Unit 2: Assembly Design 22

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Semester 1**
Length: **10 weeks**
Status: **Published**

Standards

CS.9-12.8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
CS.9-12.8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
CS.9-12.8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
CS.9-12.8.2.12.ED.6	Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
CS.9-12.8.2.12.NT.2	Redesign an existing product to improve form or function.
CS.9-12.8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
CS.9-12.8.2.12.ITH.1	Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.

Enduring Understandings

Students will understand that …

- **U1 –** Technical professionals use a variety of models to represent systems, components, processes and other designs including graphical, computer, physical, and mathematical models.
- **U2 –** Computer aided drafting and design (CAD) software packages facilitate the creation of virtual 3D computer models of parts and assemblies.
- **U3 –** Physical models are created to represent and evaluate possible solutions using prototyping technique(s) chosen based on the presentation and/or testing requirements of a potential solution.
- **U4 –** Technical professionals clearly and accurayely document and report their work using technical writing practice in multiple forms.
- **U5 –** An equation is a statement of equality between two quantities that can be used to describe real phenomenon and solve problems.
- **U6 –** Solving mathematical equations and inequalities involves a logical process of reasoning and can be accomplished using a variety of strategies and technological tools.
- **U7 –** A function describes a special relationship between two sets of data and can be used to represent a real world relationship and to solve problems.

Essential Questions

- **EQ1 –** How should one decide what information and/or artifacts to include in a portfolio? Should a portfolio always include documentation on the complete design process?
- **EQ2 –** Did you use every possible type of model during the design and construction of your puzzle cube? Describe each model that you used?
- **EQ3 –** How reliable is a mathematical model?

Knowledge and Skills

KNOWLEDGE: Students will …

- **K1 –** Explain the term "function" and identify the set of inputs for the function as the domain and the set of outputs from the function as the range.
- **K2 –** Be familiar with the terminology related to and the use of a 3D solid modeling program in the creation of solid models and technical drawings.
- **K3 –** Differentiate between additive and subtractive 3d solid modeling methods

SKILLS: Students will …

- **S1** – develop and/or use graphical, computer, physical and mathematical models as appropriate to represent or solve problems.
- **S2 –** Fabricate a simple object from technical drawings that may include an isometric view and orthographic projections. U1, U5
- **S3 –** Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints. U1, U2
- **S4 –** Generate CAD multi-view technical drawings, including orthographic projections and pictorial views, as necessary, showing appropriate scale, appropriate view selection, and correct view orientation to fully describe a simple part according to standard engineering practice. U1, U2
- **S5 –** Construct a testable prototype of a problem solution. U1, U3
- **S6 –** Analyze the performance of a design during testing and judge the solution as viable or non-viable with respect to meeting the design requirements. U3
- **S7 –** Create a set of working drawings to detail a design project. U1, U2
- **S8 –** Organize and express thoughts and information in a clear and concise manner. U4
- **S9 –** Utilize project portfolios to present and justify design projects. U4
- **S10 –** Use a spreadsheet program to graph bi-variate data and determine an appropriate mathematical model using regression analysis. U1, U7
- **S11 –** Construct a scatter plot to display bi-variate data, investigate patterns of association, and represent the association with a mathematical model (linear equation) when appropriate. U1, U5
- **S12 –** Solve equations for unknown quantities by determining appropriate substitutions for variables and manipulating the equations. U6
- **S13 –** Use function notation to evaluate a function for inputs in its domain and interpret statements that use function notation in terms of a context. U7
- **S14 –** Build a function that describes a relationship between two quantities given a graph, a description of a relationship, or two input-output pairs. U1, U7
- **S15 –** Interpret a function to solve problems in the context of the data. U6, U7
- **S16 –** Interpret the slope (rate of change) and the intercept (constant term) of a linear function in the

context of data. U1, U5

S17 – Compare the efficiency of the modeling method of an object using different combinations of additive and subtractive methods. U2

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing

Resources

4.1.P PuzzleDesignChallenge.docx
4.1.P.RU PuzzleDesignChallengeRubric.docx
4.1.a.A PuzzlePartCombinations.docx
4.1.a.A PuzzlePartCombinationsExamples.docx
4.1.a.A Modeling.pptx
4.1.a.A PuzzlePartCombinationsExamples.docx
4.1.b.A GraphicalModeling.docx
4.1.c.A MathematicalModeling.docx
4.1.c.A MathematicalModeling.pptx
4.1.d.A SoftwareModelingIntroductionADDSTEAM.docx
4.1.e.A SoftwareModelingIntroductionVideo.docx
4.1.f.A SoftwareModelingIntroductionReference.docx
4.1.g.A ModelCreation.docx
4.1.g.A AdditiveSubtractiveModeling.pptx
4.1.h.A AssemblyConstraints.pptx
4.1.i.A CreatingDrawingsCAD.pptx
4.1.j.A Portfolios.pptx
4.2.A PuzzleCubePackageOptional.docx
4.2.A.RU PuzzleCubePackage.Rubric.docx