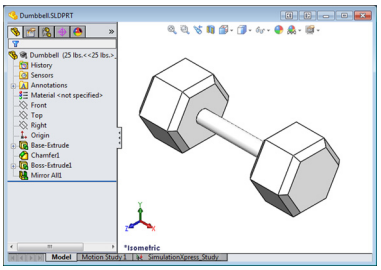
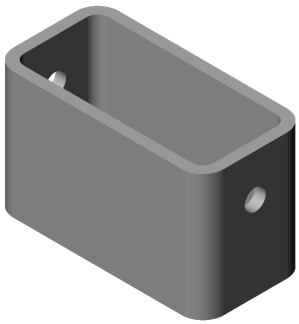
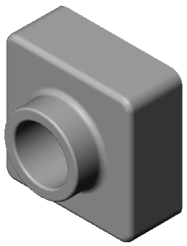
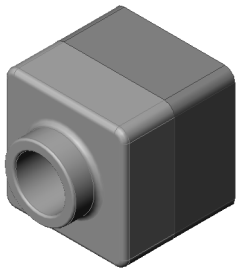
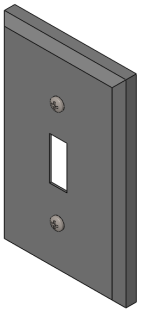
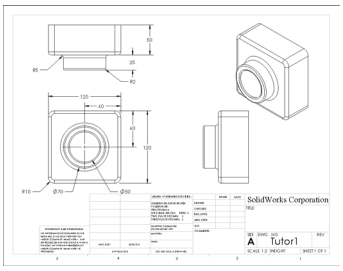
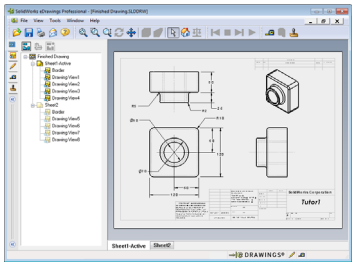
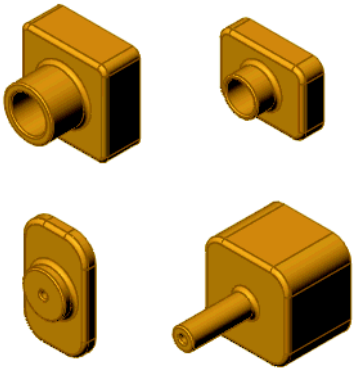
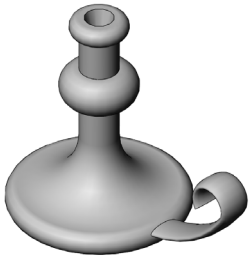
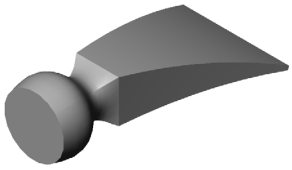
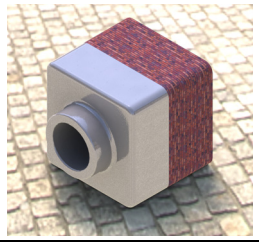
C

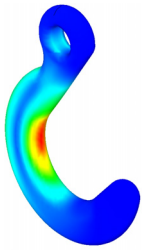
Appendix C: STEM Course Outline

Science, Technology, Engineering, and Mathematics (STEM) Course Outline

Week	Lesson	Competencies
1	Lesson 1: Using the Interface 	• **Engineering**: Knowledge of an engineering design industry software application. • **Technology**: Understand file management, copy, save, starting and exiting programs.
2	Lesson 2: Basic Functionality 	• **Engineering**: Develop a 3D part based on a selected plane, dimensions, and features. Apply the design process to develop the box or switch plate out of cardboard or other material. Develop manual sketching techniques by drawing the switch plate. • **Technology**: Apply a windows based graphical user interface • **Math**: Understand units of measurement, adding and subtracting material, perpendicularity, and the x-y-z coordinate system.
3	Lesson 3: The 40-Minute Running Start 	• **Engineering**: Utilize 3D features to create a 3D part. Create a pencil sketch of a profile for chalk and an eraser. • **Technology**: Work with common music/software case and determine the size of a CD container. • **Math**: Apply concentric relations (same center) between circles. Understand conversion from millimeters to inches in an applied project. Apply width, height, and depth to a right prism (box). • **Science**: Calculate volume of a right prism (box).

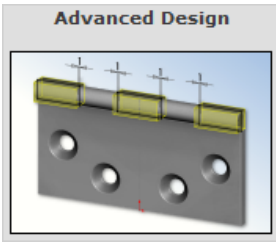
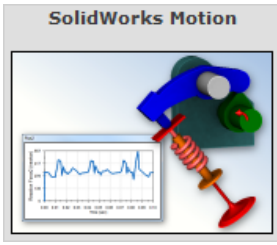
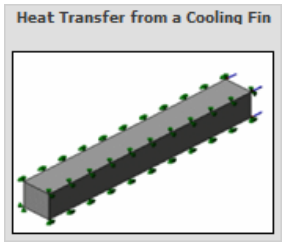
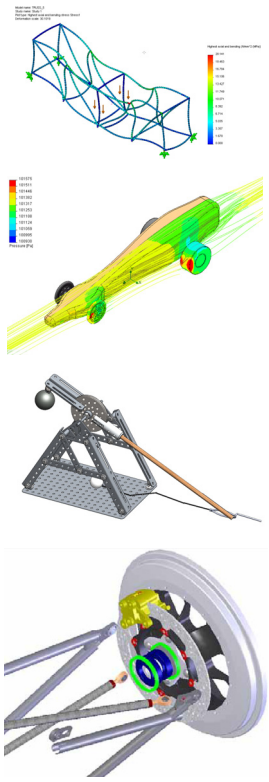
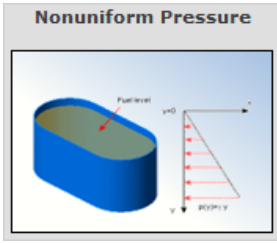
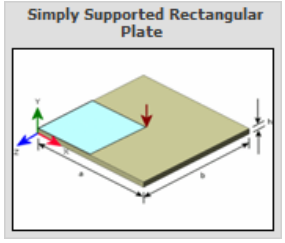
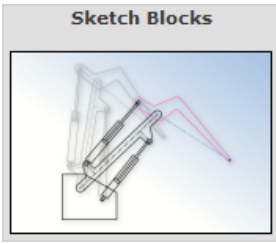
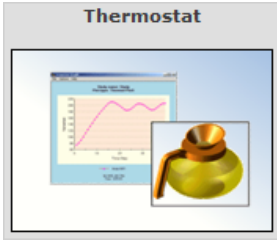
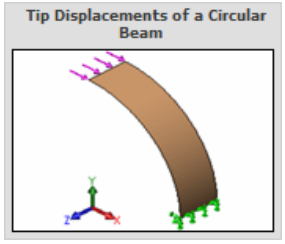
Week	Lesson	Competencies
4	Lesson 4: Assembly Basics 	• **Engineering**: Evaluate the current design and incorporate design changes that result in an improved product. Review fastener selection based on strength, cost, material, appearance, and ease of assembly during installation. • **Technology**: Review different materials and safety in the design of an assembly. • **Math**: Apply angular measurements, axes, parallel, concentric and coincident faces, and linear patterns. • **Science**: Develop a volume from a profile revolved around an axis.
5	Lesson 5: SolidWorks Toolbox Basics 	• **Engineering**: Select fasteners automatically based on hole diameter and depth. Utilize fastener vocabulary such as thread length, screw size, and diameter. • **Technology**: Utilize the Toolbox Browser and display of thread style. • **Math**: Relate diameter of screw to screw size. • **Science**: Explore fasteners created from different materials.
6	Lesson 6: Drawing Basics 	• **Engineering**: Apply engineering drawing standards to part and assembly drawings. Apply concepts of orthographic projection to 2D standard views and isometric views. • **Technology**: Explore associativity between different, but relative file formats that change during the design process. • **Math**: Explore how numeric values describe overall size and features of a part.
7	Lesson 7: SolidWorks eDrawings Basics 	• **Engineering**: Mark up engineering drawings utilizing eDrawings comments. Understanding how to communicate with manufacturing vendors. • **Technology**: Work with different file formats including animations. Understand attachments for email.

Week	Lesson	Competencies
8	Lesson 8: Design Tables 	• **Engineering**: Explore family of parts with a design table. Understand how design intent can be built into a part to allow for changes. • **Technology**: Link an Excel spreadsheet with a part of an assembly. See how they relate a manufactured component. • **Math**: Work with numerical values to change overall size and shape of a part and assembly. Develop width, height and depth values to determine volume of the CD Storage box modifications.
9	Lesson 9: Revolve and Sweep Features 	• **Engineering**: Explore different modeling techniques that are utilized for parts molded or machined in a lathe process. Modify the design to accept a candle of different sizes. • **Technology**: Explore the difference in plastic design for cups and travel mugs. • **Math**: Create axes and a profile of revolution to create a solid, 2D ellipse, and arcs. • **Science**: Calculate the volume and unit conversion for a container.
10	Lesson 10: Loft Features 	• **Engineering**: Explore different design changes to modify the function of a product. • **Technology**: Knowledge of how thin wall plastic parts are developed from lofts. • **Math**: Understand tangency effects on surfaces. • **Science**: Estimate volume for different containers.
11	Lesson 11: Visualization 	• **Engineering**: Enhance the appeal of a product with visualization and animation. • **Technology**: Work with different file formats to enhance presentation skills.

Week	Lesson	Competencies
12	Lesson 12: SolidWorks Sustainability	• **Engineering**: Performing environmental assessment of designs using a product life cycle methodology. • **Technology**: Using a CAD-integrated screening-level environmental Life Cycle Assessment tool. • **Math**: Interpreting numerical data in various forms (percentage change, pie charts, and absolute results) to make design decisions. • **Science**: Understanding environmental indicators: meaning global warning potential using carbon footprint, measuring air impacts using acidification potential, measuring water quality impacts using water eutrophication, and measuring nonrenewable energy consumption over a product's life cycle.
13	Lesson 13: SolidWorks SimulationXpress 	• **Engineering**: Explore how material properties, forces, and restraints affect part behavior. • **Technology**: Knowledge of the finite element process to analyze force and pressure on a part. • **Math**: Understand units and apply matrices. • **Science**: Investigate density, volume, force, and pressure.

Note: The time for weekly lessons in approximate, based on three-45 minute class periods per week. Additional lessons are provided to encourage independent learning, imagination, innovation, and problem solving skills. Instructors should also utilize Week 1 to set up folders for students, manage accounts, and the student login process. The SolidWorks curriculum is flexible, you can select from additional tutorials and projects.

Additional Tutorials

SolidWorks Tutorials, SolidWorks Simulation Tutorials, SolidWorks Simulation Verification Problems, and Design Projects develop additional modeling and engineering design skills with real world components. SolidWorks Simulation Tutorials and Verification problems develop engineering, math, and science competencies. Design projects explore the engineering design process with an additional component.

Additional SolidWorks Tutorials	Additional SolidWorks Simulation Tutorials	SolidWorks Simulation Verification Problems	Design Projects
Click **Help, SolidWorks Tutorials**	Click **Tools, Add-Ins** to activate SolidWorks Simulation. Then click **Help, SolidWorks Simulation, Tutorials** or access them through the main SolidWorks Tutorial window	Click **Tools, Add-Ins** to activate SolidWorks Simulation. Then click **Help, SolidWorks Simulation, Validation, Verification Problems**	www.solidworks.com/curriculum