high school, community college, and institutions of higher learning. Students in STEM Applications complete study in technology literacy, the design process, emerging technologies, computer-aided design, sustainable design and technology, power and energy, robotics simulation, financial and economic literacy, and workplace skills for the 21st century. The STEM Applications curriculum framework is built upon 21st Century Skills Standards, ACT College Readiness Standards, and the National Educational Technology Standards for Students.

Student Prerequisites

Students should be enrolled as ninth graders in order to take STEM Applications.

Licensure Requirements

The 983 licensure endorsement is needed to teach the STEM Applications course. The requirements for the 983 licensure endorsement are listed below:

1. Applicant must have earned a 4-year education degree (bachelor's degree) or higher from an accredited institution of higher education.
2. Applicant must hold a current and valid Mississippi 5-year teaching license.
3. Applicant must successfully complete an MDE-approved computer literacy certification exam.
4. Applicant must successfully complete certification for an online learning workshop, a module, or a course that is approved by the MDE.
5. Applicant must successfully complete a STEM Applications certification workshop, module, or course that is approved by the MDE.

Note: If an applicant meets all requirements listed above, that applicant will be issued a 983 endorsement to be added to his or her 5-year license.

Professional Learning

If you have specific questions about the content of each training session provided, please contact the Research and Curriculum Unit at 662.325.2510, and ask for the Professional Learning Specialist.

Course Outline

Course code: 000273

Unit	Unit Name	Hours
1	Orientation and Ethics	5
2	Technology Literacy	5
3	The Design Process	5
4	Emerging Technologies (ongoing)	5
5	Computer Aided Design	25
6	Sustainable Design and Technology	10
7	Power and Energy	25
8	Robotics Simulation	10
9	Financial and Economic Literacy	20
10	Workplace Skills: School to Careers	10
Total		120

STEM Applications Research Synopsis

Introduction

Development of the STEM Applications curriculum arose from the growing career opportunities in this area. As technology grows, so grows the need for an educated and competent workforce. Though Mississippi offers secondary and postsecondary programs that focus on the areas of science, technology, engineering, and mathematics, a need for an introductory course materialized. Students need the opportunity to be introduced to the concepts associated with the STEM area before they choose a specialty area. Additionally, the concepts discussed in STEM Applications are those that will be beneficial to all students in future endeavors, whether they choose academic or career and technical education.

Needs of the Future Workforce

Currently, there are approximately 40,000 positions in the STEM area in the state of Mississippi, with over 8 million nationwide. According to the Economic Modeling Specialists Inc. (EMSI), employment needs are expected to rise by 19% by the year 2019. Computer science, engineering, and life sciences alike are all expected to have large employment percentage gains in the next decade.

SOC Code	Description	MS 2010 Jobs	MS 2019 Jobs	Change	% Change	2010 Median Hourly Wage	National 2010	National 2019	National % Change	2010 National Median Hourly Earnings
15-0000	Computer and mathematical science occupations	12,057	14,513	2,456	20%	\$22.20	3,786,413	4,354,991	15%	\$32.72
17-0000	Architecture and engineering occupations	17,495	20,519	3,024	17%	\$26.70	2,592,768	2,787,937	8%	\$32.79
19-0000	Life, physical, and social science occupations	10,386	12,361	1,975	19%	\$23.44	1,787,919	2,098,819	17%	\$26.65
	Total	39,938	47,393	7,456	19%	\$24.49	8,167,101	9,241,747	13%	\$31.41
Source: EMSI Complete Employment - 1st Quarter 2011										

Perkins IV Requirements

The STEM Applications curriculum meets Perkins IV requirements of high-skill, high-wage, and/or high-demand occupations by introducing students to and preparing students for critical-need occupations. It also offers students a program of study including secondary, postsecondary, and IHL courses that will prepare them for

occupations in these fields. Additionally, the STEM Applications curriculum is integrated with academic common core standards. Lastly, the STEM Applications curriculum focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

Curriculum Content

Summary of Standards

The standards to be included in the STEM Applications curriculum are the Common Core Standards for English Language Arts and Mathematics, 21st Century Skills, and the National Educational Technology Standards (NETS) for Students. Combining these standards to create this document will result in highly skilled, well-rounded students who are prepared to enter a secondary academic or career and technical program of study. They will also be prepared to academically compete nationally as the Common Core Standards are designed to prep students for success in college and careers.

Academic Infusion

The STEM Applications curriculum is tied dually to the Common Core English Language Arts and Mathematics standards. The curriculum provides multiple opportunities to enhance these academic skills. Since students will be required to communicate effectively in the classroom as well as in the workforce, there is a considerable amount of writing in this curriculum. The finance portion of this curriculum provides several opportunities for focus in mathematics as it requires several calculations and critical thinking. Additionally, the CAD unit gives students experience with drawing, scale, and measurement.

Professional Preparation

Teacher Licensure

The 983 licensure endorsement is needed to teach the STEM Applications course. The requirements for the 983 licensure endorsement are listed below:

1. Applicant must have earned a 4-year education degree (bachelor's degree) or higher from an accredited institution of higher education.
2. Applicant must hold a current and valid Mississippi 5-year teaching license.
3. Applicant must successfully complete an MDE-approved computer literacy certification exam.
4. Applicant must successfully complete certification for an online learning workshop, a module, or a course that is approved by the MDE.

5. Applicant must successfully complete a STEM Applications certification workshop, module, or course that is approved by the MDE.

Note: If an applicant meets all requirements listed above, that applicant will be issued a 983 endorsement to be added to his or her 5-year license.

Best Practices

Innovative Instructional Technologies

Recognizing that today's students are digital learners, the classroom should be equipped with tools that will teach them in the way they need to learn. The STEM Applications curriculum includes teaching strategies that incorporate current technology. It is suggested that each classroom house a classroom set of desktop student computers and one teacher laptop. To make use of the latest online communication tools such as wikis, blogs, and podcasts, the classroom teacher is encouraged to use a learning management system, for example, the Blackboard Content Management System, that introduces students to education in an online environment and places the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways. Some are visual learners, needing only to read information and study it to succeed. Others are auditory learners, thriving best when information is read aloud to them. Still others are tactile learners, needing to participate actively in their learning experiences. Add the student's background, emotional health, and circumstances, and a very unique learner emerges. To combat this, the STEM Applications curriculum is written to include several instructional methods by using the Understanding by Design (UbD) approach. This method of instructional design leads students to a deeper understanding of course material and provides multiple opportunities for students to succeed in different ways. Many activities are graded by rubrics that allow students to choose the type of product they will produce. By providing various teaching and assessment strategies, students with various learning styles can succeed.

Career and Technical Education Student Organizations

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the STEM Applications curriculum. Some examples include Future Business Leaders of America (FBLA), SkillsUSA, and the Technology Student Association (TSA). Each

of these student organizations provides students with growth opportunities and competitive events. Teachers are encouraged to give students the opportunity to participate in one of these or another student organization.

Cooperative Learning

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the STEM Applications curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The STEM Applications curriculum provides opportunities for students to work together and help each other to complete complex tasks.

Conclusions

Based on the previous information, the Mississippi STEM Applications curriculum will be filled with opportunities to teach and learn using technology. The students will be exposed to emerging technologies, engineering, and environmental topics that will help them to become more well-rounded and culturally-aware individuals. Other widely used teaching strategies such as cooperative learning, problem-based learning, and demonstration will also be included in this curriculum. These will help to prepare students for the hands-on instruction they will likely receive upon entering further secondary study and/or the workforce.

Many instructors rely on collaboration among their colleagues; therefore a P.A.C.E site, similar to a B.R.I.D.G.E site, will be created for the STEM Applications instructors to share ideas and lesson plans. The curriculum document will be updated regularly to reflect the needs of society and the workforce.

Professional Organizations

Future Business Leaders of America-Phi Beta Lambda, Inc.
1912 Association Drive
Reston, VA 20191-1591
800.325.2946
<http://www.fbla-pbl.org/>

SkillsUSA
14001 SkillsUSA Way
Leesburg, VA 20176
703.777.8810
<http://www.skillsusa.org/>

Technology Student Association
1914 Association Drive
Reston, VA 20191-1540
888.860.9010
<http://www.tsaweb.org/>

Using this Document

Unit Number and Title

Suggested Time on Task

An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75–80% of the time in the course.

Competencies and Suggested Performance Indicators

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested performance indicators represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Suggested Teaching Strategies

This section of each unit indicates research-based strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies that reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

Suggested Assessment Strategies

This section indicates research-based strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

Integrated Academic Topics, 21st Century Skills and Information and Communication Technology Literacy Standards, ACT College Readiness Standards, and Technology Standards for Students

This section identifies related academic topics as required in the Subject Area Testing Program (SATP) in Algebra I, Biology I, English II, and U.S. History from 1877, which are integrated into the content of the unit. Research-based teaching strategies also incorporate ACT College Readiness standards. This section also identifies the 21st Century Skills and Information and Communication Technology Literacy skills. In addition, national technology standards for students associated with the competencies and suggested objectives for the unit are also identified.

References

A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested, and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Unit 1: Orientation and Ethics

Understandings and Goals

Enduring Understandings

In this unit, the student will learn the following:

- Personality, teamwork, and leadership abilities are integral components for creating a healthy learning community.
- Safety is an integral part of daily life.
- Students will understand the importance of school policies and procedures.
- Students will understand classroom guidelines and expectations.

Essential Questions

- What would happen if there were no rules or regulations?
- Why do some people not work well together?
- How do people get the jobs they want to have?

Vocabulary

Identify and review the unit vocabulary:

Career
Emerging
Innovations
Leadership
Learning style
OSHA
Policy
Procedures
Technology
Workforce

Suggested Learning Experiences

Competency 1: Identify course expectations, school policies, program policies, and safety procedures related to STEM Applications. <small>(DOK1, CS12)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify course expectations, school policies, and program policies related to STEM Applications. <small>(T2, T4, T5)</small>	a. Using the school handbook, read and discuss school district policies and procedures. Emphasize the district’s Internet acceptable use policy. Engage the students in a teacher-led conversation/debate about the pros and cons of the school’s Internet acceptable use policy. Create and issue a quiz about the rules and regulations with a 100% passing requirement.	a. Graded quiz
b. Identify, describe, and demonstrate the importance of safety and the proper use of lab equipment. <small>(T5)</small>	b. Identify and discuss the use of proper precautions when using the equipment in the laboratory. Group students, and have them analyze the “Safety Scenarios—What Would You Do?” provided in the curriculum. Have the students answer the questions and then rank the items listed in the scenario from the least important (No. 7) to the most important (No. 1). Have the students describe how each item will be used to assist with their survival.	b. Group Participation Rubric
c. Describe the operating procedures for the equipment utilized in the course. <small>(T6, CCE8)</small>	c. Identify and discuss the location of laboratory equipment and its resources. Discuss the role and responsibility of the teacher and the students. Have the students list the equipment that is used in this course and describe a minimum of five safety rules that apply to any workstation.	c. Teacher observation
d. Compare and contrast safety issues in the classroom to safety issues in industry. <small>(T5, T6, CCE9)</small>	d. Using a multimedia presentation, Internet access, and so forth, discuss the relationship between classroom safety and real-world safety. Have students research the safety guidelines in industry (OSHA). Then have students select a technical field that they are interested in and illustrate and present how OSHA standards are used in a safety procedure in that field (poster, skit, 3-D visual, etc.). (Reference: http://www.osha.gov) Invite an employee of local industry to be a guest speaker and discuss workplace safety issues in comparison to classroom safety. Encourage the speaker and students to discuss workplace safety issues and how they impact business and industry economically.	d. OSHA Standards in the Workplace Rubric

Competency 2: Recognize the importance of personality development, leadership, and teamwork in relation to the classroom environment, interpersonal skills, and others. <small>(DOK1, CS1, CS3, CS8, CS16)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discover individual	a. Show students a learning style video found at	a. Project Rubric

learning styles and their importance in the classroom/workplace. ^(T1, CCE1)	<p>http://www.teachertube.com (Title: Just Say Yes!) (Multiple Learning Styles). Have students take a learning styles inventory (http://www.vark-learn.com) to determine student learning styles. Explain to students that it is important to know they learn. Have students divide into groups based on learning styles. Have each group create a collage using magazines and bulletin board/poster paper that explains its learning style. Evaluate the learning style collage based on content and creativity.</p> <p>Use information from this inventory throughout the year when assigning group work. Have students summarize the information from the learning style and personality inventory in a blog entry titled "How I learn best...."</p>	Journal Rubric
b. Identify potential influences that shape the personality development including personality traits, heredity, and environment. ^(T2, CCE1)	<p>b. Discuss the importance of understanding different personalities.</p> <p>Create short scenarios of cooperative and uncooperative group members, and have students act them out.</p> <p>Discuss the qualities of an effective leader, and identify opportunities available through student organizations (TSA) and in the local community that develop leadership skills.</p>	<p>b. Teacher observation</p> <p>Role-play or Skit Rubric</p>
c. Develop effective leadership, decision-making, and communication skills. ^(T2)	<p>c. Have students identify and interview five community leaders and ask each leader, "Why do you think you are an effective leader?" Have students bring those traits to the next class meeting. Make an overall list of characteristics. Have each student set a goal and work toward improving his or her personal leadership.</p> <p>Use a rubric to grade a summary report of matching leaders and opportunities in the community to develop leadership skills.</p>	c. Report Rubric
d. Identify career interests. ^(T4)	d. Complete Mississippi Bridges Guideway for ninth grade.	d. Printouts from Guideway

Competency 3: Identify emerging careers in the technology field. ^(DOK1, CS13, CS14)

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Research, identify, and describe emerging careers in the technology field. ^(T3, CCE1)	a. Use Internet search engines, magazines, articles, and so forth to discover new and exciting careers that are available in technology-related fields. Have students link their personal career choice area to the technology that is available in that field.	a. Teacher observation
b. Investigate requirements necessary to work in selected emerging technology	b. Have students research their career choice more in depth to discover education requirements, salary, and so forth (Reference: http://www.bls.gov). Students will then create a "road map" to follow in order to reach	b. Project Rubric

fields. ^(13, CCE1)

that goal (High school courses, college courses, workforce training, etc.).

Performance Task

Performance Task Title

No performance task necessary for orientation units.

Attachments for Performance Task

None

Unit Resources

Web sites

Occupational Safety and Health Administration - Home. (n.d.). Retrieved May 02, 2011, from <http://www.osha.gov>

TeacherTube. (n.d.). Retrieved May 2, 2011, from <http://www.teachertube.com>

U.S. Bureau of Labor Statistics. (n.d.). Retrieved May 02, 2011, from <http://www.bls.gov>

VARK--A Guide to Learning Styles. (n.d.). Retrieved May 02, 2011, from <http://www.vark-learn.com>

Unit 2: Technology Literacy

Understandings and Goals

Enduring Understandings

In this unit, the student will learn the following:

- Technology is constantly changing.
- Technology requires continuous learning of new skills.
- Technology should be based on personal and/or career needs.
- Technology requires proper storage and disposal.
- Technology can make jobs easier.

Essential Questions

- What is technology?
- How does technology evolve?
- How is society affected by technology?
- How can technology benefit your personal/career needs?
- How can technology make jobs easier?

Vocabulary

Identify and review the unit vocabulary:

Applications	HTML
Boolean Search Logic	Hyperlink
Browser	Internet
Communication	Science
CPU Central Processing Unit	Software
Digital Camera	Surf
Digital Video Camera	Technology
Download	URL
E-Mail	Virus
Hardware	WWW

Suggested Learning Experiences

Competency 1: Define technology. <small>(DOK1, CS9, CS11)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Examine the many characteristics of technology. <small>(T3, T6, CCE1)</small>	<p>a. Show pictures to the class, asking them if it is technology. (Try to have the most random pictures.) Arrange pictures, based on student response, on a display board labeled “Technology/Not Technology.” After all students have had a turn, provide students with the definition of technology, and have students correct the display if needed. (Note: all pictures should be examples of technology—sort of a “trick” question to get them thinking about the true definition of technology.)</p> <p>Have class discussion, and use word web on what students think the definition of technology is. Give the correct definition and discuss. (Have students keep all in their notes.)</p>	<p>a. Journal Rubric</p> <p>Knowledge of presentation</p>
b. Discover the various types of technology. <small>(T3, T6, CCE1)</small>	<p>b. Bring a current article on technology, and share with the class. Answer what area the technology is in and what it is. Discuss the various types of technology. Have posters labeled with each of the 16 career clusters (http://www.careerclusters.org/16clusters.cfm). Have students locate pictures of technology use in each area. The students should cut out and bring in the pictures and glue them on the correct poster.</p> <p>Have students create a PPT on technology in each career cluster (or have the students choose a cluster they would like to focus on, making sure all 16 are covered). Students will present their slide show to the class and teacher.</p>	<p>b. Teacher observation</p> <p>Presentation Rubric</p>

Competency 2: Demonstrate understanding of the evolution of technology. <small>(DOK2, CS9, CS11)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Research and report on evolution of technology. <small>(T3, T6, CCE1, CCE2, CCE3, CCE7, CCE8)</small>	<p>a. Discuss human needs and wants and how they relate to the true meaning of technology. Choose an era to begin with and discuss how technology has changed throughout history. Point out the major technology that defined each period of time.</p> <p>Pick a product of technology. Create a time line on your product. Start with who invented it and what year. Go through any modifications it has had.</p> <p>Create a scrapbook page on your product. Be sure to include who and when it was invented. Include pictures</p>	<p>a. Teacher observation</p> <p>Time line Rubric</p> <p>Scrapbook Rubric</p>

	or drawings, and include any modifications it has had. Be creative. All pages will be fastened together to form a class scrapbook. Be sure properly cite references and credit any pictures copied. (Explain procedures.)	
b. Discuss effects technology has on society. <small>(T5, T6, CCE3)</small>	<p>b. Research and report the correct ways to dispose of various old/used technology items. Each student should report on a different type of technology. The report should include what happens to the environment if the item is disposed of improperly.</p> <p>Using Internet research, uncover what bar codes mean, who invented them, and how they have improved society. Also discuss the creation and function of the QR (Quick Response) code. Have students create their own unique bar code/QR code and be able to discuss its meaning to make it personal.</p>	<p>b. Report Rubric</p> <p>Project Rubric</p>

Performance Task

Performance Task Title: “Calm Down, Folks!”

You are a technology expert, renowned for your work in recyclable materials. The Mayor of Vanna, a small town in Mississippi, has called on you to help him with a problem. A company called Versa is planning to build a modern factory near your small town. Versa manufactures a new type of technology that is unknown to the community. It has been rumored that this new technology could have hazardous effects on the area. Your task is to research the new technology and describe it to the community. They would also require a picture of the technology. You are also asked to calm community fears concerning the product by detailing the benefits of this technology and assure them that with the proper disposal (which you will describe), there will be no ill effects on the community. Create a community flyer to educate the public on how the new factory will benefit the citizens and the changes it will bring to the community. You will be evaluated according to the accuracy, cleanliness, clarity, and overall presentation of your product. (The project should include a one-page report on the new technology with a picture and how to dispose of it, as well as a flyer to inform the public.)

Attachments for Performance Task

Performance Task Rubric (Located in Appendix A)

Unit Resources

Web sites

States' Career Clusters Initiative. (n.d.). *States' career clusters*. Retrieved May 02, 2011, from

<http://www.careerclusters.org/16clusters.cfm>

Unit 3: The Design Process

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Understand the meaning of each step of the design process.
- Demonstrate understanding of design process by analyzing its use in the development of a product.
- Apply the design process to build and test products.

Essential Questions

- What does each step of the design process mean?
- How do you determine if the design process was used to design an item?
- What are some things to consider when modifying a product?
- What design criteria should you consider when designing a product?

Vocabulary

Identify and review the unit vocabulary:

Analyze
Assessment
Brainstorm
Criteria
Data
Design
Design process
Goals
Implement
Innovation
Model
Process
Quality assurance
Specify

Suggested Learning Experiences

Competency 1: Recognize the need for a design process. <small>(DOK1, CS6, CS7, CS13)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define the design process. <small>(T3, CCE1, CCE2, CCE3)</small>	<p>a. (Please be aware that there are conflicting views as to how many steps a design process has, but this is the one that will be used in this course.)</p> <p>The teacher will demonstrate a product and how it was designed following each step of the design process to establish the meaning of each step.</p> <ul style="list-style-type: none"> • Identify the problem/product innovation. • Define the working criteria/goals. • Research and gather data. • Brainstorm/generate creative ideas. • Analyze potential solutions. • Develop and test models. • Make the decision. • Communicate and specify. • Implement and commercialize. • Perform post-implementation review and assessment. 	a. Teacher-created/guided activity
b. Identify items designed through the design process and those that are not. <small>(T3, CCE1, CCE2, CCE3)</small>	<p>b. The teacher will discuss and give examples of items designed through the design process steps and items that were not designed through the design process.</p> <p>The student will research various items and determine if the design process was used and create a multimedia presentation to illustrate this to the class. The teacher and students will discuss each multimedia presentation to reinforce understanding.</p>	b. Presentation Rubric

Competency 2: Examine how the design process is used to create and modify products and inventions. <small>(DOK2, CS1, CS5, CS12)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Follow the design process to modify a product or invention. <small>(T1, T4, CCM48)</small>	a. Students will modify a feature of an existing product (such as a cell phone, microwave, can opener, etc.) using the design process by describing and drawing the modification.	a. Student-created drawing, Teacher Observation
b. Apply concepts of planning, design, building, testing, quality assurance, and customer needs. <small>(T1, T4, T5, CCM49)</small>	b. Choose one of the following two activities: 1. Define planning, design, building, testing, quality assurance, and customer needs as these terms apply to the design process. Students will work in groups to build a paper tower following specified design criteria with limited supplies and compete with other groups in the classroom for the tallest, free-standing (for 10 seconds) tower. The students will compete, and the teacher will keep measurements on the board as the towers are tested. Provide prizes to the top winners.	b. Paper Tower Contest (Supplies are listed.)

	<p>2. Students will work in groups to build an aircraft decoy following specified design criteria with limited supplies and compete with other groups in the classroom for the aircraft decoy that will travel the longest distance. The students will compete, and the teacher will keep measurements by marking the distance on the string. Provide prizes to the top winners.</p> <p>Students will complete the reflective memo on the activity completed above.</p> <p>OPTIONAL: Invite a guest speaker to explain the design process of a product in your area (ex. automobile industry, computer industry, timber industry, refining industry, department of transportation, etc.).</p>	<p>Attached Air Craft Decoy Design competition (Supplies are listed.)</p> <p>Journal Rubric</p>
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Performance Task

Performance Task Title: Cardboard Chair Design

Students will work in groups of 3 or 4 to build a cardboard chair following specified design criteria.

You are a furniture designer charged with creating a new line of chairs that use recyclable material but still support people. You intend to practice using only cardboard for your design. Please use the activity sheet for further instructions. You will be evaluated by the design, explanation, specifications, aesthetics, and group work.

Attachments for Performance Task:

Cardboard Chair Design Activity (Located in Appendix A)

Cardboard Chair Design Rubric (Located in Appendix A)

Performance Task Rubric (Located in Appendix A)

Unit Resources

Web sites

The design process. (n.d.). *The Design Process*. Retrieved May 2, 2011, from <http://tinyurl.com/thedesignprocess>

Unit 4: Emerging Technologies

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Understand that technology is ever-changing and ever-evolving.
- See how technology changes to meet the needs of consumers.
- Realize the process of creating a new technology.

Essential Questions

- How does technology evolve?
- How is a new technology developed?

Vocabulary

Identify and review the unit vocabulary:

Consumer
Emerging
Evolve
Proposal
Technology

Suggested Learning Experiences

Competency 1: Evaluate emerging technologies in society. <small>(DOK3, CS1, CS9, CS11)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and evaluate technologies that have been developed within the last 3 months (ongoing). <small>(T6, CCE1)</small>	a. Students will research recent technologies that have been developed within the last 3 months. They will give a summary of the new product, the pros and cons of the product, and their opinion of the product.	a. Emerging Technology Journal

Competency 2: Develop a proposal for a new technology. <small>(DOK4, CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS11, CS13, CS15, CS16)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Design a new technology based on previous research. <small>(T1, T2, T3, T4, T5, T6)</small>	a. Have students consider a product that they wish were made differently. They should think about how they would recreate it to make it better. Refer to performance task below.	a. Performance Task Rubric
b. Write a proposal to present your product to an industry for purchase. <small>(T1, T2, T3, T4, T6, CCE4, CCE5, CCE7)</small>	b. Students should prepare a true proposal that they would present in order to persuade someone to change the product from Competency 2a. Refer to performance task below.	b. Performance Task Rubric

Performance Task

Performance Task Title: New Technology Design

At your company, you are in charge of evaluating consumer comments and suggestions in order to better design and redesign the products that your company makes. After weeks of consideration, you are now charged with designing and creating a new technology that will better meet the needs of consumers. Once designed, create a proposal for your boss to persuade him that this is how the technology should be created from now on. You should consider how your boss would feel as well as the general public, as you would want them both to approve. Your proposal should be a report with visual aid(s), a multimedia presentation, or other product that would be convincing. You will be evaluated on the quality, cleanliness, accuracy, knowledge, and thoroughness of your proposal and presentation.

Attachments for Performance Task

Performance Task Rubric (Located in Appendix A)

Unit Resources

Books

Einsiedel, E. F. (2009). *Emerging technologies: From hindsight to foresight*. Vancouver, BC: UBC Press.

Web sites:

Cutting Edge - The latest in emerging technologies - CNET News. (2011). Technology News - CNET News. Retrieved May 02, 2011, from <http://news.cnet.com/cutting-edge/>

Unit 5: Computer Aided Design (CAD)

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Understand why computer aided design is important and how it has evolved.
- Realize what is involved in computer aided design and what tools/software are available to perform CAD design.
- Learn the basic CAD software commands.

Essential Questions

- What is CAD drafting?
- What can be done using a CAD system?
- Who uses CAD systems and why?
- Why is CAD important?

Vocabulary

Identify and review the unit vocabulary:

Attributes
Axis
CAD
Dimensions
Drafting
Engineer
Interact
Isometric view
Measurement
Monochrome
Orbit
Orthographic view
Perspective view
Plans
Scale

Suggested Learning Experiences

Competency 1: Examine the drafting and design industry. (DOK1, CS1, CS6, CS11)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Examine the history of drafting and design. (T3, T6, CCE1, CCE2, CCE3)	a. Discuss CAD vocabulary. After discussion, group students, and have them research the history of drafting and design. The students should consider how drafting has evolved from the earliest known blueprints to now. They should also consider what prompted the changes in the CAD industry. Have students prepare a report or a time line outlining the history of drafting and design. (Teachers: Refer to the resources at the end of this unit.)	a. Report Rubric/Time line Rubric
b. Identify drafting and design applications in business and industry. (T3, T6, CCE1, CCE2, CCE3)	b. Have students pick one of the 16 national career clusters (perhaps the one they best identify with) and research the use of CAD in that area of industry. Be sure that all 16 clusters are covered. Students should be prepared to discuss openly, comparing and contrasting the use of CAD in each cluster.	b. Discussion Rubric

Competency 2: Create 3-D models with CAD software. (DOK4, CS6, CS11)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Distinguish between the types of drawing views: orthographic, isometric, and perspective. (T6, CCE1, CCE2, CCE3, CCM43, CCM44)	a. Introduce the three types of drawing views to students via a multimedia presentation, and discuss the definitions of each. (Teachers: Refer to the references at the end of this unit.) Help students realize how to differentiate between each view. Create quiz to ensure student understanding.	a. Graded quiz
b. Demonstrate use of basic drawing commands. (T6, CCM30, CCM43, CCM44)	b. Using CAD software, introduce drawing commands individually, and discuss why each one is used. Have students practice using them, creating elementary sketches that you have demonstrated. (Could be ongoing for a few classes.) Students should become comfortable with maneuvering the commands in the software. Terminology and commands will differ depending on which CAD software you use. (Teachers: Please refer to the STEM PACE site for additional CAD activities and resources.)	b. Teacher Observation and/or graded quizzes
c. Create 3-D drawings using CAD software. (T6, CCM30, CCM43, CCM44)	c. Have students measure an area of the school building (cafeteria, library, etc.) and create a 3-D drawing of the area. Students could also draw other objects/buildings as instructed by the teacher.	c. Drawing Rubric

Performance Task

Performance Task Title: The House of Your Dreams!

You are a home buyer who would like to show an architect exactly what you would like for your house to look like. Since you are familiar with CAD software, you decide to sketch the design yourself. You want to be sure that the architect understands exactly what you want, so your design should be easy to understand. Design and draw the house you would like to have using CAD software. You should include all of the rooms you would need, as well as exterior landscaping (trees, bushes, pool, etc.) if desired. You will be evaluated on your understanding of CAD software, as well as the accuracy and sophistication of your drawing.

Attachments for Performance Task

Drawing Rubric (Located in Appendix A)

Unit Resources

Books

Chopra, A. (2011). *Google sketchup 8 for dummies*. Hoboken, NJ: Wiley Pub.

Grover, C. (2009). *Google sketchup: The missing manual*. Beijing, China: O'Reilly.

Web sites

Computer-aided design. (2011, April 21). *Wikipedia, the Free Encyclopedia*. Retrieved May 02, 2011, from http://en.wikipedia.org/wiki/Computer-aided_design

Google sketchup 8. (2011). *Google SketchUp*. Retrieved May 02, 2011, from <http://sketchup.google.com>

Unit 6: Sustainable Design and Technology

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Grasp the story behind the things we buy, use, and toss in order to help us to consume in ways that improve our lives and the lives of others.
- Gain the knowledge and skills to help them be informed and empowered consumers.

Essential Questions

- What does “sustainability” mean?
- What is the difference between “going green” and “sustainability”?
- Which is more important to our economy, environment, and/or society?
- Does either “green” or “sustainability” concepts affect you?
- Should you be concerned about “sustainability”?

Vocabulary

Identify and review the unit vocabulary:

Climate change
Ecological footprint
Ecology
Economy
Environment
Incinerator
Landfill
Lifestyle
Luxury
Midden
Natural resources
Necessity
Population
Recycling
Sustainability
Sustainable design
Waste disposal

Suggested Learning Experiences

Competency 1: Demonstrate understanding of the concept of sustainable design. (DOK2, CS1, CS3, CS5, CS7, CS14)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Research and report on the concept of sustainable design. (T3, T6, CCE1, CCE2, CCE3)	<p>a. Hook: You tube video(s) “Sustainability Explained Through Animation” http://www.youtube.com/watch?v=B5NiTN0chj0 Mr. Box - A Short Film on Sustainability http://www.youtube.com/watch?v=INLyfernZQ4&feature=fvw</p> <p>Hold a discussion on what the students think/feel about the concepts contained in this video. (If unable to watch these videos in class, prepare teaching materials based on these concepts.)</p> <p>Begin class with the Essential Questions.</p> <p>Have students write a short description of their current view of sustainable design. Ask them to evaluate their personal lifestyles to see if they are practicing a sustainable or wasteful lifestyle.</p> <p><i>OR</i></p> <p>Using the “Sustainability Project” Activity, students should research and explain the difference between “green” and “sustainability” and decide which they feel is most important and why.</p>	<p>a. Class discussion</p> <p>Class discussion</p> <p>200 word minimum on Discussion Board (Use Discussion Rubric.)</p> <p>Presentation Rubric</p>
b. Discuss ways that sustainable design can reduce waste in society. (T3, T6, CCE6)	<p>b. Using <i>Buy, Use, Toss?</i> (free download http://www.facingthefuture.org/Curriculum/BuyUseToss/tabid/469/Default.aspx) Unit 1: Garbology, students will analyze typical contents of a trash can saved from the class trash over a 24-hr period as “luxury” and “necessity.” Students could also complete the “Buried Treasure” activity and answer each question with complete sentences. Submit document for evaluation per instructions.</p> <p>Follow up with reading a short article about trash typically found in a modern dump in North America. Using this information, students will draw conclusions about how these artifacts reflect the lifestyles of those who used and disposed of the items.</p>	<p>b. Graded questions for accuracy</p> <p>Group Participation Rubric</p>

Competency 2: Design a “green” alternative to an existing product. (DOK4, CS1, CS2, CS3, CS5, CS6, CS7, CS13, CS14, CS16)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Evaluate common	a. Using <i>Buy, Use, Toss?</i> Curriculum Unit 2: Mapping the	a. Group Participation

<p>products to discover positive/negative effects on the environment. ^(T3, T4, T5, T6, CCE1, CCE2, CCE3)</p>	<p>Impact, students will create a web diagram to illustrate environmental, social, and economic impacts associated with everyday items. Students will develop ideas to reduce the ecological footprint and associated impacts related to an everyday item. Refer to the references section for links to relevant films/videos on this subject.</p>	<p>Rubric</p>
<p>b. Using CAD, design an environmentally friendly alternative to a common product. ^(T3, T4, T5, T6, CCE1, CCE2, CCE3)</p>	<p>b. Brainstorm and diagram all the resources, processes, and impacts associated with one everyday object. Divide students in groups of 3-4 with paper and markers. Each will decide on an item, brainstorm, and draw diagram with the associated impacts of items. Then students will find an alternative solution to the product being discussed and design/draw it using CAD software.</p>	<p>b. Drawing Rubric</p>

Performance Task

Performance Task Title: Environmentally-Friendly Town

You have been selected to lead a community group that is charged with developing a plan to turn your city into an “Environmentally-Friendly Town.” With your group (3-4 people), develop a class action plan that addresses one or more of the issues discussed during this unit. Brainstorm what you feel is the most important environmental sustainability issues, and then decide where you can start making an impact for their futures. Your group will present your ideas to the class and then discuss and reflect. (Teachers: have students choose the best features of each plan to develop the “best” plan. Also, possibly award the group that has the “best” ideas.)

Attachments for Performance Task

Performance Task Rubric (Located in Appendix A)

Unit Resources

Web sites

Department of Energy - For Students and Kids. (n.d.). *Department of Energy - Homepage*. Retrieved May 02, 2011,

from <http://www.energy.gov/forstudentsandkids.htm>

Energy savers: Do-it-yourself home energy assessments. (2011, September 02). *EERE: Energy Savers Home Page*.

Retrieved May 02, 2011, from

http://www.energysavers.gov/your_home/energy_audits/index.cfm/mytopic=11170

Green schools. (2011). *Green Schools Initiative: Index*. Retrieved May 02, 2011, from <http://greenschools.net/>

Inform: Building environmental literacy. (2011). *Welcome :: INFORM, Inc*. Retrieved May 02, 2011, from

<http://www.informinc.org/pages/index.php>

Issues, G. (2011). Buy, use, toss? Science & social studies curriculum--facing the future. *Sustainability & Global*

Issues Curriculum/Facing the Future. Retrieved May 02, 2011, from

<http://www.facingthefuture.org/Curriculum/BuyUseToss/tabid/469/Default.aspx>

Issues, G. (2011). Curriculum and lesson finder--facing the future. *Sustainability & Global Issues Curriculum | Facing*

the Future. Retrieved May 02, 2011, from

<http://www.facingthefuture.org/Curriculum/FindCurriculumthatIsRightforYou/tabid/68/Default.aspx>

Sang, C. (2011). YouTube-Mr. box-A short film on sustainability. *YouTube-Broadcast Yourself*. Retrieved May 02,

2011, from <http://www.youtube.com/watch?v=INLyfernZQ4>

Secret life. (2011). *Secret Life*. Retrieved May 02, 2011, from <http://www.secret-life.org>

YouTube-Sustainability explained through animation. (2011). *YouTube-Broadcast Yourself*. Retrieved May 02, 2011,

from <http://www.youtube.com/watch?v=B5NiTN0chj0>

Your environment. Your choice. Resources for waste education. (n.d.). *US Environmental Protection Agency*.

Retrieved May 02, 2011, from <http://www.epa.gov/epawaste/education/teens/index.htm>

Unit 7: Power and Energy

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Realize the benefits of renewable energy.
- Recognize and understand the different types of power and energy.
- Be aware of jobs and careers in power and energy.
- Understand the flow of energy.
- Be aware of the pollution effects of energy.

Essential Questions

- What is power?
- What is energy?
- Where does electricity come from?
- How is energy created?
- Where does power come from?
- How does my consumption of energy affect the Earth?

Vocabulary

Identify and review the unit vocabulary:

Biomass
Consumption
Energy
Fuel Cell
Geothermal
Nuclear
Pollution
Power
Solar

Suggested Learning Experiences

Competency 1: Demonstrate understanding of the power and energy industry. (DOK2, CS1, CS2, CS5)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discover the many types of power and energy. (T3, T6, CCE1, CCE2, CCE3)	a. Create a multimedia presentation that explains several different types of power and energy, clean, or otherwise (solar, nuclear, biomass, fuel cells, geothermal, wind, electrical, renewable, nonrenewable, etc.). Have students compare and contrast the different types. Students should discuss/debate which they think is best, especially for their geographic area.	a. Group Participation Rubric
b. Identify terms and concepts related to the power and energy industry. (T3, T6, CCE1, CCE2, CCE3)	b. Define relevant vocabulary words. Discuss how these concepts relate to the environment.	b. Teacher Observation
c. Research and report on careers in the power and energy industry. (T3, T6, CCE1, CCE2, CCE3)	c. Have students research careers in the power and energy industry. Students can be grouped or work individually to discover each level of employment throughout this industry (linemen→executive). Students should prepare a report and present it to the class. (Be sure that several different careers are covered and not duplicated.)	c. Report Rubric Presentation Rubric

Competency 2: Evaluate the effects of power and energy on the environment. (DOK3, CS1, CS3, CS4, CS5, CS14)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Examine energy flow through the environment. (T3, T6, CCE1, CCE2, CCE3)	a. Begin by asking students where energy and/or power comes from. Allow them to brainstorm where it begins. Lead discussion on where power and energy start and how they flow through the environment. After discussion, give students slips of paper with pictures of the flow of energy on them. Students should try to put them together to create the correct picture (like a puzzle). Then conclude discussion by reinforcing the flow of energy in the environment by referring to the completed picture.	a. Group Participation Rubric
b. Identify pollution effects of energy production and usage. (T3, T6, CCE1, CCE2, CCE3)	b. Have students research deeper into the types of short-term and long-term pollution effects that the production of energy causes. The students should start to see where the biggest problems lie and what alternatives are available. Have students choose a type of energy production and outline it using the “Which Energy Should We Use?” activity sheet (located in Appendix A). Have students hang the activity sheets on the wall for the students to peruse, and then have students explain their reasoning to the class.	b. Project Rubric
c. Propose a solution to an energy problem in	c. See Performance Task below.	c. Performance Task Rubric

your geographical area. (T1, T2, T3, T6, CCE1, CCE2, CCE3)		
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Performance Task

Performance Task Title: Solve Our Energy Problem!

As the Renewable Energy Chairperson of your company, your job is to identify areas of waste or potential energy problems in your geographical area and find solutions for them. The ultimate goal of your company is to make the best of the resources that are available in your area. Find a problem area in your community, town, city, or region that could be improved. Develop a strategic plan to remove the current problem and implement a more energy efficient, environmentally-friendly alternative. (Keep in mind the jobs and human factor of the decisions that you make as they are likely to affect the people of the community.) Outline your plan using the “Solve Our Energy Problem” activity sheet, and then present it to your company’s board (the class) for approval. You will be evaluated according to the accuracy, cleanliness, clarity, and overall presentation of your product.

Attachments for Performance Task

“Solve Our Energy Problem!” Activity Sheet
Performance Task Rubric (Located in Appendix A)

Unit Resources

Books

Boyle, G. (2004). *Renewable energy: Power for a sustainable future* (2nd ed.). Oxford, UK: Oxford University Press.

Web sites

Clean energy. (2010). *Clean Energy--Union of Concerned Scientists*. Retrieved April 28, 2011, from

http://www.ucsusa.org/clean_energy/

EIA energy kids-electricity. (n.d.). *EIA Energy Kids-Electricity*. Retrieved April 28, 2011, from

http://www.eia.doe.gov/kids/energy.cfm?page=electricity_home-basics

EIA energy kids-quiz. (n.d.). *EIA Energy Kids-Quiz*. Retrieved April 28, 2011, from

<http://www.eia.doe.gov/kids/energy.cfm?page=quiz>

EIA energy kids-secondary. (n.d.). *EIA Energy Kids-Secondary*. Retrieved April 28, 2011, from

http://www.eia.doe.gov/kids/energy.cfm?page=activities_secondary

Renewable energy. (n.d.). *EduGreen - Edugreen.teriin.org*. Retrieved April 28, 2011, from

<http://edugreen.teri.res.in/explore/renew/renew.htm>

TVA: Green power switch. (2011). *TVA: Green Power Switch*. Retrieved April 28, 2011, from

<http://www.tva.gov/greenpowerswitch/>

Unit 8: Robotics Simulation

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Understand how robots work using logic.
- Be aware of simple programming techniques.
- Recognize the obstacles programmers face when programming a robot.

Essential Questions

- How do robots work?
- What do you think it means to “program” a robot?

Vocabulary

Identify and review the unit vocabulary:

Garbage in-Garbage out
Logic
Program
Robot

	<p>around obstacles. (This is a game, but uses simple programming that will prepare them for more advanced programming.)</p> <p>http://www.nasa.gov/audience/foreducators/robotics/home/ROVER.html</p> <p>The student will program robots in the virtual world. This site has many activities for the students to learn about robots and programming. There is a teacher area that you should examine and become familiar with in order to help your students succeed.</p> <p>http://www.mind.ilstu.edu/curriculum/modOverview.php?modGUI=208</p> <p>RoboMind--free downloadable software for virtual programming. Students can write and execute programs here. http://robomind.en.softonic.com/</p>	
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Performance Task

Performance Task Title

No performance task necessary

Attachments for Performance Task

None

Unit Resources

Web sites

NASA-ROVER--Robotic online virtual exploration rover. (n.d.). *NASA*. Retrieved April 29, 2011, from

<http://www.nasa.gov/audience/foreducators/robotics/home/ROVER.html>

RoboMind. (n.d.). *RoboMind*. Retrieved April 29, 2011, from <http://robomind.en.softonic.com/>

Robotics: At your command: Control your R.O.V. (n.d.). *The Tech Museum*. Retrieved April 29, 2011, from

<http://www.thetech.org/robotics/atyourcommand/index.html>

Virtual robotics lab. (n.d.). *The Mind Project*. Retrieved April 29, 2011, from

<http://www.mind.ilstu.edu/curriculum/modOverview.php?modGUI=208>

Unit 9: Financial and Economic Literacy

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Know how to manage a budget.
- Understand that daily living takes money and sacrifice for most people.

Essential Questions

- How do you know you are making good financial decisions?
- What does it mean to live on a budget?
- How do credit card companies and banks make profits?

Vocabulary

Identify and review the unit vocabulary:

Budget
Consumer
Credit
Economy
Finance
Interest
Investor
Literate
Producer
Profit

Suggested Learning Experiences

Competency 1: Understand financial literacy and services. (DOK2, CS2, CS3, CS13, CS14)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define financial literacy. (T3, T6, CCE1, CCE2, CCE3)	<p>a. Ask students for their definition of “finance.” Using their responses, compile a definition. From here, help students determine what it means to be “financially literate.”</p> <p>Present the compiled definition on the screen for all to see. After clarifying definition for notes, observe as students write the definition and personal examples in their notebooks of items normally included in personal finances.</p>	a. Teacher Observation
b. Recognize the role of financial service providers in achieving financial goals. (T3, T6, CCE1, CCE2, CCE3)	<p>b. Discuss with students who serves as financial service providers in their community. Determine what financial services they offer and why they are important. Have a frank discussion about whether or not the students ever see themselves in need of financial services. (At the end of the discussion, the students should see that these people are not only there to help those in trouble but to help people make good decisions so they do not get into financial trouble.)</p> <p>Divide students into groups. Each group will take on the role of someone in financial services and present, for 2 minutes, the importance of the role in providing the help needed in making sound financial decisions. The students should describe the duties, importance, and expected character of people who work in that area. (Ex. Bank tellers, loan officers, etc.)</p>	<p>b. Teacher Observation</p> <p>Group Participation Rubric</p>

Competency 2: Demonstrate an understanding of the purpose and importance of credit. (DOK2, CS2, CS3, CS13, CS14)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify sources of credit. (T3, T6, CCE1, CCE2, CCE3)	<p>a. Question students concerning their knowledge of types of credit.</p> <p>Compile a list of types of credit. Add types that were omitted.</p> <p>Show examples of credit and credit card applications. Examine each element so that students see what is expected of them in order to be approved.</p>	a. Teacher observation and verbal questioning
b. Compare types of credit. (T3, T6, CCE1, CCE2, CCE3)	b. Discuss the types of credit (credit cards, loans, etc.). Explain finance charge, APR, etc. Illustrate how finance	b. Teacher Observation

	<p>charges are calculated. Have students compare types of credit through use of simulations.</p> <p>Ask students to determine which type of credit is best in given situations and why.</p> <p>Have students work in groups of 2–3. They will write each type of credit and give an example of one item they would purchase using each type and tell why they selected that particular type for the chosen item. Each group will present to the class. Allow students to discuss/debate the choices of their peers.</p>	Group Participation Rubric
c. Compute cost of using and extending credit. ^(T3, T6, CCM1, CCM2, CCM3)	c. Ask students to think of one item they have longed to purchase but did not have the money to buy it. Ask each student to estimate how much this item would cost. The students should pretend they bought this item on credit. The teacher will decide on the interest rate and how many months each student will take to pay off the item. (This should vary for each student.) Help students calculate how long it will take them to pay the item off and how much it ends up costing after interest is applied.	c. Graded Assignment

Competency 3: Recognize the role of major financial decisions in personal financial literacy. ^(DOK1, CS2, CS3, CS13, CS14)

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Summarize the use of a budget to make personal economic decisions and plan for the future. ^(T3, T6, CCM1, CCM2, CCM3)	<p>a. Ask for students’ definition of budget. Add to their statements to complete the definition. Help them discern a “need” from a “want.”</p> <p>Assign small groups, and have them compile a list of necessities and wants of a household.</p> <p>Lead guided discussion on how the budget affects the future of a family.</p>	a. Teacher Observation
b. Compare and contrast different incomes in careers depending on supply and demand of skills and education levels. ^(T3, T6, CCE9, CCM1, CCM2, CCM3)	<p>b. Guided Assignment: Group students, and give them each a budget worksheet comprised examples of three budgets-low income, middle income, and high income. Have students compare each and tell what major item(s) were omitted as well as the differences in amounts spent by each group. Discuss questions. Check to see what each group found missing from the budgets.</p> <p>Individual Assignment: Have students draw careers out of a hat. (Provide a variety of low income and high income positions.) The slips of paper should also tell them their marital status, the amount of credit card debt they have, the number of dependents they are responsible for, and their monthly rent/mortgage payment. Each student should be required to use a</p>	<p>b. Graded Assignment</p> <p>Project Rubric</p>

	budget worksheet to plan how they would survive on the amount of money they earn. (Use Example of Family Budget Worksheet, located in Appendix A.)	
c. Research the different roles in the economy such as producers, consumers, savers, workers, and investors. (T3, T6, CCE1, CCE2, CCE3)	c. Define economy. Discuss with students who all make up the economy (producers, consumers, savers, workers, investors, spenders, etc.). Ask students if the economy would continue on a profitable course if any of the roles listed were missing. Discuss each group's role in stabilizing the economy. Instruct small groups to take on one of the roles. (Be sure all are covered.) Research it, and write a brief essay of its importance to share with the class.	c. Observation and questioning Essay Rubric
d. Examine the tools that can be used to manage financial resources. (T3, T6, CCE1, CCE2, CCE3)	d. Ask students if they have a particular method for saving money. Discuss several options (the envelope system, etc.) as useful tools for managing money. Challenge students to try a new method and report on it at the end of the week to see how successful it was. Discuss online bill pay and using computer finance software to budget, save, and so forth. Reiterate the benefit of financial advisors and their role in helping manage income.	d. Graded Assignment
e. Examine consequences of economic choices made by individuals. (T3, T6, CCM1, CCM2, CCM3)	e. See performance task below.	e. Performance Task Rubric

Performance Task

Performance Task Title: Let's Buy a House!

You are a homebuyer. But you want to be sure that you can afford it. Surf online to find the house you would like to purchase. After finding the base price, research what will be added to this cost for your mortgage and what those values would be for your community. Add the current interest rate, insurance, taxes, realtor fees, and so forth to come up with your monthly payment on a 30-yr mortgage. Multiply that by 360 months, and that is how much the house will actually "cost" you. Provide your calculations to your teacher.

Attachments for Performance Task

Performance Task Rubric (Located in Appendix A)

Unit Resources

Books

Garman, E. T., & Forque, R. E. (2010). *Personal finance*. Mason, OH: South-Western Cengage Learning.

Tyson, E. (2009). *Personal finance for dummies*. New York, NY: Wiley Pub.

Web sites

Free printable budget worksheet. (2010). *DollarTimes.com-Financial Calculators and Save Money Guide*. Retrieved

April 29, 2011, from <http://www.dollartimes.com/download-and-print/>

Ramsey, D. (2009, September 5). Dave Ramsey's envelope system. *Dave Ramsey Homepage*. Retrieved April 29,

2011, from http://www.daveramsey.com/article/dave-ramseys-envelope-system/lifeandmoney_budgeting/

Unit 10: Workplace Skills: School to Careers

Understandings and Goals

Enduring Understandings

In this unit, the student will do the following:

- Demonstrate desirable employability skills.
- Effectively interview for a job.

Essential Questions

- What are some reasons people work?
- How would you explain the difference between a job and a career?
- How are interests and skills different?
- What are some basic skills you may use at work?
- What are desirable employability traits?

Vocabulary

Identify and review the unit vocabulary:

Concentration
Consistency
Creativity
Dedication
Dependability
Drive
Duty
Enthusiasm
Fairness
Flexibility
Honesty
Honor
Humility
Initiative
Integrity
Optimism
Professionalism
Respect
Self-control
Self-discipline
Self-esteem
Sense of humor
Sociability
Wisdom

Suggested Learning Experiences

Competency 1: Demonstrate proper workplace skills. (DOK2, CS1, CS7, CS8, CS13, CS14, CS16)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe traits of a quality employee, including integrity, loyalty, responsibility, and so forth. (T2, T3, T6, CCE1, CCE2, CCE3)</p>	<p>a. Hook: Tell the students congratulations as they walk through the door at the start of class and tell them they got the job. Hand each student an envelope that contains the title of his or her new job in the envelope.</p> <p>Once class has began, ask the students to share their new job announcement with the class and why they believe they were chosen for this job.</p> <p>Then, start into lecture once the discussion is over. Lecture: Power Point Presentation Central Questions</p> <ul style="list-style-type: none"> • What are some reasons people work? • How would you explain the difference between a job and a career? • Name basic skills you may use at work. • What are employability traits? <p>Employability Traits Skit: Have the students review the list of employability traits. Once they have looked over them, ask students to choose one trait. After they have chosen a particular trait, ask them to take a minute and think of how they can act it out without actually saying what they are trying to resemble. Have the students act out these traits one at a time while the other students try to guess. It is a great way to have them learn employability traits and have fun!</p> <p>Journal: In their journals, they will need to respond to the following question: What employability skills do you already have, and which ones do you need to work on?</p>	<p>a. Group Participation Rubric</p> <p>Journal Rubric</p>
<p>b. Prepare a project management methodology, and use it consistently. (T1, T2, T3, T4, T5, T6, CCE1, CCE2, CCE3)</p>	<p>b. Guide students with questions, and have them brainstorm a consistent process for completing any assigned project. Below is a simple project management methodology found at http://www.mpmm.com/project-management-methodology.php. Have class finalize the process and post it on the wall.</p> <p>Example: <u>Project Management Process</u></p> <ul style="list-style-type: none"> • Agree precise specification for the project. • Plan the project. • Communicate the project plan to your project team. 	<p>b. Project Rubric</p>

	<ul style="list-style-type: none"> • Agree and delegate project actions. • Manage and motivate. • Check, measure, monitor, and review project progress. • Complete project. • Project follow-up 	
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Competency 2: Provide essential documents and skills required for entering the workforce. ^(DOK3, CS6, CS7, CS8, CS11, CS13, CS15, CS16)

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Prepare a résumé containing essential information. ^(T1, T2, T3, T4, T5, T6, CCE1, CCE2, CCE3, CCE7, CCE8)</p>	<p><i>Note: Choices offers the following items online that could be used in this unit:</i> <i>Résumé Builder</i> <i>Job Interview Practice</i> <i>Cover Letter Creator</i> <i>Thank-you Letter Builder</i></p> <p>a. Choices Professional Tools allows the teacher to set up your students by class, individual students, or a group of students for completion of activities. Students should follow the instructions on the résumé builder or create one under teacher direction.</p>	<p>a. Résumé Rubric</p>
<p>b. Describe and demonstrate the procedures for a job interview. ^(T1, T2, T3, T4, T6, CCE1, CCE2, CCE3, CCE7, CCE8)</p>	<p>b. Large group discussion on job interview etiquette. Students could watch videos of examples of good interviews and bad interviews and critique them.</p> <p>After completing job interview practice, the student will complete a “mock” interview with the teacher, another adult, or fellow student.</p>	<p>b. Teacher observation</p> <p>Interview Rubric</p>
<p>c. Prepare and finalize electronic portfolio to include all relevant materials. ^(T1, T2, T3, T4, T5, T6, CCE1, CCE2, CCE3, CCE7, CCE8)</p>	<p>c. Explain to students about the program Choices <u>online</u> that is used in the Career Center. (You may want to get the Career Center tech to help if you are not familiar with all that Choices has to offer for this unit.) Guide the students through logging onto their Choices account if they have one. If they do not have an account already set up, you will have to guide them through this process. The students should complete the ninth grade Guideway in MS Bridges.</p> <p>Choices offers three surveys to help the student find out more about themselves and build an electronic portfolio. The e-portfolio should include a résumé, references, relevant work samples, and so forth.</p>	<p>c. Portfolio Rubric</p>

Performance Task

Performance Task Title

No performance task necessary. Students should complete an entire job application/interview process.

Attachments for Performance Task

None

Unit Resources

Books

Klaus, P., Rohman, J. M., & Hamaker, M. (2007). *The hard truth about soft skills: workplace lessons smart people wish they'd learned sooner*. New York, NY: Collins.

Web sites

Blackboard. (2011). *Blackboard*. Retrieved May 2, 2011, from <http://rcu.blackboard.com>

Project management methodology: Project life cycle. (n.d.). *Project Management Methodology-Project Management Process*. Retrieved April 29, 2011, from <http://www.mpmm.com/project-management-methodology.php>

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation and Ethics	
	1. Identify course expectations, school policies, program policies, and safety procedures related to STEM Applications. (DOK1)
	2. Recognize the importance of personality development, leadership, and teamwork in relation to the classroom environment, interpersonal skills, and others. (DOK1)
	3. Identify emerging careers in the technology field. (DOK1)
Unit 2: Technology Literacy	
	1. Define technology. (DOK1)
	2. Demonstrate understanding of the evolution of technology. (DOK2)
Unit 3: The Design Process	
	1. Recognize the need for a design process. (DOK1)
	2. Examine how the design process is used to create and modify products and inventions. (DOK2)
Unit 4: Emerging Technologies	
	1. Evaluate emerging technologies in society. (DOK3)
	2. Develop a proposal for a new technology. (DOK4)
Unit 5: Computer Aided Design (CAD)	
	1. Examine the drafting and design industry. (DOK1)
	2. Create 3-D models with CAD software. (DOK4)
Unit 6: Sustainable Design and Technology	
	1. Demonstrate understanding of the concept of sustainable design. (DOK2)
	2. Design a "green" alternative to an existing product. (DOK4)
Unit 7: Power and Energy	
	1. Demonstrate understanding of the power and energy industry. (DOK2)
	2. Evaluate the effects of power and energy on the environment. (DOK3)
Unit 8: Robotics Simulation	
	1. Demonstrate understanding of robotics in industry. (DOK2)
	2. Simulate robotics programming. (DOK3)

Unit 9: Financial and Economic Literacy		
	1.	Understand financial literacy and services. (DOK2)
	2.	Demonstrate an understanding of the purpose and importance of credit. (DOK2)
	3.	Recognize the role of major financial decisions in personal financial literacy. (DOK1)
Unit 10: Workplace Skills: School to Careers		
	1.	Demonstrate proper workplace skills. (DOK2)
	2.	Provide essential documents and skills required for entering the workforce. (DOK3)

Appendix A: Activities and Rubrics

Alphabetized list of activities and rubrics follows.

Cardboard Chair Design Rubric

Student Name _____

Date _____

Design 20 pts

___ Original sketch

Final Design

___ Drawn to scale

___ Neat

___ Scale included

___ Side view

___ Front view

___ Top view

Explanation 20 pts

___ How does your chair address the five elements of design? (Function, Structure, Economy, Aesthetics, and Integrity)

___ What is the function or use of your chair? How does your chair uniquely address this function?

___ Justification for change in design

___ Approximate retail cost if the chair were manufactured

___ Name of product

___ What specific considerations were used in deciding on the particular design of your chair.

___ Use correct grammar.

Meets Specifications 40 pts

___ Holds 150 lb weight for chair or holds objects sitting on top level for table

___ Aesthetics 10 pts

___ Group evaluation 5 pts

___ Self evaluation 5 pts

___ Total

Teacher Comments:

Discussion Rubric

Student Name _____

Date _____

	5	4	3	2	1	Score
Quality of Comments	Timely and appropriate comments, thoughtful and reflective, responds respectfully to other student's remarks, provokes questions, and comments from the group	Volunteers comments, most are appropriate and reflect some thoughtfulness, leads to other questions or remarks from student and/or others	Volunteers comments but lacks depth, may or may not lead to other questions from students	Struggles but participates, occasionally offers a comment when directly questioned, may simply restate questions or points previously raised, may add nothing new to the discussion or provoke no responses or question	Does not participate and/or only makes negative or disruptive remarks, comments are inappropriate or off topic	
Resource/Document Reference	Clear reference to text being discussed and connects to it to other text or reference points from previous readings and discussions	Has done the reading with some thoroughness, may lack some detail or critical insight	Has done the reading; lacks thoroughness of understanding or insight	Has not read the entire text and cannot sustain any reference to it in the course of discussion	Unable to refer to text for evidence or support of remarks	
Active Listening	Posture, demeanor, and behavior clearly demonstrate respect and attentiveness to others.	Listens to others most of the time, does not stay focused on other's comments (too busy formulating own) or loses continuity of discussion. Shows consistency in responding to the comments of others	Listens to others some of the time, does not stay focused on other's comments (too busy formulating own) or loses continuity of discussion. Shows some consistency in responding to the comments of others	Drifts in and out of discussion, listening to some remarks while clearly missing or ignoring others	Disrespectful of others when they are speaking; behavior indicates total non-involvement with group or discussion	
Total						

Drawing Rubric

Student Name _____

Date _____

Criteria	Excellent 3	Satisfactory 2	Insufficient 1	Score
Completed Drawings	Drawing contains clean and sharp lines.	Drawing has mostly clean lines.	Drawing has many lines that are not cleanly drawn.	
Understanding	Student shows accuracy and understanding of drawing method.	Student shows satisfactory command of drawing method.	Student shows signs of misunderstanding of drawing method.	
CADD Concepts	Student shows command of hidden lines and 3-D connections in drawing.	Student shows adequate command of hidden lines and 3-D connections in drawing.	Student shows poor understanding of hidden lines and 3-D connections in drawing.	
Total				

Essay Rubric

Student Name _____

Date _____

Criteria	1	2	3	4	Score
Writing Skills	Poor grammar and punctuation; only one paragraph; incomplete thoughts; no conclusion or defined topic	Poor grammar, but understandable; one or two paragraphs; no conclusion	Appropriately organized; some improvement needed to clearly understand the topic; poor conclusion	Correct grammar and punctuation; defined topic and conclusion; easy to read and understand	
Knowledge of the Topic	Little to no understanding of the project; shows lack of interest and research; unable to answer questions on the topic	Basic understanding of the task; very little interest (too easy); unable to sufficiently answer questions	Adequate understanding of the task; appropriate information for the audience; could be further studied	Questions answered easily; information is appropriate for the audience; shows interest and good investment of time	
Accuracy	Incorrect facts throughout the presentation	One or two correct facts, but primarily poor information	A few incorrect facts but effective overall presentation	Complete factual information; good overall research	
Total					

Group Participation Rubric

Student Name _____

Date _____

Project Title:

	1 point	2 points	3 points	4 points	Total
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-Task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total Score	

HowStuffWorks Activity on Robots

Student Name _____

Date _____

Go to the Web site <http://science.howstuffworks.com/robot.htm>. From “Inside this Article,” you will complete the questions about each section and view the video in each section.

Section 1: Introduction to How Robots Work

1. Human beings are made up of what five major components?
 - a.
 - b.
 - c.
 - d.
 - e.
2. What does NASA’s robot Urbie do?
3. How do the components of a robot compare to the five major components of humans?
4. Name three famous robots, and tell what they do:
 - a.
 - b.
 - c.
5. Watch the video “Military Robot Videos” (at the top of the section).
 - a. Name two ways that robots are used for the military.
 - 1.
 - 2.
 - b. How is Global Hawk used?
 - c. What is some information that Global Hawk sends to the military?
 - d. How fast is information transferred from Global Hawk?
 - e. How precise are the GPS coordinates given from Global Hawk?

Section 2: Robotic Basics

1. What is a quality that most robots have in common?
2. Robots spin wheels and pivot jointed segments with an _____.
3. The robot’s _____ controls everything attached to the circuit.
4. Most robots are **reprogrammable**. What does reprogrammable mean?
5. The most common robot sense is _____.

Section 3: The Robotic Arm

1. What word is “robot” derived from, and what is it translated as?
2. What are most robots in the world designed for?
3. What is the most common manufacturing robot, and what is it made up of?
4. What kinds of sensors are used to make sure the robot moves just right?
5. What does “six degrees of freedom” mean?
6. What do pressure sensors tell the computer about the robot?
7. Where do most industrial robots work?

Section 4: Mobile Robots

1. What was NASA’s FIDO Rover designed to do?
2. If the robot is moving on smooth ground, then the best locomotion system to use is _____ or _____.
3. What moves robot legs back and forth?
4. Remote robots are useful for exploring dangerous areas of the environment such as the _____ or _____.
5. Watch the video “Danger Robots.”
 - a. How are robots used in dangerous situations?
 - b. What are some “creatures/animals” that Rex imitates?
 - c. What animal are they studying to help develop a robot to climb?

Section 5: Autonomous Robots

1. What are autonomous robots?
2. Which robot is a good example of this?
3. Who uses Urbie and for what?
4. Simpler robots use what kinds of sensors to see obstacles?
5. Watch the video “Bombat: The Military Robot” (at the top of the section).
 - a. Where is Bombat used and for what?
 - b. Who uses Bombat II, and what is it used for?

Section 6: Homebrew Robots

1. What are homebrew robots?

2. From the video “Household Robots,” describe Domo.

3. What does the robot “Stare” do?

4. How may this help elderly people?

Click on “See More” to get to the following sections:

Section 7: Robotics and Artificial Intelligence

1. What is artificial intelligence (AI)?

2. This includes the ability to:

- a.
- b.
- c.
- d.

3. The real challenge of AI is to understand how what works?

Interview Rubric

Student Name _____

Date _____

<i>THE STUDENT...</i>	EXCELLENT (4)	GOOD (3)	NEEDS IMPROVEMENT (2)	UNACCEPTABLE (1)	SCORE
Arrives prior to the interview					
Displays confidence with body language					
Maintains eye contact					
Maintains proper facial expression					
Provides a self-introduction					
Extends hand and shakes hands firmly with the interviewer					
Dresses appropriately for the interview					
Responds in a concise, grammatically correct, and appropriate manner					
Asks appropriate questions and demonstrates awareness of background of company and requirements of the job					
Cues on interviewer's closure and responds appropriately					
Total					

Journal Rubric

Student Name _____

Date _____

Use this rubric to assess students' abilities to complete the journal activities assigned for this lesson. Share this assessment with students prior to completing the journal-writing lessons so they will understand how they will be assessed. You can also use the rubric as a basis for discussion and feedback with each student.

1. The student writes journal responses in complete sentences. _____
2. The student writes five or more sentences to answer questions. _____
3. The student responds to questions by self-questioning, retelling, predicting, or assuming the role of a character. _____
4. The student's experiences and opinions are clear. _____
5. The student works with a peer to share journal responses and to develop a combined response when requested. _____

TOTAL: _____

EXCELLENT (4)	VERY GOOD (3)	FAIR (2)	POOR (1)
The student completes the task with no major errors. The student demonstrates a full understanding of the concepts.	The student completes the task with only a few major errors and some minor errors. The student demonstrates a strong understanding of the concepts.	The student completes the task with some major errors and many minor errors. The student has difficulty understanding the concepts.	The student fails to complete the task. The student does not understand the concepts.

Teacher Comments:

OSHA Standards in the Workplace Rubric

Student Name _____

Date _____

CATEGORY	4 Points	3 Points	2 Points	1 Point	Score
Content - Accuracy	At least seven accurate facts are displayed on the poster.	Five to six accurate facts are displayed on the poster.	Three to four accurate facts are displayed on the poster.	Less than three accurate facts are displayed on the poster.	
Graphics -Clarity	Graphics are all in focus, and the content is easily viewed and identified from 6 ft away.	Most graphics are in focus, and the content is easily viewed and identified from 6 ft away.	Most graphics are in focus, and the content is easily viewed and identified from 4 ft away.	Many graphics are not clear or are too small.	
Required Elements	The poster includes all required elements as well as additional information.	All required elements are included on the poster.	All but one of the required elements are included on the poster.	Several required elements are missing.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed. It is not attractive.	
Grammar	There are no grammatical mistakes on the poster.	There is one grammatical mistake on the poster.	There are two grammatical mistakes on the poster.	There are more than two grammatical mistakes on the poster.	
Total					

Paper Tower Contest

Purpose

To design and construct the tallest free standing tower from a single sheet of paper and 30 cm of tape

Materials

- One sheet of paper per student
- One sheet of colored paper per lab group 30 cm of tape
- Scissors
- Meter stick

Procedure

1. Each student will receive one sheet of paper. Use this sheet to try out various design possibilities. Think wildly!
2. Each lab group will receive one sheet of colored paper for their competition tower.
3. Before beginning with the colored paper, examine the designs of each group member.
4. Decide which aspects of each design should be incorporated into your final design. The most important aspects of a winning team are communication and cooperation.
5. Plan ahead. Set a timetable for experimentation and for actual construction. Plan on finishing at least 5 minutes before the announced "time's...."
6. Watch your time. Do not fall too far behind schedule.
7. Your tower must be free standing for at least 10 seconds.
8. Your teacher will measure each tower one at a time before the end of class.

Observation and Data

1. Look at the designs from the other groups. Describe how they are similar.
2. Look at the designs from the other groups. Describe how they are different.

Analysis

1. What were the limiting factors in your tower's construction?
2. Did your group work well as a team? What could be done differently to be more effective?

Applications

1. What architectural elements have been incorporated your design?

Peanut Butter and Jelly Programming Activity Sheet

Description: Students will learn the importance of written communication skills and sequential thinking while trying to write a “computer” program on how to make a peanut butter and jelly sandwich.

Goal: To understand the importance of “meaning what you say,” or “garbage in-garbage out,” integrated with sequential thinking.

Objective: Students will write specific and sequential steps on how to make a peanut butter and jelly sandwich.

Teacher Materials:

- Peanut butter
- Jelly
- Bread
- Butter knife
- Napkins

Student Materials:

- Paper and pencils

Vocabulary: *garbage in-garbage out* - This phrase means that if a programmer states inaccurate or incorrect steps (garbage), the computer will output garbage as well.

Procedure:

Students will write a very detailed and step-by-step paragraph on how to make a peanut butter and jelly sandwich, for homework. The next day, the students will input (read) their instructions to the computer (teacher or another student). Then the teacher will “make” the programs, being sure to do exactly what the students say. For example, if a student says, “Take a piece of bread out of the bag,” the teacher takes only a small “piece” out instead of a slice (which is what the student actually meant).

As a follow-up, students can edit their “computer programs” and have a peer read through them for clarity.

Conclusion: Make sure that students understand that the purpose of this activity is to show how important it is to input robotic programming exactly as you, the programmer, intend. Otherwise, you will not get the desired result.

Performance Task Rubric

Student Name _____

Date _____

Criteria	1	2	3	4	Score
Presentation	Unorganized; does not flow; hard to follow; does not account for the knowledge of the audience; bland; no use of color or graphics	Ideas are organized, but presentation requires further explanation to follow; some use of color and graphics; obvious improvement needed.	Appropriately organized; some improvement needed to clearly understand the topic; appropriate use of graphics	Presentation flows easily and can be understood easily by the audience; good use of color and graphics; all required information is present.	
Cleanliness	Unorganized experimentation; poor lab skills; messy and unorganized report; lacks direction	Ideas are organized, but presentation requires further explanation to follow; poor lab skills; obvious improvement needed.	Appropriately organized; some improvement needed to clearly understand the topic; only a few errors in lab skills	Report flows easily and is easily understood; good lab skills; all required information is present.	
Knowledge of the Topic	Little to no understanding of the project; shows lack of interest and research; unable to answer questions on the topic	Basic understanding of the task; very little interest (too easy); unable to sufficiently answer questions	Adequate understanding of the task; appropriate information for the audience; could be further studied	Questions answered easily; information appropriate for the audience; shows interest and good investment of time	
Thoroughness	No understanding of the science involved; did not include all topics	Poor understanding of the science; one reference; only a couple of topics researched	Decent explanation of the science; two references; most topics present	Effective explanation of science; all topics present	
Accuracy	Incorrect facts throughout the presentation; no data inclusion	One or two correct facts, but primarily poor information; poor representation of data	A few incorrect facts, but effective overall presentation; should improve representation of data	Complete factual information; good overall presentation and representation of data	
Total					

Teacher comments:

Portfolio Rubric

Student Name _____

Date _____

	4 Points	3 Points	2 Points	1 Point	Points
Contents	Portfolio contains all of the required materials.	Portfolio contains most of the required materials.	Portfolio contains some of the required materials.	Portfolio contains little of the required materials.	
Choice of Documentation	Samples show student progress and knowledge of general educational principles.	Samples show student progress and some knowledge of general educational principles.	Samples show some student progress and some knowledge of general educational principles.	Random selection of sample documents; no knowledge of general educational principles	
Organization	Portfolio is complete and neatly organized. A reader can easily find things.	Portfolio is well organized. A reader has little difficulty finding things.	Portfolio is fairly well organized. A reader may have a little difficulty finding things.	Portfolio shows some attempt at organization. A reader has difficulty finding things.	
Mechanics	There are no errors in spelling, punctuation, or grammar.	There are few errors in spelling, punctuation, or grammar.	Errors in spelling, punctuation, or grammar are evident.	Errors in spelling, punctuation, or grammar are numerous and detract from the portfolio.	
Overall Portfolio Impact	The portfolio effectively demonstrates the student's skills, abilities, and knowledge to potential employers.	The portfolio helps to demonstrate the student's skills, abilities, and knowledge to potential employers.	The portfolio does little to demonstrate the student's skills, abilities, and knowledge to potential employers.	The portfolio does not demonstrate the student's skills, abilities, and knowledge to potential employers.	
TOTAL					

Presentation Rubric

Student Name _____

Date _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score Obtained
Content	Addressed all assignment components	Addressed all but one assignment component	Omitted two assignment components	Omitted more than two assignment components	
Detail	Fully addressed all assignment components	Fully addressed most assignment components	Partially addressed most assignment components	Partially addressed few assignment components	
Accuracy	No grammatical, typographical, spelling, or punctuation errors	1–2 grammatical, typographical, spelling, or punctuation errors	3–5 grammatical, typographical, spelling, or punctuation errors	More than 5 grammatical, typographical, spelling, or punctuation errors	
Clarity	Logical, orderly sequence	Somewhat logical sequence	Confusing sequence	No evidence of order/sequence	
Design	Excellent design selection and usage	Adequate design selection or 1–2 design errors	Inadequate design selection or 3–5 design errors	Poor design selection or more than 5 design errors	
Appeal	Very appealing; excellent use of animation, transitions, sound, etc.	Somewhat appealing; adequate use of animation, transitions, sound, etc.	Not very appealing; limited use of animation, transitions, sound, etc.	Not appealing; very limited or no use of animation, transitions, sound, etc.	
				Score	

Teacher Comments:

Project Rubric

Student Name _____

Date _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score Obtained
Content	Addressed all assignment components	Addressed all but one assignment component	Omitted two assignment components	Omitted more than two assignment components	
Detail	Fully addressed all assignment components	Fully addressed most assignment components	Partially addressed most assignment components	Partially addressed few assignment components	
Accuracy	No grammatical, typographical, spelling, or punctuation errors	1–2 grammatical, typographical, spelling, or punctuation errors	3–5 grammatical, typographical, spelling, or punctuation errors	More than 5 grammatical, typographical, spelling, or punctuation errors	
Design	Excellent design selection and usage	Adequate design selection or 1–2 design errors	Inadequate design selection or 3–5 design errors	Poor design selection or more than 5 design errors	
Appeal	Very appealing; excellent use of animation, transitions, sound, etc.	Somewhat appealing; adequate use of animation, transitions, sound, etc.	Not very appealing; limited use of animation, transitions, sound, etc.	Not appealing; very limited or no use of animation, transitions, sound, etc.	
				Score	

Teacher Comments:

Report Rubric

Student Name _____

Date _____

	EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)	SCORE
Topic	Directly relevant	Somewhat relevant	Remotely related	Totally unrelated	
Organization	Good organization; events are logically ordered; sharp sense of beginning and end	Organized; events are somewhat jumpy	Some organization; events jump around; start and end are unclear	Not organized; events make no sense	
Quality of Information	Supporting details specific to subject	Some details are non-supporting to the subject.	Details are somewhat sketchy.	Unable to find specific details	
Grammar and Spelling	All grammar and spelling are correct.	Only one or two errors	More than two errors	Very frequent grammar and/or spelling errors	
Interest Level	Vocabulary is varied; supporting details are vivid.	Vocabulary is varied; supporting details need work.	Vocabulary is constant; details lack "color."	Needs descriptive words	
Neatness	Word processed or typed; clean and neatly bound in a report cover; illustrations provided	Legible writing; well-formed characters; clean and neatly bound in a report cover; illustrations provided	Legible writing; some ill-formed letters; print too small or too large; papers stapled together	Illegible writing; loose pages	
Timeliness	Report handed in on time	Up to 2 days late	Up to 1 week late	Report handed in more than 1 week late	
				Total	

Teacher Comments:

Résumé Rubric

Student Name _____

Date _____

	EXCELLENT 25	WELL DONE 20	MEETS STANDARDS 15	BEGINNING 10	NO EVIDENCE 0	SCORE
Format	Résumé contains appropriate contact information such as name, address, phone number, e-mail. Résumé contains other information such as objectives, education, experience, and references. There are no spelling or formatting errors.	Résumé contains appropriate contact information such as name, address, phone number, e-mail. Résumé contains other information such as objectives and education. There are 2–4 spelling or formatting errors.	Résumé contains appropriate contact information such as name, address, phone number, e-mail. Résumé contains other information such as objectives. There are 5–7 spelling or formatting errors.	Résumé contains appropriate contact information such as name, address, phone number, and e-mail. There are 8–10 spelling or formatting errors.	Assignment was not turned in.	
Education	Résumé contains details regarding education. All schools that were attended, graduation dates, diploma/degree received, and major field of study are included.	Résumé contains details regarding education. All schools that were attended, graduation dates, and major field of study are included.	Résumé contains details regarding education. All schools that were attended and major field of study are included.	Résumé contains details regarding education. All schools that were attended are included.	Assignment was not turned in.	
Experience	Résumé contains details regarding work experiences. Experience includes internships in the field, service learning, entry-level jobs relevant to current position, and current position.	Résumé contains details regarding work experiences. Experience includes service learning, entry-level jobs relevant to current position, and current position.	Résumé contains details regarding work experiences. Experience includes entry-level jobs relevant to current position and current position.	Résumé contains details regarding work experiences. Experience includes current position.	Assignment was not turned in.	
Realism	Résumé contains realistic names and dates. Résumé is believable.	Résumé is fairly believable with realistic names or dates.	Résumé has unrealistic dates or names.	Résumé is obviously unrealistic and contains conflicting information.	Assignment was not turned in.	
Total						

Robotics Multimedia Presentation Assignment

Student Name _____

Date _____

Introduction

Robotics in the real world are much different than robots in the movies. They are not as independent or intelligent as we would like them to be. From the robots in the *Star Wars* movies to the robots in *Irobots*, they are not as useful as we would like for them to be!

Engineers and programmers are working hard to make more robots for a variety of things that can be used in many jobs. Many advances have been made to further the technology capabilities.

Your assignment is to find as much information as possible about four different aspects of robotics technology, employment, and uses. As a class, this will develop a more complete picture of what robotics is and what it can become.

Robotics Webquest

Each student will work individually to complete a Robotics multimedia presentation using PowerPoint. Find relevant information for each of the four topics. Answer all of the questions for each topic, and include any other important information that is found and provides new insight into the use of robotics as an educational tool and as an industrial tool.

General Guidelines for PowerPoint

- Specific questions are given for each topic to answer. Give other important, relevant information that you find.
- Use the title given for each slide.
- Use font size no smaller than 20.
- Include a picture/clipart on each slide.
- Use a color, an image, or a template as a background.
- 1 point will be deducted for each grammar/spelling errors.

Slide 1: Title slide (10 points)

- Use a title such as "Robotics Technology in Industry, the Military, Science Exploration and Employment Opportunities."
- Include your name, date, and class block on the slide.
- Include a picture or clipart relevant to the topic.

Slides 2 and 3 (20 points): Employment in Robotics Technology

Research a robotics engineer and a robotics technician. Answer the questions about each.

1. What do they do?
2. What type of education is required?
3. What are the average salaries nationwide?
4. What is the job outlook for each?
5. Search for a job opening and tell what company, the location, and salary offered (if available).

Resources for you to use during this portion of your search:

- <http://ms.bridges.com>

- <http://www.bls.gov/oco>
- <http://hotjobs.yahoo.com/>
- <http://www.indeed.com>

Slides 4 and 5 (20 points): Industrial Robotics

- Name two different types of industries that use robotics.
- Tell how robots are used in the industry.
- How has robotics changed manufacturing technology?
- What is the future of robotics?

Resources for you to use during this portion of your search:

- <http://www.ehow.com>
- <http://www.learnaboutrobots.com/industrial.htm>
- <http://prime.jsc.nasa.gov/ROV/types.html>
- <http://www.fanucrobotics.com/>

Slides 6 and 7 (20 points): Military Robotics

- What are some of the tasks robotics perform in today's military?
- What does the military have planned for the use of robotics in the future?

Resources for you to use during this portion of your search:

- <http://www.spawar.navy.mil/robots/>
- http://www.ehow.com/how-does_4570165_how-robots-used-military.html
- <http://science.howstuffworks.com/military-robot.htm>

Slides 8 and 9 (20 points): Scientific Exploration using Robotics

- Where and how are robotics used for scientific exploration?
- What are some future plans for robotics for science exploration in space or on earth?

Resources for you to use during this portion of your search:

- <http://robots.open.ac.uk/space/missions.html>
- http://news.nationalgeographic.com/news/2003/07/0716_030716_ballard.html

Slide 10: Resources

- I suggest you create this slide after the title slide and add your resources as you complete the project by topic. Each topic will use different resources to complete the presentation.
- **List the four topics and resources used under each topic with at least two resources per topic. The same resource may be used more than once if information overlaps.**

Evaluation

- Each slide/topic will be evaluated as stated in the rubric.
- Presentations will be done at the conclusion of the robotics unit.

Role-play or Skit Assessment Rubric

Student Name _____

Date _____

	EXCELLENT (4)	GOOD (3)	AVERAGE (2)	POOR (1)	TOTAL
Accuracy	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
Role	Excellent character development; student contributed in a significant manner	Good character development; student contributed in a cooperative manner	Fair character development; student may have contributed	Little or no character development; student did not contribute much at all	
Knowledge Gained	Can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why	Can clearly explain several ways in which his or her character "saw" things differently than other characters	Can clearly explain one way in which his or her character "saw" things differently than other characters	Cannot explain any way in which his or her character "saw" things differently than other characters	
Props	Used several props and showed considerable creativity	Used 1 or 2 appropriate props that made the presentation better	Used 1 or 2 props that made the presentation better	Used no props to make the presentation better	
Required Elements	Included more information than required	Included all required information	Included most required information	Included less information than required	
				Total	

Safety Scenarios—What Would You Do?

Student Name _____

Date _____

Scenario 1: Juan comes into class after lunch and sits at his desk. He is exhausted from playing basketball at lunch, so he puts his head down on his desk. He feels something on his face and realizes that it is some broken glass. Someone in the previous class must have broken a test tube. What should the students from the previous class have done differently?

Scenario 2: Veronica is working with a Bunsen burner (open flame). Her hair swings down and lands in the flame. What should she have done before she lit the Bunsen burner?

Scenario 3: Ms. Patterson has given you very specific directions on how to complete a lab experiment. Your lab partner is curious and wants to see what will happen if you add 30 drops of indicator to a solution instead of 2 drops. What should you tell your partner?

Scenario 4: During a lab, Edgar realizes that his pencil needs to be sharpened, so he gets up to sharpen it. His partner gets bored without him, so he gets up to go see how other experiments are going. Someone at another table gets up to get a paper towel because her hands are getting messy. Adriana has Ms. Patterson's permission to get up and get a beaker. As she walks back to her seat, Edgar's pencil breaks again, so he pushes out his chair to go back to the sharpener. This trips Adriana, and she breaks the beaker. How could this have been avoided?

Scenario 5: Today is the first day that the class is working on modules. In the Thermal Unit, there is a certain type of wax that must be used along with gloves and a lighter for safety. While checking the equipment inventory, Stephanie noticed that the lighter was missing. She informed Ms. Patterson of the situation. Ms. Patterson instructed Stephanie to skip that particular experiment. Yet, because Stephanie was so excited about the experiment, she used the hot plate instead to light a piece of paper. She quickly threw the paper in the trash to avoid getting caught by the teacher. What rule did Stephanie break? What other hazards may occur from this incident?

Scenario 6: You are following all the rules and are being very careful, but you accidentally adjusted the pressure to high on the Pneumatic Module. You placed your safety glasses on your forehead instead of putting them on. What are some possible incidents that could occur? How would you handle them? What if you were following all the rules and a tube accidentally loosens? What would you do?

Scenario 7: You are the division head for a large chemical plant that is part of a Fortune 500 company. Because of the nature of your business, there are a number of medical facilities on site to handle medical emergencies and accidents. You learn through the grapevine that a nurse stationed at one of the infirmaries has been diagnosed with the AIDS virus and that some employees are worried. How would you handle this situation?

Scrapbook Grading Scale

Name _____

Invention _____

Scrapbook

Creative:	4	3	2	1
Neat:	4	3	2	1
Requirements:	4	3	2	1
Completed on time:	4	3	2	1

Total: _____

Teacher Comments:

Solve Our Energy Problem

Student Name _____

Date _____

Describe the energy problem at hand:

Proposed solution to the problem:

Describe how community and humans will be affected by change:

Is the benefit of the solution worth the cost (financial, human, job loss, etc.) of the solution?

YES

NO

Why or why not?

Sustainability Project

You have been elected as President of the Recycling Association of Mississippi. You have been asked to persuade the city council to start a community service recycling program. You are to develop a team to prepare a PowerPoint presentation in order to persuade the city council to fund the local recycling center which is struggling to stay in business with the issues that are currently facing our economy. The purpose of this presentation is for the city council to understand the relationship of recycling as just a part of being a part of a bigger picture called “sustainability,” which is facing our world. This PowerPoint will be followed by a poster campaign of creating a community that supports not only the concept of “Reduce, Reuse, Recycle” but the importance of creating a community concerned about the concept of a sustainable world.

The team will consist of three to four members. A presentation, poster program, and a brief report will be presented to the city council on the following topics:

1. What is sustainability?
2. Sustainability vs. Green
3. Recycling:
 - a. Plastic
 - b. Glass
 - c. Paper
 - d. Metal

PowerPoint requirements:

1. 10 slides
 - a. Title slide
 - b. How item is made? (What raw material is used?)
 - c. Three facts (i.e.: % of consumption/% not being recycled/ time to biodegrade in landfill)
 - d. Examples of items that fall under recycling item
 - e. How is this item recycled? (Step by step)
 - f. Show what happens if this item is *not* recycled.
 - g. One effective video to help persuade city council members to see the importance of recycling
 - h. List sources used for presentation
2. Include relevant photos
3. Outline version (not complete sentences)

Poster Requirements

1. Title and Graphics – clear, easily viewed from 6 ft away
2. Minimum one graphic on poster
3. Attractive – design, layout, and neat

Report Requirements

1. A brief description and a reflection of what you have learned about the benefits of recycling

Presentation Requirements – (See rubric for detail.)

1. Subject
2. Preparation
3. Sensitive to Audience
4. Visual Aid

Timeline Rubric

Student Name _____

Topic _____

Category	4	3	2	1
Quality of Content	Included events are important and interesting. No major dates are excluded.	Most included dates are important. One or two major events may be missing.	Some events are trivial and major events are missing.	Many major events are missing and too many trivial events are included.
Quality of Facts	Time line contains at least 8-10 events related to topic.	Time line contains at least 6-7 events related to topic.	Time line contains at least 5 events related to topic.	Time line contains fewer than 5 events related to topic.
Accuracy of Content	Facts are accurate for all events reported on time line.	Facts are accurate for almost all events reported on time line.	Facts are accurate for most of the events reported on time line.	Facts are often inaccurate for events reported on time line.
Sequence of Content	Events are placed in proper order.	Almost all events are placed in proper order.	Most of the events are placed in proper order.	Most of the events are incorrectly placed on the time line.
Dates	An accurate, complete date has been included for each event.	An accurate, complete date has been included for almost each event.	An accurate, date has been included for almost each event.	Dates are inaccurate or missing for several events.

Which Energy Should We Use?

Student Name _____

Date _____

Type of Energy: _____

- Pros:**
- 1)
 - 2)
 - 3)
-

- Cons:**
- 1)
 - 2)
 - 3)
-

- Possible Pollution Effects:**
- 1)
 - 2)
 - 3)
-

Recommend this type of energy? **YES** **NO**

Why or why not? _____

Appendix B: Glossary

Unit 1

Career: An occupation undertaken for a significant period of a person's life and with opportunities for progress

Emerging: Move out of or away from something and come into view.

Innovations: A new method, idea, or product

Leadership: The action of leading a group of people or an organization

Learning style: An individual's mode of gaining knowledge, esp. a preferred or best method

OSHA: Abbreviation. Occupational Safety and Health Administration

Policy: A proposed or adopted course or principle of action

Procedures: An established or official way of doing something

Technology: The application of scientific knowledge for practical purposes

Workforce: All the people working or available to work, as in a nation, company, industry, or on a project

Unit 2

Applications: Computer programs with a user interface

Boolean Search Logic: Combining words and phrases using the words AND, OR, NOT and NEAR (otherwise known as Boolean operators) to limit, widen, or define your Internet search

Browser: A program that accesses and displays files and other data available on the Internet and other networks

Communication: The imparting or exchanging of information or news

CPU: (Central Processing Unit) The key component of a computer system, which contains the circuitry necessary to interpret and execute program instructions

Central Processing Unit: The key component of a computer system, which contains the circuitry necessary to interpret and execute program instructions

Digital Camera: Camera that records and stores digital images

Digital Video Camera: A video camera is a camera used for electronic motion picture acquisition, initially developed by the television industry but now common in other applications as well

Download: To copy data from one computer system to another or to a disk

E-Mail (Electronic Mail): To communicate electronically on the computer

Hardware: The machines, wiring, and other physical components of a computer or other electronic system

HTML: Hypertext Markup Language, a standardized system for tagging text files to achieve font, color, graphic, and hyperlink effects on World Wide Web pages

Hyperlink: A link from a hypertext file or document to another location or file, typically activated by clicking on a highlighted word or image on the screen

Internet: An international computer network providing e-mail and information from computers in educational institutions, government agencies, and industry, accessible to the general public via modem links

Science: The intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment

Software: The programs and other operating information used by a computer

Surf: To browse the Internet; look around casually and randomly, without seeking anything in particular

Technology: The application of scientific knowledge for practical purposes

URL: Uniform Resource Locator; a location or address identifying where documents can be found on the Internet; a Web address

Virus: A piece of code that is capable of copying itself and typically has a detrimental effect, such as corrupting the system or destroying data

WWW: World Wide Web; a system of interlinked hypertext documents contained on the Internet

Unit 3

Analyze: Examine methodically and in detail the constitution or structure of (something, esp. information), typically for purposes of explanation and interpretation.

Assessment: The evaluation or estimation of the nature, quality, or ability of someone or something

Brainstorm: A spontaneous group discussion to produce ideas and ways of solving problems

Criteria: A principle or standard by which something may be judged or decided

Data: Facts and statistics collected together for reference or analysis

Design: A plan or drawing produced to show the look and function or workings of a building, garment, or other object before it is built or made

Design process: A decision-making process surrounds any design

Goals: The objects of a person's ambition or effort; an aim or desired result

Implement: To put into effect

Innovation: A new method, idea, product, etc.

Model: A three-dimensional representation of a person or thing or of a proposed structure, typically on a smaller scale than the original

Process: A series of actions or steps taken to achieve an end

Quality assurance: The maintenance of a desired level of quality in a service or product

Specify: Identify clearly and definitely.

Unit 4

Consumer: A person who purchases goods and services for personal use

Emerging: Become apparent, important, or prominent.

Evolve: Develop gradually.

Proposal: A plan or suggestion put forward for consideration or discussion by others

Technology: The application of scientific knowledge for practical purposes

Unit 5

Attributes: A quality or feature regarded as a characteristic or inherent part of someone or something

Axis: An imaginary straight line passing through the center of a symmetrical solid and about which a plane figure can be conceived as rotating to generate the solid

CAD: Computer-aided design

Dimensions: Cut or shape an object to particular measurements

Drafting: To draw the outlines or plan of; sketch

Engineer: A person who designs, builds, or maintains engines, machines, or public works

Interact: Act in such a way as to have an effect on another

Isometric View: Isometric projection is a form of graphical projection, more specifically, a form of axonometric projection.

Measurement: The size, length, or amount of something, as established by measuring

Monochrome: Consisting of or displaying images in black and white or in varying tones of only one color

Orbit: The curved path of a celestial object or spacecraft around a star, planet, or moon, esp. a periodic elliptical revolution

Orthographic View: A camera view that shows one side of an object or scene (front, side, top, back, and so on) so it appears projected on a plane without the effect of perspective

Perspective View: An approximate representation, on a flat surface (such as paper), of an image as it is seen by the eye

Plans: A detailed proposal for doing or achieving something

Scale: A system of ordered marks at fixed intervals used as a reference standard in measurement

Unit 6

Climate change: Change in the statistical properties of the climate system when considered over periods of decades

Ecological footprint: A measure of human demand on the Earth's ecosystems. It compares human demand with planet Earth's ecological capacity to regenerate.

Ecology: The branch of biology that deals with the relations of organisms to one another and to their physical surroundings.

Economy: The wealth and resources of a country or region, esp. in terms of the production and consumption of goods and services

Environment: The surroundings or conditions in which a person, animal, or plant lives or operates

Environmental justice: An equitable spatial distribution of burdens and benefits to groups such as racial minorities, residents of economically disadvantaged areas, or residents of developing nations

Incinerator: An apparatus for burning waste material, esp. industrial waste, at high temperatures until it is reduced to ash

Landfill: The disposal of refuse and other waste material by burying it and covering it over with soil

Lifestyle: The way in which a person or group lives

Luxury: The state of great comfort and extravagant living

Midden: A dunghill or refuse heap

Natural resources: Materials or substances such as minerals, forests, water, and fertile land that occur in nature and can be used for economic gain

Necessity: The fact of being required or indispensable

Population: All the inhabitants of a particular town, area, or country

Recycling: Convert waste into reusable material.

Sustainability: Of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged

Sustainable design: The philosophy of designing physical objects, the built environment and services to comply with the principles of economic, social, and ecological sustainability

Waste disposal: Proper disposition of a discarded or discharged material in accordance with local environmental guidelines or laws

Unit 7

Biomass: The total quantity or weight of organisms in a given area or volume

Consumption: The using up of a resource

Energy: The strength and vitality required for sustained physical or mental activity

Fuel Cell: The strength and vitality required for sustained physical or mental activity

Geothermal: Of, relating to, or produced by the internal heat of the earth

Nuclear: Of or relating to the nucleus of an atom

Pollution: The presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects

Power: The ability to do something or act in a particular way, esp. as a faculty or quality

Solar: Of, relating to, or determined by the sun

Unit 8

Garbage in-Garbage out: This term refers to the fact that computers will process nonsensical, faulty or incomplete input data and produce nonsensical, faulty or incomplete output.

Logic: Reasoning conducted or assessed according to strict principles of validity

Program: Provide a computer or other machine with coded instructions for the automatic performance of a particular task.

Robot: A machine capable of carrying out a complex series of actions automatically

Unit 9:

Budget: An estimate, often itemized, of expected income and expense for a given period in the future

Consumer: A person who purchases goods and services for personal use

Credit: Time allowed for payment for goods or services obtained on trust

Economy: The wealth and resources of a country or region, esp. in terms of the production and consumption of goods and services

Finance: Provide funding for a person or enterprise.

Interest: A sum paid or charged for the use of money or for borrowing money

Investor: Someone who commits capital in order to gain financial returns

Literate: Having knowledge or skill in a specified field

Producer: A person, company, or country that makes, grows, or supplies goods or commodities for sale

Profit: A financial gain, esp. the difference between the amount earned and the amount spent in buying, operating, or producing something

Unit 10

Concentration: The action or power of focusing one's attention or mental effort

Consistency: Conformity in the application of something, typically that which is necessary for the sake of logic, accuracy, or fairness

Creativity: The use of the imagination or original ideas, esp. in the production of an artistic work

Dedication: Complete and wholehearted devotion, especially to a career, ideal, etc.

Dependability: The quality of being trustworthy and reliable

Drive: To carry vigorously through

Duty: A moral or legal obligation; a responsibility

Enthusiasm: Intense and eager enjoyment, interest, or approval

Fairness: Free from bias, dishonesty, or injustice

Flexibility: Ability to adapt to new circumstances

Honesty: Fairness and straightforwardness of conduct

Honor: Regard with great respect

Humility: A modest or low view of one's own importance; humbleness

Initiative: The ability to assess and initiate things independently

Integrity: The quality of being honest and having strong moral principles; moral uprightness

Optimism: Hopefulness and confidence about the future or the successful outcome of something

Professionalism: The competence or skill expected of a professional

Respect: A feeling of deep admiration for someone or something elicited by their abilities, qualities, or achievements

Self-control: The ability to control oneself, in particular one's emotions and desires or the expression of them in one's behavior, esp. in difficult situations

Self-discipline: The ability to control one's feelings and overcome one's weaknesses; the ability to pursue what one thinks is right despite temptations to abandon it

Self-esteem: Confidence in one's own worth or abilities; self-respect

Sense of humor: The trait of appreciating and being able to express the humorous

Sociability: the relative tendency or disposition to be sociable or associate with one's fellows.

Wisdom: The quality of having experience, knowledge, and good judgment; the quality of being wise.

Appendix C: Industry Standards

CSS1-21st Century Themes

CS1 Global Awareness

1. Using 21st century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
3. Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business, and Entrepreneurial Literacy

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national, and global levels
3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

1. Obtaining, interpreting, and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems.
2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.).
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions.
4. Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues).

CSS2-Learning and Innovation Skills

CS6 Creativity and Innovation

1. Think Creatively
2. Work Creatively with Others
3. Implement Innovations

CS7 Critical Thinking and Problem Solving

1. Reason Effectively
2. Use Systems Thinking
3. Make Judgments and Decisions
4. Solve Problems

CS8 Communication and Collaboration

1. Communicate Clearly

2. Collaborate with Others

CSS3-Information, Media and Technology Skills

- CS9 Information Literacy**
 1. Access and Evaluate Information
 2. Use and Manage Information
- CS10 Media Literacy**
 1. Analyze Media
 2. Create Media Products
- CS11 ICT Literacy**
 1. Apply Technology Effectively

CSS4-Life and Career Skills

- CS12 Flexibility and Adaptability**
 1. Adapt to change
 2. Be Flexible
- CS13 Initiative and Self-Direction**
 1. Manage Goals and Time
 2. Work Independently
 3. Be Self-directed Learners
- CS14 Social and Cross-Cultural Skills**
 1. Interact Effectively with others
 2. Work Effectively in Diverse Teams
- CS15 Productivity and Accountability**
 1. Manage Projects
 2. Produce Results
- CS16 Leadership and Responsibility**
 1. Guide and Lead Others
 2. Be Responsible to Others

Appendix D: Common Core Standards

English Language Arts (6-12)

College and Career Readiness Anchor Standards for *Reading*

Key Ideas and Details

CCR1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCR2: Determine central ideas or themes of a text, and analyze their development; summarize the key supporting details and ideas.

CCR3: Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

CCR4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCR5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

CCR6: Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

CCR7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

CCR8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

CCR9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

CCR10: Read and comprehend complex literary and informational texts independently and proficiently.

College and Career Readiness Anchor Standards for *Writing*

Text Types and Purposes

CCW1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

CCW2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

CCW3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

CCW4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCW5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCW6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

CCW7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

CCW8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

CCW9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

CCW10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for *Speaking and Listening*

Comprehension and Collaboration

CCSL1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

CCSL2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSL3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

CCSL4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

CCSL5: Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

CCSL6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

College and Career Readiness Anchor Standards for *Language*

Conventions of Standard English

CCL1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCL2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

CCL3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

CCL4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

CCL5: Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

CCL6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics (High School)

Number and Quantity

The Real Number System

CCM1: Extend the properties of exponents to rational exponents.

CCM2: Use properties of rational and irrational numbers.

Quantities

CCM3: Reason quantitatively and use units to solve problems.

The Complex Number System

CCM4: Perform arithmetic operations with complex numbers.

CCM5: Represent complex numbers and their operations on the complex plane.

CCM6: Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

CCM7: Represent and model with vector quantities.

CCM8: Perform operations on vectors.

CCM9: Perform operations on matrices and use matrices in applications.

Algebra

Interpret the structure of expressions

CCM10: Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

CCM11: Perform arithmetic operations on polynomials.

CCM12: Understand the relationship between zeros and factors of polynomials.

CCM13: Use polynomial identities to solve problems.

CCM14: Rewrite rational expressions.

Creating Equations

CCM15: Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

CCM16: Understand solving equations as a process of reasoning, and explain the reasoning.

CCM17: Solve equations and inequalities in one variable.

CCM18: Solve systems of equations.

CCM19: Represent and solve equations and inequalities graphically.

Functions

CCM20: Understand the concept of a function and use function notation.

CCM21: Interpret functions that arise in applications in terms of the context.

CCM22: Analyze functions using different representations.

Building Functions

CCM23: Build a function that models a relationship between two quantities.

CCM24: Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

CCM25: Construct and compare linear, quadratic, and exponential models, and solve problems.

CCM26: Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions

CCM27: Extend the domain of trigonometric functions using the unit circle.

CCM28: Model periodic phenomena with trigonometric functions.

CCM29: Prove and apply trigonometric identities.

Geometry

CCM30: Experiment with transformations in the plane.

CCM31: Understand congruence in terms of rigid motions.

CCM32: Prove geometric theorems.

CCM33: Make geometric constructions.

Similarity, Right Triangles, and Trigonometry

CCM34: Understand similarity in terms of similarity transformations.

CCM35: Prove theorems involving similarity.

CCM36: Define trigonometric ratios, and solve problems involving right triangles.

CCM37: Apply trigonometry to general triangles.

Circles

CCM38: Understand and apply theorems about circles.

CCM39: Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

CCM40: Translate between the geometric description and the equation for a conic section.

CCM41: Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

CCM42: Explain volume formulas, and use them to solve problems.

CCM43: Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry

CCM44: Apply geometric concepts in modeling situations.

Statistics and Probability

CCM45: Summarize, represent, and interpret data on a single count or measurement variable.

CCM46: Summarize, represent, and interpret data on two categorical and quantitative variables.

CCM47: Interpret linear models.

Making Inferences and Justifying Conclusions

CCM48: Understand and evaluate random processes underlying statistical experiments.

CCM49: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Conditional Probability and the Rules of Probability

CCM50: Understand independence and conditional probability and use them to interpret data.

CCM51: Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

CCM52: Calculate expected values, and use them to solve problems.

CCM53: Use probability to evaluate outcomes of decisions.

Appendix E: National Educational Technology Standards for Students (NETS-S)

- T1** Creativity and Innovation
- T2** Communication and Collaboration
- T3** Research and Information Fluency
- T4** Critical Thinking, Problem Solving, and Decision Making
- T5** Digital Citizenship
- T6** Technology Operations and Concepts

T1 Creativity and Innovation
Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students do the following:

- a. Apply existing knowledge to generate new ideas, products, or processes.
- b. Create original works as a means of personal or group expression.
- c. Use models and simulations to explore complex systems and issues.
- d. Identify trends and forecast possibilities.

T2 Communication and Collaboration
Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students do the following:

- a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- c. Develop cultural understanding and global awareness by engaging with learners of other cultures.
- d. Contribute to project teams to produce original works or solve problems.

T3 Research and Information Fluency
Students apply digital tools to gather, evaluate, and use information. Students do the following:

- a. Plan strategies to guide inquiry.
- b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
- d. Process data and report results.

T4 Critical Thinking, Problem Solving, and Decision Making
Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students do the following:

- a. Identify and define authentic problems and significant questions for investigation.
- b. Plan and manage activities to develop a solution or complete a project.
- c. Collect and analyze data to identify solutions and/or make informed decisions.
- d. Use multiple processes and diverse perspectives to explore alternative solutions.

T5 Digital Citizenship
Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students do the following:

- a. Advocate and practice safe, legal, and responsible use of information and technology.
- b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.

- c. Demonstrate personal responsibility for lifelong learning.
- d. Exhibit leadership for digital citizenship.

T6 Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students do the following:

- a. Understand and use technology systems.
- b. Select and use applications effectively and productively.
- c. Troubleshoot systems and applications.
- d. Transfer current knowledge to learning of new technologies.