Figure 5.5: Every Graph Tells a Story Project Plan

Project Title: Every Graph Tells a Story	**Topic:** Designing a 3-D graph that tells a story about data

Grade Level: 3–5 Adjusted by the increasing the complexity and level of data as well as the number of required data points	**Estimated Class Time:** Between eight and ten classes

Challenge: Design and build a 3-D graph that can tell a story about lots of numbers. Can your graph tell the story if you are not there to explain it?

Curricular Connections	Skills Focus
Art—must be visually appealing and moving from two to three dimensions **Mathematics**—graphing skills and relationships between numbers **English Language Arts, Science, Social Studies**, **World Languages**—can be topic of the graph	**Critical Thinking**—depicting data to convey a message or story; choosing materials **Creativity**—making it stand out; visual appeal to create audience engagement **Spatial Reasoning**—scaling; 3-D thinking **Global View**—using trends and statistics about other regions and countries can be focus **Collaboration**—working as a team; identifying what makes people look at the graph **Communication**—ensuring that people can understand the graph and that it conveys the message

Overall Plan	
Hook	Have students explore some innovative graphs online using some from the following resources. • Information Is Beautiful (https://informationisbeautiful.net) • Statista's Chart of the Day (www.statista.com/chartoftheday) • DataVizProject (https://datavizproject.com)
Quick Build	One class period. • Different groups get different subjects to graph based on objects in your classroom or school. • After some initial observations, students list five different features or characteristics that they noticed (five shirt colors, five foods). They make a tally chart to record the incidence of each characteristic. • With little instruction, challenge students to make a graph of their data in about twenty minutes. • Debrief and reflect by having each group show and explain their graph. Other students can ask questions and make comments. • Each group should identify three things that would make their graph easier to understand or more fun to look at. Alternate: Play a graphing game online (Early Childhood Education Zone at https://bit.ly/2XbhpYc).

Background Instruction	• Types of graphs • Labeling • Scale • Legend or key • Any specific related to the graph's subject, if needed
Background Research	Assign or have students choose a general topic for their graph. Topics can be broad such as food, plants, pastimes, and books. Choose anything that relates to your current curricular content if you want to focus on a subject in addition to mathematics. Students find or collect data depending on the topic. If you are introducing large numbers and statistics to students, some good resources may be found on these sites. • Our World in Data (https://ourworldindata.org) • World Resources Institute (www.wri.org/resources) • World Bank data tables (http://wdi.worldbank.org/tables) • NOAA Data in the Classroom (https://dataintheclassroom.noaa.gov)

Engineering Design Process	
Know Your Problem • Know your end user • Identify constraints • Define criteria	• Students or teachers determine who they show their graphs to: adults, younger or older students, their classmates. • Help students identify constraints; typical constraints include the project's overall size, the time they will have to build the graph, and any materials they may use. • Have groups develop criteria; remind them it must look good and be related to their project. For instance, a project focused on the ocean might have an overall blue color scheme and fish as a theme.
Know Your Options • Research • Brainstorm	• Help students identify a good data set related to their topic. • Brainstorming should focus on ideas like the type of graph, colors, and objects that would make it 3-D. Lead brainstorming by give periodic prompts related to these ideas.
Develop a Solution—Part One • Choose a design • Identify needed materials	• Just as they would in any EDP projects, have students decide or vote on key features of their graph, including type, color, theme, objects, and materials. • Students create an initial list of materials.
Develop a Solution—Part Two • Create a plan; make a sketch • Build the graph	• Visit **go.SolutionTree.com/21stcenturyskills** for an abbreviated "Initial Design Plan Graph Project." It is important that students complete this before starting to build. Jobs are listed but they are optional for this project. • Allow three or four classes for building; remind students that graphs must not be flat (2-D), must have the key features you taught them about (labels, units, scale, and so on), and must meet the constraints and criteria.

| Develop a Solution—Part Three
• Present the graph
• Get feedback
• Plan modifications to make it better | • Groups present their graphs in a gallery-like setting where you invite others to come and view them in your classroom. An extension or added challenge has students be absent during this visit, since the graph should be able to tell the story.
• Have groups create a three- or four-question Likert scale survey to give to viewers. Questions should include whether the story is clear and about color and overall theme and presentation. Students must understand that they are looking for information about how clear and engaging their graph is.
• Once the galley tour is over, guide groups in analyzing their surveys. Ask each group to list three ways they could improve their graphs. |

Group Size

Groups of three work well; if necessary, groups of four will work.

Assessment

Follow the general assessment guidelines in chapter 3 (page 80–91).