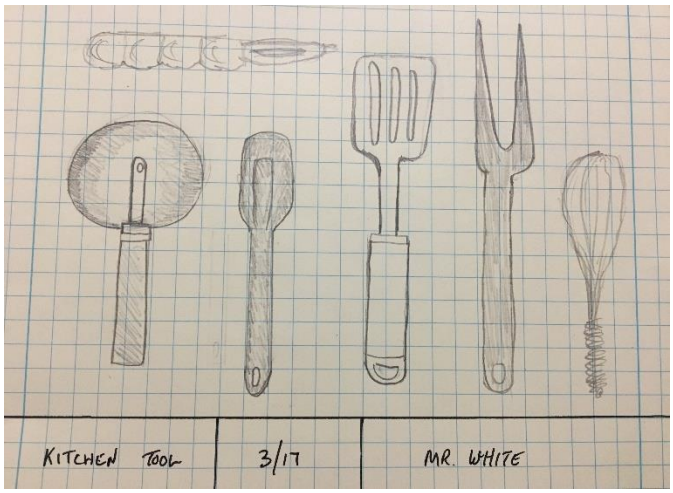


Project: Kitchen Tool Design

Introduction:

We all have or have seen a wide variety of tools in our kitchens. People who are working in a kitchen need specific tools for certain applications. These tools generally serve a single purpose and should be easily accessible to the user. What if we could possibly combine or add to some of these common tools to make it easier for the user?

Purpose of the Project:

The purpose of this project is to go through the design process and have students brainstorm, sketch, model, and present an innovative practical kitchen tool that could be used in preparing food.

This project introduces students to 3D modeling concepts. The project will utilize many different features found in the current software. Students will become familiar with a variety of commands as well as the workflow of the CAD program. Throughout this course students will frequently utilize many of the techniques developed in this lesson.

This project allows students to act as designers. Each group will interview a “client” and design a kitchen tool to meet their needs. Students will interview the client and develop a design brief to identify the type of tool and what it should do. Student groups will create sketches for the client and design the tool after they receive approval.

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Concepts:

- Analyze models for appropriate engineering design features that are needed.
- Develop strategies for the building of solid models for the rapid creation of design solutions.
- Communicate ideas to a group through the use of sketches and other documentation.
- Create a drawing to communicate design ideas and engineering principles to an audience.

Outline:

Documentation
    Engineering Notebook
    Documentation of possible objects to be designed
Modeling
    Creation of 3D models
Communication
    Presentation of design solutions

Assessment:

Assessment is both formative and summative. It is an integral part of quality instruction. During the course of each project, one of the teacher's main functions is to work with student groups, keeping track of progress and providing formative assessment in the form of feedback and promoting reflection on the part of students. The focus should be on promoting lifetime learning and 21st century skills. The goal of instruction is to promote abilities in research, problem solving, designing, experimenting, testing, collecting and analyzing data.

Rubrics are used in the assessment process to communicate expectations of quality. Rubrics should be shared with students at the beginning of a project to clarify any misconceptions before beginning their work. Students can then build the skills and gather knowledge to solve the problem presented to the expectations of excellence described.

General Rubrics for Literacy tasks:
Argumentative_Pursuasive
Informational_Explanatory

Individual Project Rubric:
Kitchen Tool Design Project Rubric

Essential Question:

How can we make a new and improved tool to perform a kitchen task that is routinely done by hand?

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Student Scenario:

There are many tools found in all of our kitchens that serve a particular purpose. Your team has been given the task by a large kitchen appliance company. You must take an ordinary manual hand-held kitchen tool and innovate it.

You will interview your client to discover their needs. After conducting research on styles, characteristics, and sizes, you will select a design that meets the desired requirements. You will create a design brief to share with your clients giving a short presentation about your design, highlighting your favorite characteristics. Obtain the client's approval before beginning work on the final design. You will create the solid model and verify its characteristics by printing and building a prototype. NOTE: The teacher will decide how the "client" and the client's needs for the project are to be represented.

The research and learning activities are designed to help students:

- Create sketches to communicate to a group
- Use mathematical formulas to aid in the design of a product
- Utilize specific software features to create a solid model of their idea
- Communicate their solution to their peers

Deliverables include:

- Engineering Notebook
- CAD model
- 3D printed model
- Outline of an Engineering Report that includes 3D images and working drawing
- Presentation of the development process

Daily Plan:

Day 1

Key Question: What are the expectations of the project?

Introduce students to the project by providing them with the Essential Question and the scenario.

Review and discuss with your students the design process, Engineering Notebook and design documentation requirements. Discuss the problem statement, design brief, testing protocol and management plan. Review the elements of a good engineering report with the students. These were all covered in the first project titled *Introduction to the Engineering Design Process* but should be reinforced on a regular basis. All projects depend on the design process and student activities should relate directly.

Have the students form teams of two. Allow the students five minutes to discuss the problem. Students begin by brainstorming ideas in their Engineering Notebooks. The teacher will provide a list of vocabulary terms that students will need to research on their own. The teams can divide the list of terms among

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team members and share their definitions. All team members are responsible to know all definitions.

Day 2-4
Key Question: How do we get started in the design process?

The teacher should specify that the teams will be responsible for researching the characteristics and specifications of the kitchen tool. The client should specify the characteristics of the tool. The tool should be easy to use and an improvement over what can be purchased today.

NOTE: The teacher will decide how the “client” and the client’s needs for the project are to be represented.

Student teams should spend some time interviewing the client to establish the desired characteristics. Students begin sketching in the Engineering Notebook.

The teacher reminds students about the help system to find out how the software accomplishes basic features they might want to incorporate. https://docs.sw.siemens.com/en-US/doc/246738425/PL20220830878154140.user_interface/xid1816059. Students can enter terms to view a tutorial for creating certain features. Students can reference specific terms from the vocabulary list for specific commands to be used in the design of the kitchen tool. Students can use their account to sign into the dashboard https://learn.sw.siemens.com/dashboard. The dashboard will provide access to video resources for Solid Edge. Other tutorials, in the Activities section, are available for use if students struggle.

Student teams research the types of kitchen tools available and basic ergonomics. Student teams discuss the specifications of the tool. Students list the criteria and constraints of the problem they are solving. Teams research the existing kitchen tools and discover information about ergonomics. The teams will use formulas to calculate data needed based on the shape of the tool. Students should be refining their sketches in the Engineering Notebook.

Remind students to record research notes and sources as well as reflections on the day in the Engineering Notebook.

Day 5-7
Key Question: How do we get started on our individual designs?

Student teams finish creating their isometric sketches and create a design brief to include with their sketch. They then meet with the client who will need to sign off on the design proposal before beginning the solid model. Once the design has been verified, and permission given, students begin modeling with the software

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to convey their ideas. Students can reference Basic 3D Commands and Creating Drawing Views for specific commands to use in the kitchen tool design.

Day 8-9
Key Question: How can we model efficiently?

Teams discuss their tool and how to achieve the design given the approved sketch they presented. They work together to design the tool and divide the work of creating the 3D solid model of the pieces they are responsible for. They utilize the division of work in the creation of their project management plan.

Teams are reminded to continually check their solid models for accuracy to ensure the correct sizes are created.

Students can review tutorials as necessary. Students record sketches and reflections in the Engineering Notebook. Once the students feel they have a kitchen tool solution that meets the requirements, they should consider practical enhancements.

Day 10
Key Question: How can we finalize our designs?

The teacher should review the design process with the class and check with teams to see where they are in the design process along with any known or perceived problems with kitchen tool designs encountered.

Students will finish modeling using the software and tutorials as necessary.

Day 11
Key Question: How does one plan and deliver a presentation to the class?

The teacher will discuss with the students how to optimally present their ideas to the class. Students should also be prepared to justify any design enhancements incorporated into the kitchen tool. Students will continue to refine the model using the Solid Edge. Students will use the 3D printer to prepare samples of the kitchen tool. Teams finalize their designs.

Students discuss the items needed in their presentation to their clients. The team decides on the types of graphics to include. Students should prepare an Engineering Report about the process of designing the kitchen tool. They should be required to write the introduction, provide results including graphics, a conclusion and include the acknowledgement sections reporting the source of the information. The rest of the report can be in outline format.

Day 12
Key Question: How do we convey our ideas?

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Students can present their solutions to the class one at a time. In the end, all students can reflect on their work by giving and receiving feedback on how they could possibly improve their designs.

Vocabulary:

Chamfer
Constraints
Conversion
Cut
Ergonomics
Extrusion
Feature Tree
Fillet
Hole
Intellisketch
Join
Keypoints
Loft
Mirror
Nest
Offset
Pattern
Reference Plane
Revolve
Round
Sketch Lock
Sweep
Thin Wall
Trim
Volume

Resources:

Search terms
Kitchen tools:

- Kitchen gadgets
- Cooking utensils
- Kitchen accessories
- Culinary tools
- Kitchenware
- Cooking equipment
- Kitchen appliances
- Cooking implements
- Food preparation tools

Volume Formulas:

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- Volume calculator
- Volume conversion
- Conversion factor
- Conversion table

Converting Cubic Inches to Fluid Ounces
- cubic-inches-to-us-ounces
- cubic-millimeters-to-liters

Engineering Notebook:
- Engineering Notebook Definition
- What is an Engineering Notebook?
- Importance of Engineering Notebooks
- Engineering Notebook Best Practices
- Keeping an Engineering Notebook
- Engineering Notebook Guidelines

Engineering Reports
- Purdue OWL Engineering Reports
- Engineering Report Writing Guidelines
- Writing Technical Reports in Engineering
- Purdue OWL Writing in Engineering
- Engineering Report Structure
- Tips for Writing Engineering Reports

Engineering and Technical Writing
- Technical Writing Standards
- Engineering Writing Resources
- Writing Guides for Engineers
- Technical Communication Standards
- Writing Resources for Engineering Students
- USU EWC Technical Writing
- Technical Writing and Presentation
- Engineering Communication Guidelines
- Technical Writing PDF
- Engineering Presentation Skills
- Writing Technical Reports

Engineering Sketching:
- Isometric Sketching
- Orthographic Sketching
- Technical Drawing Techniques
- Orthographic techniques
- Isometric Drawing Tutorial

Department of Labor:
- Mynextmove
- Bureau of Labor Statistics

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- Employment Trends
- Wage Data
- Labor Market Information
- Occupational Outlook
- Industry Statistics
- Labor Force Participation

Help Systems

This help system can be used to get general background information, find This help system can be used to get general background information, find tutorials about individual topics, and to find out how the software accomplishes basic features. Students can search for design elements they might want to incorporate Information about Solid Edge is available from https://docs.sw.siemens.com/en-US/product/246738425/doc/PL20220830878154140.user_interface/html/xid1816059.

Tutorials

Tutorials can be found in the Activities section are available for use by students. The teacher can help students identify the section of the tutorials dealing with the needed topics.

Siemens Learning Center

There is a huge collection of video tutorials found in libraries on Solid Edge for Education and Community website. To gain access to the resources students and teachers must register at the Siemens Learning Center. The link to instructions for creating your account is https://drive.google.com/file/d/1UHKPrmYf3rncbjHQS9LXPzC3zvUStOno/view?usp=sharing. Use your account to sign into the dashboard https://learn.sw.siemens.com/dashboard. The dashboard will provide access to video resources for Solid Edge.

Email Support

There is email support for the use of the software. If you are unable to discover what you are looking for contact solid-edge-edu-support.sisw@siemens.com.

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