Orange Public Schools

Office of STEM-Focused Learning

Curriculum Guide

PLTW Gateway
App Creators

Curriculum Framework

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PLTW Curriculum Framework – App Creators
Lesson 1: Let's Create an App!

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• Q2 – How do computer scientists design and develop mobile apps that meet desired needs?
• Q3 – What does effective teamwork look like?</td></tr>
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Domains are key understandings and long-term takeaways that go beyond factual knowledge into broader and more conceptual comprehensions.

Domains are areas of expertise that an employer in a specific field may seek.

Students will develop understandings about…

"I will be able to address real-world challenges because I understand…"

Students will understand that …</td><td>Learning Objectives
Objectives articulate what skills students need to be able to do. (The learning objectives will become targets of assessment.)

Objectives are functions that directly relate to the workplace or in an applied academic setting.

Students will use knowledge and skills to…

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Knowledge and skills include the essential facts and basic concepts that a student should know and be able to recall in order to perform the competency.

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		KS1.2A4: Iteratively test throughout the design process to ensure that a solution meets the requirements.
	LO1.2B: Apply user-centered design principles when creating a solution.	KS1.2B1: Investigate the types of interactions between users and a proposed solution. KS1.2B2: Describe the importance of involving prospective users early and often during the design process.
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D2.1 Data: With the aid of computational power, a tremendous quantity of data can quickly and efficiently processed and analyzed to help solve a problem.	**LO2.1B:** Create and store data during the execution of a program.	KS2.1B1: Describe ways data can be stored on a digital device. KS2.1B2: Store, access, and update data stored in variables (temporary data).
D2.2 Algorithms: A wide range of professionals use algorithms, a sequence of steps used to solve a problem. This can be accomplished with or without coding.	**LO2.2A:** Analyze and create algorithms.	KS2.2A1: Create an algorithm or sequence of steps to accomplish a task. KS2.2A2: Identify different algorithms that can be used to solve the same problem. KS2.2A3: Analyze, break down, and explain the logic of an algorithm. KS2.2A4: Locate and debug errors within an algorithm. KS2.2A5: Create simple algorithms that involve variables, conditionals, operators, or logic.
D2.3 Abstraction: An abstraction generalizes a concept, allowing people to ignore some of the details. Abstractions make it easier to handle complexity by focusing on the relevant pieces of the big picture and hiding the details.	**LO2.3A:** Develop and apply abstractions.	KS2.3A1: Explain the purpose of an abstraction.
D2.4 Programming: Creating a set of statements processed by an electronic device to perform a task.	**LO2.4A:** Analyze the structure and functionality of a program.	KS2.4A1: Identify and describe the high-level structures of a program, such as user interface components, data components, event handlers, and procedures. KS2.4A2: Describe the appropriate code blocks and convention used in the programming language. KS2.4A3: Identify possible events that can occur during runtime and select the appropriate event-handler blocks to respond to these events. KS2.4A4: Trace a program and deduce the values that variables will have after the code is executed.

	LO2.4B: Create programs by developing and testing code in a modular, incremental approach.	KS2.4B1: Plan a program using appropriate strategies such as natural language or flowcharting. KS2.4B2: Design and develop a program by breaking a large plan into smaller modules using procedures and event handlers (if applicable). KS2.4B3: Test code frequently as it is being developed. KS2.4B4: Debug programs using a variety of strategies to isolate and identify problems, including analyzing error messages, analyzing variable values line-by-line, generating output, or commenting out code.
	LO2.4C: Adapt or improve existing code.	KS2.4C1: Find code relevant to a problem and extend or apply it to a new purpose. KS2.4C2: Improve readability of code by creating or improving documentation, using descriptive variables and procedure names, and using comments.
	LO2.4D: Design and develop a mobile app solution.	KS2.4D1: Describe the components of a mobile app. KS2.4D2: Navigate and use an app development software to design, develop and test a mobile app. KS2.4D3: Design an app's user interface using appropriate tools. KS2.4D4: Select and use appropriate features to meet the desired functionality of an app, such as user interface components, layout arrangements, media objects, drawing and animation, sensors, location awareness, accessing phone features, and data storage. KS2.4D5: Deploy an app using the emulator or a mobile device.
D2.5 Computer Systems: Effectively harnessing computing power requires an understanding of how computers work.	**LO2.5A:** Identify methods in which electronic devices communicate with each other.	KS2.5A1: Recognize various ways of transferring data from one electronic device to another, such as USB connection, WiFi, or Bluetooth. KS2.5A2: Use a systematic process to identify the source of a problem within individual and connected devices.
D2.6 Social Impacts of Computing: Computer science solutions have global impacts in economic, environmental, and societal contexts.	**LO2.6A:** Analyze the implications of computing in society.	KS2.6A1: Identify ways that computing has changed or is changing society. KS2.6A2: Give examples of technologies that assist or extend human capabilities.

		KS2.6A3: Describe possible positive and negative social impacts of computing.
D3.1 Collaboration: Effective collaboration requires an ability to function within teams and is often necessary for successful problem solving, experimentation or design work.	**LO3.1A:** Collaborate effectively on a diverse team.	KS3.1A1: Describe how diverse perspectives in collaboration typically produce the best results in a process. KS3.1A2: Apply team norms to encourage productivity and define how a team will function and measure its success. KS3.1A3: Recognize individual strengths when defining roles and responsibilities.
D3.2 Communication: Effectively communicating orally and in writing for a given audience is an essential skill for success in all fields.	**LO3.2A:** Communicate effectively for specific purposes and settings.	KS3.2A1: Communicate to meet the needs of the audience and be appropriate to the situation. KS3.2A2: Use accurate and appropriate terminology.
	LO3.2B: Document a process according to professional standards.	KS3.2B1: Present data and information through a variety of accepted means such as: graphs, charts, images, video, schematics, code, 3D models, or simulations.
D3.3 Project Management: The discipline of carefully projecting or planning, organizing, motivating and controlling resources to achieve specific goals and meet specific success criteria.	**LO3.3A:** Demonstrate the ability to manage multiple resources throughout a project.	KS3.3A1: Devise, prioritize, and execute a plan to solve a problem, including short-term and long-term objectives when appropriate. KS3.3A2: Manage digital files appropriately.
D3.4 Professionalism and Ethics: Successful computer scientists typically exhibit specific personal and professional characteristics that lend themselves to the creative, collaborative, and solution driven nature of the profession**.**	**LO3.4A:** Abide by professional, legal and ethical standards when using digital resources.	KS3.4A2: Describe the importance of protecting personal information.
D3.5 Career Awareness: It is important to prepare a flexible education plan that matches your interests, knowing that you can change or modify that plan as you discover more about career opportunities.	**LO3.5A:** Identify the variety of careers related to engineering, biomedical sciences, and/or computer science.	KS3.5A2: Explore a variety of careers related to engineering, biomedical sciences, or computer science.

PLTW Curriculum Framework – App Creators
Lesson 2: Taking it to the Next Level!

Desired Results *(stage 1)*		
Meaning		
ESSENTIAL QUESTIONS: *Students will keep considering …* • Q1 – In what ways does technology affect people's lives? • Q2 – What do programming best practices look like? • Q3 – How do diverse perspectives of team members impact a solution?		
Meaning	*Acquisition*	
Domains/Understandings *Domains are key understandings and long-term takeaways that go beyond factual knowledge into broader and more conceptual comprehensions.* *Domains are areas of expertise that an employer in a specific field may seek.* *Students will develop understandings about…* ***"I will be able to address real-world challenges because I understand…"*** *Students will understand that …*	Learning Objectives *Objectives articulate what skills students need to be able to do. (The learning objectives will become targets of assessment.)* *Objectives are functions that directly relate to the workplace or in an applied academic setting.* *Students will use knowledge and skills to…* ***"In the workplace or academic setting, I will need to know and be able to…"***	Knowledge and Skills *Knowledge and skills include the essential facts and basic concepts that a student should know and be able to recall in order to perform the competency.* *Knowledge and skill statements are foundational to the performance of a skill.* *Student will know and be able to…* ***"After I learn the information, I will be able to use my knowledge and skills to…"***
D1.1 Mindset: Ethics, analytical thinking, creativity, persistence, iteration, and the positive role of failure are important mindsets and habits of action. They are developed over time in problem solving processes, inquiry, and computational thinking.	**LO1.1A**: Describe and analyze moments within a problem solving process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.	KS1.1A1: Recognize that identifying complex problems, defining them clearly, and proposing solutions can be difficult and requires persistence and iteration.
D1.2 Problem Solving Process and/or Design Process: Many disciplines, including engineering, computer science, and biomedical science, use an iterative, systematic process to solve problems.	**LO1.2A:** Apply an iterative process to solve a problem or create an opportunity that can be justified.	KS1.2A3: Generate ideas and/or build upon existing ideas to innovate. KS1.2A4: Iteratively test throughout the design process to ensure that a solution meets the requirements.
D1.3 Computational Thinking: Computational thinking is the thought processes involved in formulating problems and solutions that can be effectively carried out by a computer or electronic device. Common concepts of computational thinking include: the use of algorithms, abstraction, problem decomposition, and data analysis and processing.	**LO1.3A:** Apply computational thinking to solve problems.	KS1.3A1: Recognize that computational thinking can be applied in multiple disciplines. KS1.3A2: Choose appropriate computational practices when solving a problem. KS1.3A3: Decompose a problem into smaller parts.

D2.1 Data: With the aid of computational power, a tremendous quantity of data can quickly and efficiently processed and analyzed to help solve a problem.	**LO2.1A:** Collect, process, and analyze real or simulated data.	KS2.1A1: Understand that computers enable rapid processing of information. KS2.1A2: Collect, process and interpret data to gain insight on a problem and draw conclusions. KS2.1A3: Compare methods of data representation.
	LO2.1B: Create and store data during the execution of a program.	KS2.1B1: Describe ways data can be stored on a digital device. KS2.1B2: Store, access, and update data stored in variables (temporary data). KS2.1B3: Store, access, and update data stored in a list (temporary data). KS2.1B4: Store, access, and update data stored in a database or file (persistent data) [optional].
D2.2 Algorithms: A wide range of professionals use algorithms, a sequence of steps used to solve a problem. This can be accomplished with or without coding.	**LO2.2A:** Analyze and create algorithms.	KS2.2A2: Identify different algorithms that can be used to solve the same problem. KS2.2A3: Analyze, break down, and explain the logic of an algorithm. KS2.2A5: Create simple algorithms that involve variables, conditionals, operators, or logic. KS2.2A6: Create algorithms to perform repetitive or reusable tasks.
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D2.4 Programming: Creating a set of statements processed by an electronic device to perform a task.	**LO2.4A:** Analyze the structure and functionality of a program.	KS2.4A1: Identify and describe the high-level structures of a program, such as user interface components, data components, event handlers, and procedures. KS2.4A2: Describe the appropriate code blocks and convention used in the programming language. KS2.4A3: Identify possible events that can occur during runtime and select the appropriate event-handler blocks to respond to these events. KS2.4A4: Trace a program and deduce the values that variables will have after the code is executed.

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D3.3 Project Management: The discipline of carefully projecting or planning, organizing, motivating and controlling resources to achieve specific goals and meet specific success criteria.	**LO3.3A:** Demonstrate the ability to manage multiple resources throughout a project.	KS3.3A1: Devise, prioritize, and execute a plan to solve a problem, including short-term and long-term objectives when appropriate. KS3.3A2: Manage digital files appropriately.
D3.4 Professionalism and Ethics: Successful computer scientists typically exhibit specific personal and professional characteristics that lend themselves to the creative, collaborative, and solution driven nature of the profession**.**	**LO3.4A:** Abide by professional, legal and ethical standards when using digital resources.	KS3.4A2: Describe the importance of protecting personal information.

PLTW Curriculum Framework – App Creators
Lesson 3: Great App Challenge

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KS1.2A2: Explain the goal of any design process.
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	LO1.2B: Apply user-centered design principles when creating a solution.	KS1.2B1: Investigate the types of interactions between users and a proposed solution. KS1.2B2: Describe the importance of involving prospective users early and often during the design process. KS1.2B3: Recognize that understanding human interaction with a solution can improve the design and extend the abilities of humans.
D1.3 Computational Thinking: Computational thinking is the thought processes involved in formulating problems and solutions that can be effectively carried out by a computer or electronic device. Common concepts of computational thinking include: the use of algorithms, abstraction, problem decomposition, and data analysis and processing.	**LO1.3A:** Apply computational thinking to solve problems.	KS1.3A1: Recognize that computational thinking can be applied in multiple disciplines. KS1.3A2: Choose appropriate computational practices when solving a problem. KS1.3A3: Decompose a problem into smaller parts.
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D3.3 Project Management: The discipline of carefully projecting or planning, organizing, motivating and controlling resources to achieve specific goals and meet specific success criteria.	**LO3.3A:** Demonstrate the ability to manage multiple resources throughout a project.	KS3.3A1: Devise, prioritize, and execute a plan to solve a problem, including short-term and long-term objectives when appropriate. KS3.3A2: Manage digital files appropriately.
D3.4 Professionalism and Ethics: Successful computer scientists typically exhibit specific personal and professional characteristics that lend themselves to the creative, collaborative, and solution driven nature of the profession**.**	**LO3.4A:** Abide by professional, legal and ethical standards when using digital resources.	KS3.4A1: Describe property rights of digital media and software to facilitate sharing and avoid infringement. KS3.4A2: Describe the importance of protecting personal information.
	LO3.4B: Consider accessibility and equity when designing products, creating solutions, and collaborating with others.	KS3.4B1: Describe and give examples of universal design strategies that increase accessibility to appropriate resources.
D3.5 Career Awareness: It is important to prepare a flexible education plan that matches your interests, knowing that you can change or modify that plan as you discover more about career opportunities.	**LO3.5B:** Describe the role, connections between disciplines, and impact of engineering, biomedical science, and/or computer science on society.	KS3.5B1: Demonstrate personal responsibility and initiative for independent learning, keeping in mind that technology and processes will always evolve.