SOUTHERN LEHIGH SCHOOL DISTRICT
5775 Main Street
Center Valley, PA 18034

Scope and Sequence for **Grade 8 STEM: Automation and Robotics**

The Nature of Technology

National Standards for Technological Literacy	PA Standards for Science and Technology and Engineering Education
1. The characteristics and scope of technology. **6-8.F** New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology. **6-8.G** The development of technology is a human activity and is the result of individual and collective needs and the ability to be creative. **6-8.H** Technology is closely linked to creativity, which has resulted in innovation. **6-8.I** Corporations can often create demand for a product by bringing it onto the market and advertising it.	**1. Characteristics of Technology** **3.4.8.A1** Analyze the development of technology based on affordability or urgency.
2. The core concepts of technology. **6-8.M** Technological systems include input, processes, output, and at times, feedback. **6-8.N** Systems thinking involves considering how every part relates to others. **6-8.O** An open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback. **6-8.P** Technological systems can be connected to one another. **6-8.Q** Malfunctions of any part of a system may affect the function and quality of the system. **6-8.R** Requirements are the parameters placed on the development of a product or system. **6-8.S** Trade-off is a decision process recognizing the need for careful compromises among competing factors. **6-8.V** Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.	**2. Core Concepts of Technology** **3.4.8.A2** Explain how controls are steps that people perform using information about the system that causes systems to change.
3. The relationships among technologies and the connections between technology and other fields. **6-8.D** Technological systems often interact with one another. **6-8.E** A product, system, or environment developed for one setting may be applied to another setting.	**3. Technology Connections** **3.4.8.A3** Compare how a product, system, or environment developed for one setting may be applied to another setting.

Technology and Society

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4. The cultural, social, economic, and political effects of technology. **6-8.D** The use of technology affects humans in various ways, including their safety, comfort, choices, and attitudes about technology's development and use. **6-8.E** Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences. **6-8.F** The development and use of technology poses ethical issues. **6-8.G** Economic, political, and cultural issues are influenced by the development and use of technology.	**1. Effects of Technology** **3.4.8.B1** Evaluate the societal implications of the management of waste produced by technology.
6. The role of society in the development and use of technology. **6-8.E** The use of inventions and innovations has led to changes in society and the creation of new needs and wants.	**3. Society and Development of Technology** **3.4.8.B3** Explain how throughout history new technologies resulted from the demands, values, and interests of individuals, businesses, industries, and societies.

Design

National Standards for Technological Literacy	PA Standards for Science and Technology and Engineering Education
8. The attributes of design. **6-8.E** Design is a creative planning process that leads to useful products and systems. **6-8.F** There is no perfect design. **6-8.G** Requirements for design are made up of criteria and constraints.	**1. Design Attributes** **3.4.8.C1** Evaluate the criteria and constraints of a design.
9. Engineering design. **6-8.F** Design involves a set of steps, which can be performed in different sequences and repeated as needed. **6-8.G** Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum. **6-8.H** Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions. **9-12.K** A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.	**2. Engineering Design** **3.4.8.C2** Explore the design process as a collaborative endeavor in which each person in the group presents his or her ideas in an open forum.
10. The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. **6-8.F** Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system. **6-8.G** Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it. **6-8.H** Some technological problems are best solved through experimentation.	**3. Research & Development, Invention & Innovation, Experimentation/Problem Solving and Troubleshooting** **3.4.7.C3** Describe how troubleshooting as a problem-solving method may identify the cause of a malfunction in a technological system. **3.4.8.C3** Analyze how a multi-disciplinary (STEM) approach to problem solving will yield greater results.

Abilities for a Technological World

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11. Apply the design process. **6-8.H** Apply a design process to solve problems in and beyond the laboratory-classroom. **6-8.I** Specify criteria and constraints for the design. **6-8.J** Make two-dimensional and three-dimensional representations of the designed solution. **6-8.K** Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed. **6-8.L** Make a product or system and document the solution.	**1. Applying the Design Process** **3.4.8.D.1** Test and evaluate the solutions for a design problem.
12. Use and maintain technological products and systems. **6-8.H** Use information provided in manuals, protocols, or by experienced people to see and understand how things work. **6-8.I** Use tools, materials, and machines safely to diagnose, adjust, and repair systems. **6-8.J** Use computers and calculators in various applications. **6-8.K** Operate and maintain systems in order to achieve a given purpose	**2. Using and Maintaining Technological Systems** **3.4.8.D2** Operate and maintain systems in order to achieve a given purpose.

The Designed World

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16. Energy and power technologies. **6-8.E** Energy is the capacity to do work. **6-8.F** Energy can be used to do work, using many processes. **6-8.G** Power is the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.	**1. Medical Technologies** **3.4.8.E3** Examine power systems are used to drive and provide propulsion to other technological products or systems.
17. Information and communication technologies. **6-8.H** Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human. **6-8.K** The use of symbols, measurements, and drawings promotes a clear communication by providing a common language to express ideas.	**4. Information and Communication Technologies** **3.4.8.E4** Describe how the design of the message is influenced by such factors as the intended audience, medium, purpose, and nature of the message.

Pennsylvania Core Standards for Reading in Science and Technical Subjects

Key Ideas and Details

CC.3.5.6-8.A. Cite specific textual evidence to support analysis of science and technical texts.

CC.3.5.6-8.B. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CC.3.5.6-8.C. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

CC.3.5.6-8.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Integration of Knowledge and Ideas

CC.3.5.6-8.G. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CC.3.5.6-8.H. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Pennsylvania Core Standards for Writing in Science and Technical Subjects

Text Types and Purposes

CC.3.6.6-8.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing

CC.3.6.6-8.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.6-8.E. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

CC.3.6.6-8.F. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

CC.3.6.6-8.H. Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing

CC.3.6.6-8.J.I. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.