Unit 5 - Performance Tasks - Capstone Project

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Introduction to Coding

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Introduction to Coding

Grades 9-12

Capstone Project / Career Exploration

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Teacher, Corey Woodring

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. Lucy Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary of Education

Mr. George Droste, Director of Secondary Education

Board Approved:

Unit Overview

Performance Tasks, Capstone project, end of the year project

Career Exploration

Enduring Understanding

- The results and artifacts of computation and the computational techniques and strategies that generate them can be understood intrinsically both for what they are as well as for what they produce.
- Creativity and computing are prominent forces in innovation; the innovations enabled by computing have had and will continue to have far-reaching impact.

Essential Questions

- Can a creative development process affect the creation of computational artifacts?
- Does computing enhance human communication, interaction, and cognition?
- Can computing enable innovation?

Exit Skills

Exploration and Research:

- Investigate a computing innovation that has had a significant impact on society, economy, or culture.
- Produce a computational artifact that describes the intended purpose and function of the computing innovation and demonstrates how it fulfills that purpose.
- Document the development process, tools, and techniques used in creating the computational artifact.
- Analyze the beneficial and harmful effects of the computing innovation on society, economy, or culture.
- Identify and discuss how the computing innovation consumes, produces, and/or transforms data and address concerns about data storage, data privacy, or data security..
- Design, research, and create a computational artifact.

Creative Development:

- Design, implement, and test a program that solves a problem of personal interest to the student.
- Summarize, describe, and reflect on the development process of the program.
- Create a video demonstrating the use and functionality of the program.

New Jersey Student Learning Standards (NJSLS-S)

8.1 Educational Technology

8.1.12.A.4, 8.1.12.C.1, 8.1.12.D.2, 8.1.12.F.2,

8.2 Technology, Engineering, Design and Computational Thinking

8.2.12.B.1, 8.2.12.B.2, 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3, 8.2.12.E.4

	Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.
	Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.
	Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs.
8.1.12.AP.2	Create generalized computational solutions using collections instead of repeatedly using simple variables.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	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.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.D.4	Research and understand the positive and negative impact of one’s digital footprint.
TECH.8.1.12.D.5	Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.

TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

Interdisciplinary Connections

21st century life and careers

- Technology
- Digital Literacy
- English Language Arts
- Reading
- Writing
- Speaking and Listening (communication skills)
- Mathematics
- Social science
- Science and the Engineering Practices

Career Ready Practices

- CRP4. Communicate clearly and effectively and with reason.
- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Learning Objectives

Exploration and Research:

1. Investigate a computing innovation that has had a significant impact on society, economy, or culture.
2. Produce a computational artifact that describes the intended purpose and function of the computing innovation and demonstrates how it fulfills that purpose.

3. Document the development process, tools, and techniques used in creating the computational artifact.
4. Analyze the beneficial and harmful effects of the computing innovation on society, economy, or culture.
5. Identify and discuss how the computing innovation consumes, produces, and/or transforms data and address concerns about data storage, data privacy, or data security..
6. Design, research, and create a computational artifact.

Creative Development:

1. Design, implement, and test a program that solves a problem of personal interest to the student.
2. Summarize, describe, and reflect on the development process of the program.
3. Create a video demonstrating the use and functionality of the program.

Suggested Activities & Best Practices

- Edhesive and Code Studio Labs
- Teacher demonstration with hands on practice
- Discussion Boards on chapter of blown to bits. Using the course sites platform
- Collaborate with a peer to find a solution to a text compression problem using the Text Compression Widget (lossless compression scheme).
- Develop a strategy (heuristic algorithm) for compressing text.
- Use the Pixelation Tool to encode small color images with varying bits-per-pixel settings.
- Identify and construct a document using reliable sources of information when doing research
- Create an artifact (video, image, slide, poster, etc.) to communicate information about a computing topic.
- Lectures
- Powerpoint/ Prezi Presentations

Evidence of Student Learning - Checking for Understanding (CFU)

Unit tests-summative assessment

Defining-formative assessment

Web-based assessment-alternate assessment

Create an artifact (video, image, slide, poster, etc.) to communicate information about a computing topic.-benchmark assessment

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

Primary Resources & Materials

Edhesive Online Computer Simulation, Code.Org Website

Ancillary Resources

General Resources:

- Computers and Internet Access
- AP Central at Collegeboard.org
- Massive Open Online Course
- Code.org
- Multimedia Applications Tools
- Abelson, H., Ledeen, K., and Lewis, H. R. Blown to Bits: your life, liberty, and happiness after the digital explosion. Upper Saddle River, N.J.: Addison-Wesley, 2008.

Approved Programming Resources:

(may choose one or more)

- Alice - This 3-D modeling environment allows students to create and animate 3-D worlds. This environment lends itself well to creating stories and games.
- App Inventor - This open-source Web application allows students to create their own applications on mobile devices. App Lab - This is a programming environment for creating web applications with JavaScript. It allows students to develop programs and toggle back and forth between block-based and text-based programming modes.
- EarSketch - This browser-based application allows students to create their own music using either JavaScript or Python. Greenfoot - This Java IDE is designed for use in education to create two-dimensional graphic applications, such as simulations and interactive games.
- Java - There are several IDEs that can be used to write in Java. The Java language allows students to create and solve problems that vary widely in difficulty.
- JavaScript - This language is commonly used to create interactive effects within Web browsers.
- Lego Mindstorms NXT - This product integrates programming with Lego bricks and sensors to create and program robots. The instructions are assembled by linking together function blocks.
- Processing - This programming language was initially created to serve as a software sketchbook, and it can be used to teach programming using a visual context.
- Python - This language has the benefit of readability that might be helpful to new programmers.
- Scratch - This blocks-based programming language allows students to build scripts to run animations. This product can be downloaded and installed on a computer or run in the browser.
- Snap! - This Scratch-style programming language is block-based and allows users to define new primitives in JavaScript. Users can read and write information from the Internet using server-defined APIs and make mobile applications.
- Swift - This programming language is designed for use with iOS, OS X, tvOS and watchOS. This environment allows students to create their own Apple apps and includes interactive environments that

allow students to see the effects of changes or additions to code as they type.
- Design and Development Process:
- “What Is the Software Development Life Cycle?” Official Blog Airbrake Bug Tracker. https://airbrake.io/blog/insight/what-is-the-software-development-life-cycle
- “Engineering Design Process.” https://www.teachengineering.org/ engrdesignprocess.php
- “The Engineering Design Process.” http://www.eie.org/overview/engineeringdesign-process Mohammed, Nabil, Ali Munassar, and A. Govardhan.
- “A Comparison Between Five Models of Software Engineering.” IJCSI International Journal of Computer Science 7.5 (2010): 94-101.

Open Source:

- “What Is Open Source?” Opensource.com. https://opensource.com/resources/whatopen-source
- Open Source Initiative. http://opensource.org/

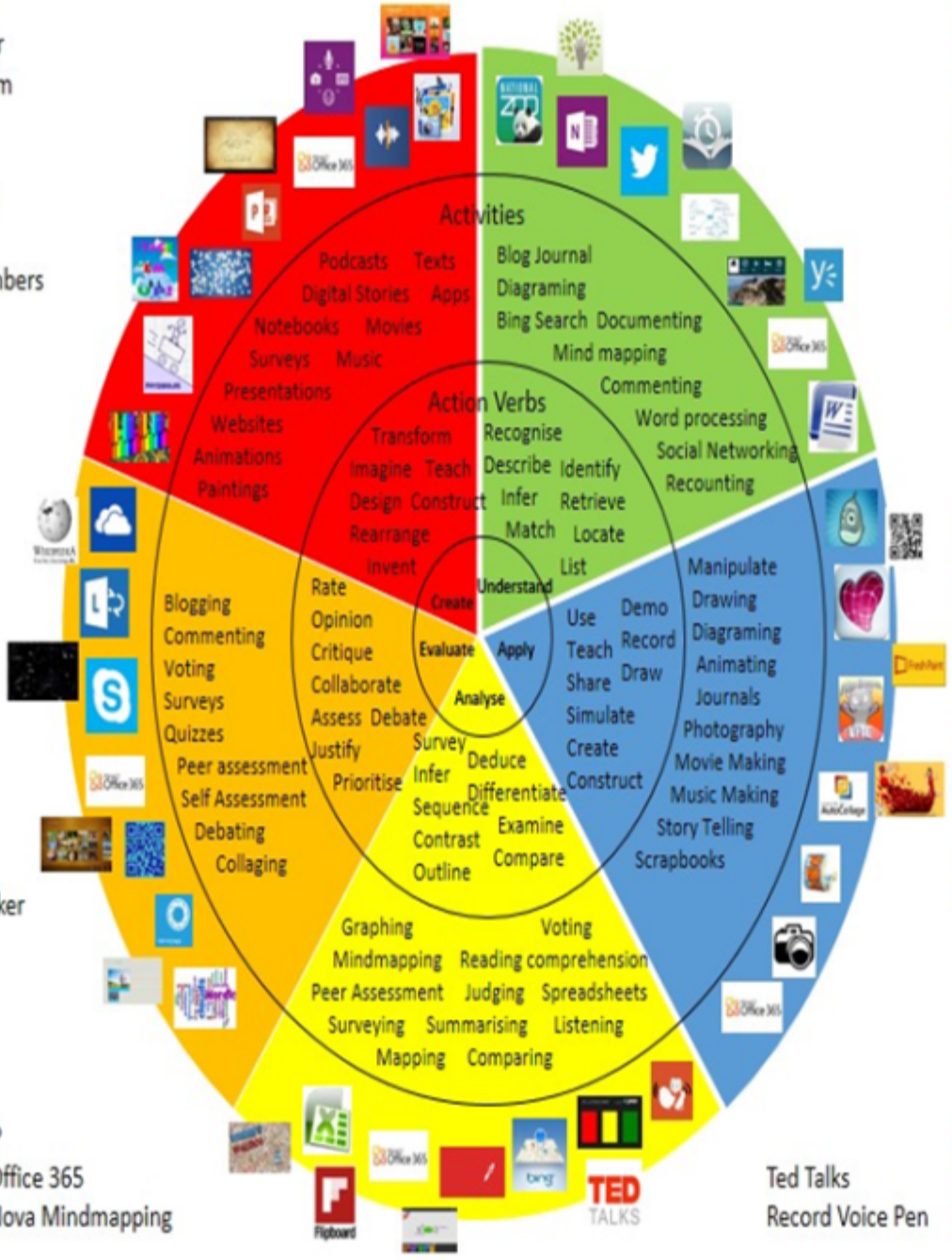
Technology Infusion

Technology Infusion and/or strategies are integrated into this unit to enhance learning. Listed below are some of the strategies:

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

21st Century Skills & Technology and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

21st Century Skills/Interdisciplinary Themes

21st Century/Interdisciplinary Themes that will be incorporated in this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

21st Century Skills that will be incorporated in this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Differentiation, identified in this unit.

- Project Based Learning
- Highlighting key vocabulary.
- Additional testing time.
- Using paired/cooperative learning.
- Using hands-on learning.
- Making curricular and personal connections.
- Developing oral, reading, and writing skills.
- Using graphic organizer and/note taking guides
- Use of technology for class
- Use of scaffolding and tiered assessments
- Other differentiation based on IEP and 504 accommodations

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments

- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Intervention Strategies

Intervention Strategies that will be employed in this unit, identified below.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing

- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Special Education Learning

Special Education Learning adaptations that will be employed in this unit, identified below.

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments

- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

English Language Learning adaptations that will be employed in this unit, using some of the ones identified below.

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Sample Lesson

Lesson Plan: Design a Website to Promote a Project

Overview

In Design a Website to Promote a Project, students will promote a community project by building a website with Google Sites.

You can use this lesson to facilitate the selection and completion of a community service project with a class

or large group of students.

This lesson is one of seven that can be used to complete different components of the project. To find the other lessons, visit the Applied Digital Skills curriculum page, and click on Capstone Collection.

Objectives

By the end of this lesson, students should be able to:

- Achieve the following objectives:
    - Collaborate with others to design a website to promote a large-scale project.
    - Visually communicate information about a large-scale project.

- Answer the following essential questions:
    - How can I communicate information about a project and promote it using digital tools?
    - How can I design a website to serve a main purpose and speak to a specific audience?

- Internalize the following enduring understandings:
    - I can use a website to communicate important information about my project to others.
    - I can help promote my project by tailoring my website for a specific purpose and audience.

Digital Skills

As they complete this lesson, students will learn and practice the following digital skills:

- Create a new Google Site
- Add a title to a website
- Change the header image
- Select a theme

- Adjust a theme color and font style
- Set sharing permissions and share the website file
- Choose layouts
- Add and format text
- Add pages
- Insert and resize images
- Add section backgrounds
- Preview and publish the website
- Share the published website link

Terms and Concepts

As they complete this lesson, students will learn and use the following terms and concepts:

- Website
- Homepage
- Header
- Theme
- Layout
- Page

Total Duration

- 70 minutes (can be extended to 100 minutes with extension videos)

Materials

- Computer with internet access (per student)
- Headphones (per student)
- Applied Digital Skills website

Lesson Outline: Main Videos Plus Extensions

	Video	Duration	Description
1	Introduction to Design a Website to Promote a Project	5 min	Students are introduced to the lesson, create and name a new website, and add a title to the homepage.
2	Discuss Your Site's Purpose and Choose a Theme and Header	10 min	Students discuss their website's purpose and audience with their groups. They then select a theme and a header image.
3	Share Your Website with Your Group	5 min	Students share the website file with their group so that everyone can collaborate on it.
4	Choose a Layout and Add Text to Your Homepage	10 min	Students choose a layout and add text to the homepage for their website.
5	Add More Pages	12 min	Students add pages to their website, choose layouts for them, and add text.
6	Insert Images and Section Backgrounds	13 min	Students insert images and section backgrounds into the pages of their website.
7	Preview and Publish Your Website	10 min	Students preview their website, publish it to the internet, and share the website link with others.
8	Design a Website to Promote a Project Wrap-Up	2 min	Students wrap up the lesson and discover how the skills they learned can apply to other tasks.
*	Extension A: Add Images of Your Event	10 min	Students add photos from their event to their website and caption them.
*	Extension B: Change Your Site's Design	8 min	Students change some of their website's design elements to give their site a different look.
*	Extension C: Embed a Survey Form in Your Site	12 min	Students create a survey using Google Forms to get feedback about their event and embed it into their website.

Prep

Before introducing this lesson to students:

- Create a teacher account at g.co/applieddigitalskills, and add a class.
- Distribute the class code to your students.
- Place your students into small groups for collaboration during this lesson, if preferred.

Procedure

1. Introduce the lesson: Prompt students to think about the different ways in which a website can be used to promote a business, service, or event. (see Appendix for suggested prompts).

2. Check in with students during class: Meet one-on-one or in small groups as students watch videos (see Appendix for suggested prompts).
3. Wrap up the lesson: Give a short closing and facilitate brief discussion about what students learned and experienced (see Appendix for suggested prompts).

Check Outcomes

Walk around class and monitor progress to ensure students:

- Log in to their Google account.
- Create a new website in Google Sites and name it.
- Add a title to the homepage.
- Discuss their website's purpose and audience with their group.
- Select a theme for their website.
- Adjust the theme color and font style.
- Select an image for their header.
- Open the share settings and type in their group members' email addresses.
- Set sharing permissions and notify people.
- Discuss the text for their homepage with their group.
- Choose a layout for their homepage.
- Add relevant project information.
- Add text to encourage their audience to read more.
- Format their text.
- Add pages to their website and title them.
- Select a layout for each page.
- Add text to each page.
- Search for and add images to pages of their website.
- Make sure images are free to use.
- Resize images as necessary.

- Select section backgrounds.
- Preview their website and make necessary changes.
- Share their website with their teacher.
- Make final changes and publish their website.
- Share the website link with others.

Assessments

Applied Digital Skills offers two tools to help measure student learning -- the end-of-lesson quiz and the student project rubric.

- The end-of-lesson quiz contains multiple-choice and open response questions. Use the quiz to help measure students' ability to recall what was covered in the lesson and demonstrate their understanding of how to use digital skills in different scenarios.
    - Note that the answer key is only available here in the teacher lesson plan
- The student project rubric example includes example criteria to score and provide comments on student projects created for this lesson. The rubric is designed to measure students' understanding and their ability to apply the digital skills covered in the lesson. Add additional rubric criteria to meet your needs.



Resources

- Example project
- Student Project Rubric
- Appendix

Tip: This lesson is designed to be completed in 1–2 class periods. It has multiple videos for students to watch, which vary in duration and guide students through building a main project around a central theme. Also included are three optional extension videos, which should each take students 5-10 minutes to complete. They can be added to the main lesson to extend instructional time and allow students to add on to their projects and reinforce skills.

Tip: Assign groups. Some videos require students to work in pairs or groups. Save time by assigning students before the lesson begins.

Tip: Reserve 5 minutes at the beginning and end of each lesson. Start each class with a 5-minute introduction and end each class with a 5-minute closing.

Tip: Use the rubric to evaluate student work. Rubrics are linked in each lesson plan to evaluate student work. Share a copy of the rubric with students before they turn in their projects.

Example Student Outcome (Format, Content, & Images)



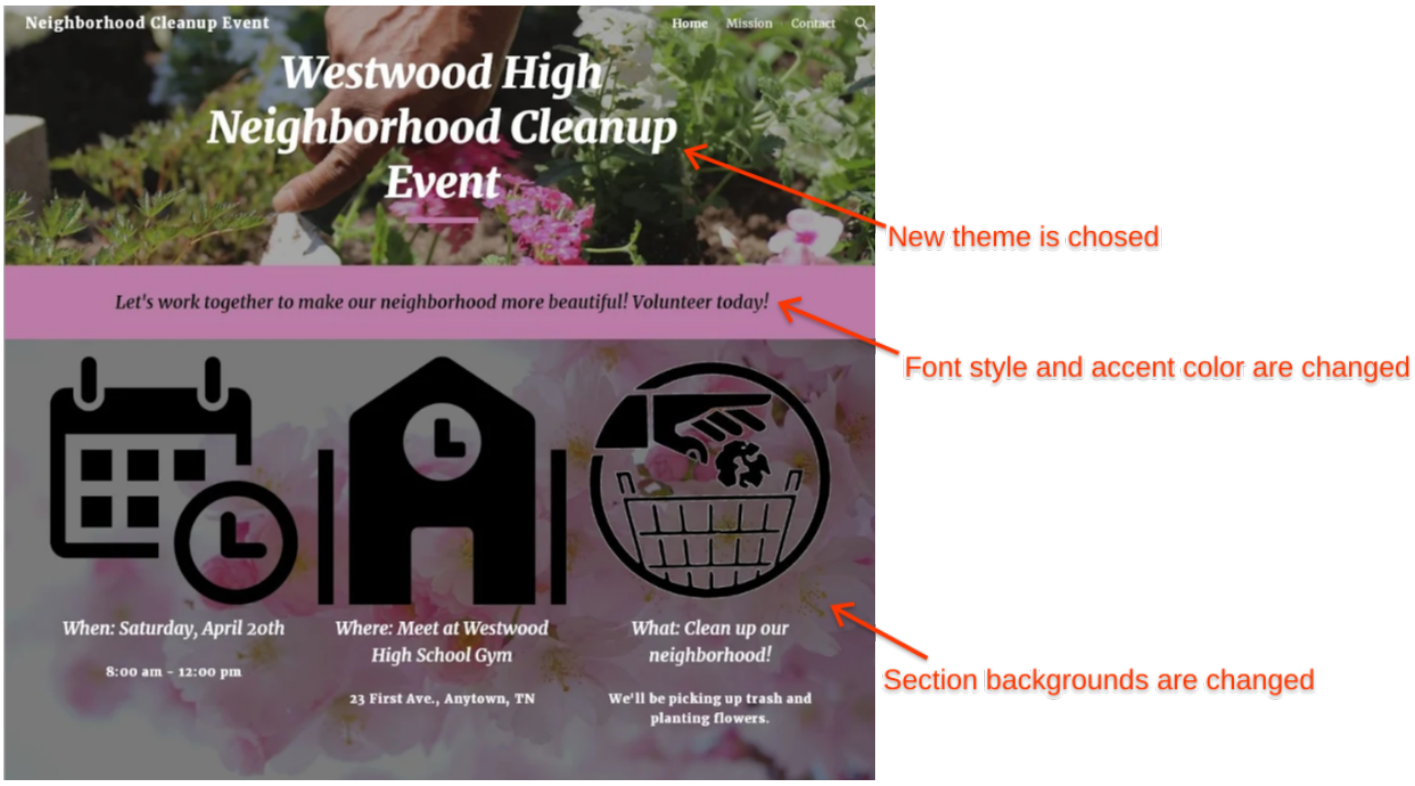
Example Student Outcome (Pages, Sharing, & Publishing)



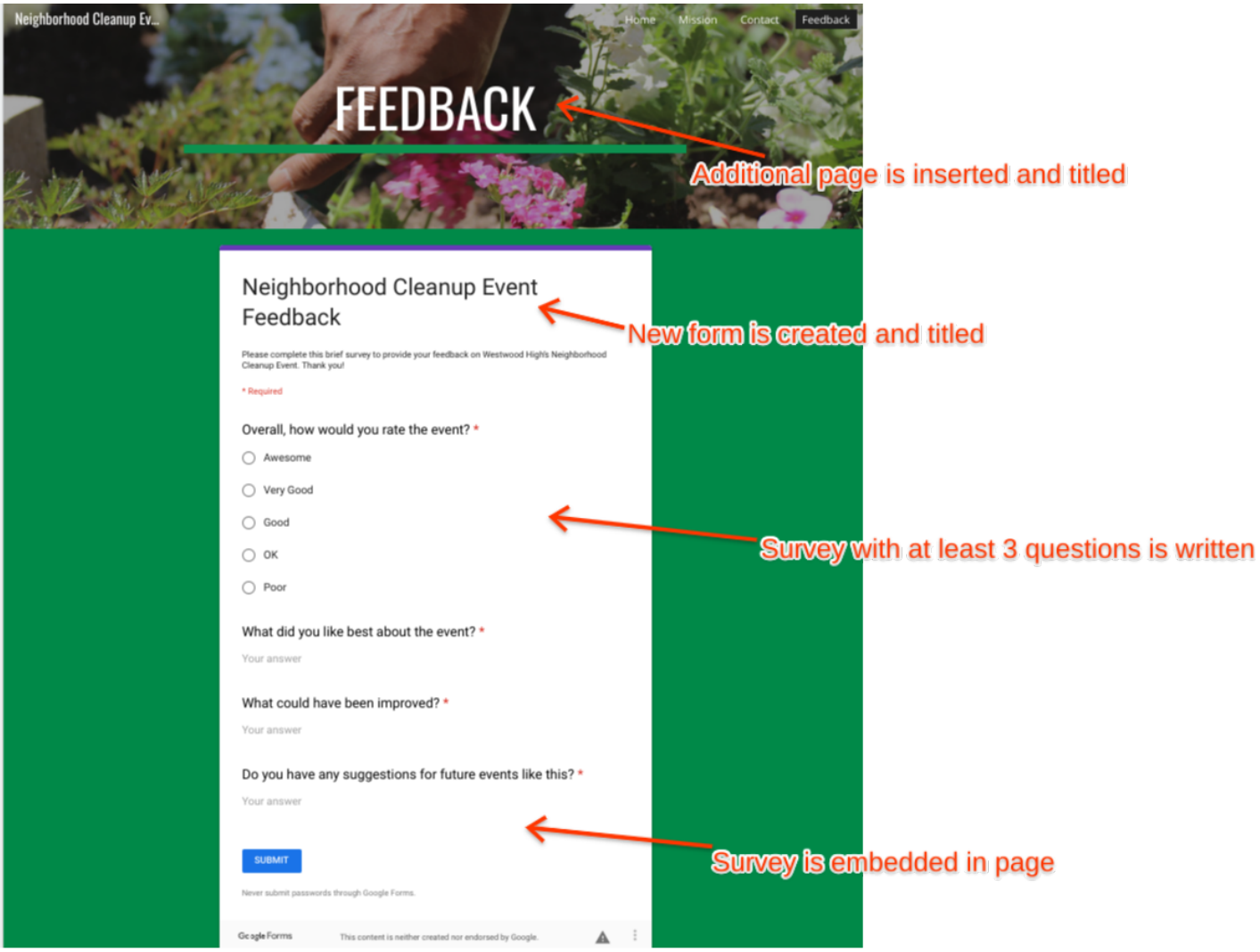
Example Student Outcome: Extension (Add Images of Your Event)



Example Student Outcome: Extension (Change Your Site's Design)



Example Student Outcome: Extension (Embed a Survey Form in Your Site)



Appendix

Design a Website to Promote a Product

Introduce the lesson and prompt students to think about where they find information about the activities and events they participate in.

Say	To get started and join our class, go to g.co/applieddigtialskills and select "Sign In." Click

	on your Google account (or create one), choose “I am a student,” and enter our class code. (Teacher note: Locate your class code on your dashboard.) After you join our class, proceed to Video 1 and begin watching.
Ask	• Have you ever tried to promote an activity or event you were involved in? How did you do it? • What tools can be used to promote a business, service, or event (e.g., flyers, brochures, PSAs, commercials, websites, email)? • What are some benefits of using digital tools for promotion?

Describe the activities and outcomes for the lesson.

Say	In this lesson, you will build a website to promote a community project using Google Sites.
Say	Go to g.co/applieddigitalskills and select “Sign In” to log into your profile. If you see “Wait,” click it and move onto the next unit. If you already see “Introduction to Design a Website to Promote a Project” then you are ready to begin watching the first video. Watch the first video, and complete the steps described.
Teacher Note	If students need help accessing the lesson, have them navigate the curriculum menu by clicking on “Curriculum” at the top of the page, then scrolling down and selecting the correct lesson.
Intro/Closing Questions	• What is the most important information you would like to communicate with others about your project? • Who is the main audience with whom you would like to share information about your project?
Engage	• How could a website be used to share information about an event with others and encourage participation?

Wrap up the lesson.

Wrap-Up	Summarize the lesson and celebrate that, as a result of the skills learned, they created an exciting project.
Say	In this lesson, you built a website to promote a community project using Google Sites. You decided on your website’s main purpose and audience with your group and worked collaboratively to design your website. You then published your website and shared the link with others to promote your project.
Ask	• How did you design your website so that it served its main purpose and appealed to

your audience?

- What else might you use a website like this for?
- How will you apply the new skills you learned here to your life or work?

Quiz Answer Key

1. A
2. C
3. B
4. A
5. D
6. C
7. B
8. B
9. D
10. (Open-Ended)
11. (Open-Ended)
12. (Open-Ended)

Evaluating Open-ended Responses:

Question 10

Look for responses that include: to determine the audience and message of the website, to choose a theme that fits the audience and message of the website, to help decide what to emphasize based on the interests of the audience.

Questions 11 and 12

Responses to these two questions can be used to:

- Identify concepts and/or skills that students may need additional instruction on or practice with to fully

understand.

- Identify where the digital skills and concepts could be embedded in future classroom activities and assignments.
- Identify if students are making connections between the digital skills and concepts covered in this lesson and how they can use those digital skills and concepts in different settings or on different assignments.