Verona Public School District
Curriculum Overview

5th Grade TED

Curriculum Committee Members:
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Verona Public Schools Mission Statement:

The mission of the Verona Public Schools, the center of an engaged and supportive community, is to empower students to achieve their potential as active learners and productive citizens through rigorous curricula and meaningful, enriching experiences.

Course Description:

Grade 5 is an introductory year emphasizing the basics of technology and engineering, as well as teaching students the engineering design process (EDP). Students explore various fields of engineering through several design challenges.

Prerequisite(s):

None

Standard 8: Technology Standards

8.1: Educational Technology: *All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*	**8.2: Technology Education, Engineering, Design, and Computational Thinking - Programming:** *All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.*
X A. Technology Operations and Concepts **X** B. Creativity and Innovation **X** C. Communication and Collaboration D. Digital Citizenship **X** E. Research and Information Fluency **X** F. Critical thinking, problem solving, and decision making	**X** A. The Nature of Technology: Creativity and Innovation **X** B. Technology and Society **X** C. Design **X** D. Abilities for a Technological World E. Computational Thinking: Programming

SEL Competencies and Career Ready Practices

Social and Emotional Learning Core Competencies: *These competencies are identified as five interrelated sets of cognitive, affective, and behavioral capabilities*	**Career Ready Practices:** *These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.*
Self-awareness: The ability to accurately recognize one's emotions and thoughts and their influence on behavior. This includes accurately assessing one's strengths and limitations and possessing a well-grounded sense of confidence and optimism.	**X** CRP2. Apply appropriate academic and technical skills. CRP9. Model integrity, ethical leadership, and effective management. CRP10. Plan education and career paths aligned to personal goals.
Self-management: The ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals.	CRP3. Attend to personal health and financial well-being. **X** CRP6. Demonstrate creativity and innovation. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity.
Social awareness: The ability to take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.	CRP1. Act as a responsible and contributing citizen and employee. CRP9. Model integrity, ethical leadership, and effective management.
Relationship skills: The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups. This includes communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	**X** CRP4. Communicate clearly and effectively and with reason. CRP9. Model integrity, ethical leadership, and effective management. CRP12. Work productively in teams while using cultural global competence.
Responsible decision making: The ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.	**X** CRP5. Consider the environmental, social, and economic impact of decisions. **X** CRP7. Employ valid and reliable research strategies. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership, and effective management.

Standard 9: 21st Century Life and Careers

9.1: Personal Financial Literacy: *This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.*	**9.2: Career Awareness, Exploration & Preparation:** *This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.*	**9.3: Career and Technical Education:** *This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.*
X A. Income and Careers B. Money Management C. Credit and Debt Management D. Planning, Saving, and Investing **X** E. Becoming a Critical Consumer F. Civic Financial Responsibility G. Insuring and Protecting	A. Career Awareness (K-4) **X** B. Career Exploration (5-8) C. Career Preparation (9-12)	A. Agriculture, Food & Natural Res. **X** B. Architecture & Construction C. Arts, A/V Technology & Comm. D. Business Management & Admin. E. Education & Training F. Finance G. Government & Public Admin. H. Health Science I. Hospital & Tourism J. Human Services K. Information Technology L. Law, Public, Safety, Corrections & Security **X** M. Manufacturing **X** N. Marketing **X** O. Science, Technology, Engineering & Math P. Transportation, Distribution & Log.

Course Materials

Core Instructional Materials: *These are the board adopted and approved materials to support the curriculum, instruction, and assessment of this course.*	**Differentiated Resources**: *These are teacher and department found materials, and also approved support materials that facilitate differentiation of curriculum, instruction, and assessment of this course.*
•	• Various Teacher Constructed Materials

H.B. Whitehorne Grade 5 TED (Technology, Engineering, and Design)

Unit Title / Topic: Exploring Technology	Unit Duration: 6 weeks

Stage 1: Desired Results

Established Goals:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Transfer Goal:

Students will be able to <u>independently</u> use their learning to design solutions to real-world problems by applying a design process that includes defining a problem, generating ideas, selecting a solution, and using simple modeling tools or techniques to test and revise a design.

Students will understand:

- technology changes constantly due to the continuing effort to improve products and systems; good is not good enough if better is possible.
- "there is no free lunch"- technology can result in positive and negative effects.
- the design world is the product of the design process that provides ways to turn resources into products and systems.
- The Engineering Design Process is a method that is used to solve technological challenges to change and improve products for the way we live.

Essential Questions:

- How has technology shaped life in the 21st century?
- What role will technology play in the future?
- How can the engineering design process benefit us in solving problems?

Students will know:

- Technology is anything developed to extend human abilities and to satisfy needs and wants.
- Technologically Literate is understanding technology and feeling comfortable with it - *being able to think about and evaluate each situation, and then make a decision.*
- Science is the study of the natural word, which explains how things happen.
- Engineering is the work of designing and creating products and processes.
- Mathematics is the study of numbers, quantity, and space.
- Technologist is a person who works in technology, building the products that engineers design.
- technology is the modification of natural resources and human-made materials to meet needs or wants and to solve problems.
- the engineering design process includes defining a problem, generating ideas, selecting a solution, testing the solution(s), making the item, evaluating it, and presenting the results.
- science and technology are interrelated, in which science is concerned with the natural world and technology with the human-made world.
- technology products and artifacts are not just electronics but also everything in society that helps humans complete everyday tasks.
- technology is often produced in teams because collective ideas have more options and variety.
- technology is often a result to improvements on pre-existing designs.
- technology by itself is neither good nor bad; it is how humans use technology that creates positive and negative outcomes.
- the essence of problem solving is in the creative and carefully documented design of the best solution using the Engineering Design Process.
- engineers, architects, and others who engage in design and technology use scientific knowledge to solve practical problems, they also have to take human values and limitations into account as well.
- design usually requires taking constraints into account- some constraints are unavoidable, others limit choices.
- communities often must be re-developed due to not only natural environmental problems and disasters, but also human-made environmental problems and disasters.
- problems are often not the result of the desire to innovate designs, but often a result of environmental tragedies out of the control of people.
- applying the Engineering Design Process to real-world problems involves careful consideration of the resources, problem, and possible alternatives that can be utilized with consideration for economic, environmental and societal issues.
- developing technology based on design solutions must be continuously monitored to ensure that the best outcomes are a result of its production.

Students will be able to:

- apply a design process that includes defining a problem, brainstorming a solution, generating ideas, identifying criteria, exploring possibilities, selecting an approach, making a model or prototype, testing and evaluating a design, and refining a design to solve a problem.
- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- contribute to a group endeavor by offering useful ideas, supporting the efforts of others, and focusing on the task.
- work safely and accurately with a variety of tools, machines, and materials.
- examine and select the resources necessary to manufacture a design that will successfully achieve its desired goal(s).
- sketch a design solution before production to ensure the integrity of the original design and truest representation as humanly possible.
- test and critique design solutions.
- analyze how technology can be both desirable and undesirable based on how it is used by society.
- find solutions through use of experimentation to solve technological problems.
- solve problems using scale factors, using ratios and proportions.
- use assessment techniques, such as trend analysis and experimentation, to make decisions about the future development of technology.
- use symbols, measurements, and drawings to clearly communicate ideas.
- develop the criteria and constraints for a given design solution.
- debate solutions to address future world concerns using technology.
- test and evaluate designs in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
- clearly describe and exemplify the benefits and challenges of a design.
- communicate orally, in writing, and by graph data gathered from surveys.

Stage 2: Acceptable Evidence

Transfer Task

E.D.P. Challenges- Students use their knowledge of the Engineering Design Process to complete several real-world challenges related to the various types of technologies. Student work cooperatively to complete design activities and deliver presentations.

Other Evidence of Learning

<u>Engineering Journals</u>- Throughout instruction, students record observations, data, notes, and ideas. This information is used by students to form conclusions and support reasoning with evidence. The body of student work is reviewed by the teacher in order to assess both content and procedural knowledge.
<u>Performance Assessments</u>- Students design, construct, and test solutions to various technological challenges. Student work cooperatively to complete design activities and deliver presentations. Students are evaluated using performance and process rubrics.
<u>Summative Assessments</u>- Students complete pre/post content knowledge tests that consist of selected response items. Students also complete brief constructed response assignments that require a written response to a question or statement.

Stage 3: Activities to Foster Learning

Learning Activities

Week 1: What is Technology?
Students will investigate the six types of technologies: energy and power, biotechnologies, communication, manufacturing, construction, and transportation.

Week 2: The Engineering Design Process
Students learn the steps of the Engineering Design Process through a step-by-step challenge activity.

Week 3: E.D.P. Challenge #1
Students work collaboratively to solve a real-world problem related to one of the types of technology.

Week 4: E.D.P. Challenge #2
Students work collaboratively to solve a real-world problem related to one of the types of technology.

Week 5: E.D.P. Challenge #3
Students work collaboratively to solve a real-world problem related to one of the types of technology.

Week 6: S.T.E.M. - How is it all related?
Students complete a STEM project that illustrates how each of the various field of science, technology, engineering, and math are related.

Possible Design Challenges:

Energy & Power- Students design a small-scale water turbine that will lift a weight when water is fed through it.
Students design a simple security alarm that will ring a buzzer when stepped on my someone entering through a door.

Biotechnologies- Students design a human arm model that will pick up and move various items.

Communication- Students design a simple crystal radio that can receive radio signals.

Manufacturing- Students design a process to construct as many products as they can in a given amount of time.

Construction- Students design a structure that withstand the effects of an earthquake.
Students design a bridge that can hold at least 20 lbs.

Transportation- Students design a Maglev Transportation vehicle that will safely travel from one location to another.

Extension: Invite engineers from the field to speak or take part in the test & evaluate stage of EDP.