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| **TEXAS CTE LESSON PLAN**[www.txcte.org](http://www.txcte.org) |
| **Lesson Identification and TEKS Addressed** |
| **Career Cluster** | Science, Technology, Engineering & Mathematics |
| **Course Name** | Engineering Design and Presentation II |
| **Lesson/Unit Title** | C-Clamp Parametric Modeling Skill Builder |
| **TEKS Student Expectations** | **130.411. (c) Knowledge and skills**(8) The student applies concepts of engineering to specific problems. The student is expected to: (B) use tools, laboratory equipment, and precision measuring instruments to develop prototypes; (D) use multiple software applications for concept presentations.(10) The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:(A) identify and describe the steps needed to produce a prototype; (B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and (C) present the prototype using a variety of media |
| **Basic Direct Teach Lesson**(Includes Special Education Modifications/Accommodations and one English Language Proficiency Standards (ELPS) Strategy) |
| **Instructional Objectives** | The student will be able to:* Create the five parts required to specifications given
* Assemble the five parts correctly
* Create exploded view of the five-parts assembly
* Place the exploded view into the 11 in. X 17 in. layout; use balloons and parts list to explain the exploded views
* Place the assembled view into the 11 in. X 17 in. layout
* Place each of the parts into the 11 in. X 17 in. layout and annotate correctly
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| **Rationale** | A CAD designer should be able to use CAD software to design engineered components. Students will be able to create the five parts of the C-Clamp, assemble them, create an exploded assembly, place them into an 11 in. X 17 in. layout, and annotate. |
| **Duration of Lesson** | This lesson should take 45 minutes lecture, 450-minute laboratory.  |
| **Word Wall/Key Vocabulary***(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * **Parts**- what makes up the object/project
* **Planes**- X, Y, and Z that you can select to create a sketch on
* **Assembly**- when all the parts are put together to create the object/problem
* **Exploded view**- when all of the parts have been assembled and then “tweaked” so that they are separated for the annotation process
* **Annotation**- dimensions of the parts
* **Parts list-** a table that explains what all the parts are and/or materials used
* **Balloon**- a type of annotation that identifies parts given in the parts list
* **Layout**- the title block or paper that you place everything into, so that you can then print it for the customer
* **Sketch**- the surface or plane area that you can draw your part on
* **Extrusion**- when you make a sketch have mass or take away/cut a part of the mass
* **Fillet**- a rounded edge
* **Chamfer**- a straight edge
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| **Materials/Specialized Equipment Needed** | * Computer with parametric modeling software issued by school district
* Paper or electronic copy of the C-Clamp Parametric Modeling Skill Builder Rubric
* Layout Page 1, Layout Page 2, and Layout Page 3
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| **Anticipatory Set**(May include pre-assessment for prior knowledge) | * Due to the levels of difficulty of the Parametric Modeling Skill Builder lessons, it is recommended they are presented in the following order:

1. Wood Clamp2. Stop Clamp3. C-Clamp4. Pipe5. Crazy for Reading Straw* Provide paper or electronic copy of the rubric and finished example drawings available for students
* Review how to create sketches on planes (X, Y, and Z)
* Review how to make extrusions
* Review how to change material types and colors
* Review how to create assemblies
* Review how to create exploded views
* Review how to place views into multiple sheets
* Review how to annotate
* Students may work together in a team of two to create the parts
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| **Direct Instruction \*** | Outline | Instructor Notes |
| I. Introduction to a C-Clamp and its partsA. C-Clamp baseB. Protection padC. Shaft screwD. Screw swivelE. Tension barII. Review how to make partsA. PlanesB. SketchC. ExtrusionsD. Materials and colorIII. Review how to make assemblyA. Place partsB. Move/rotate partsC. Constrain partsIV. Review how to make exploded viewsA. Place the assemblyB. Tweak or move out the partsV. Review how to place the exploded view into the layoutA. Place the exploded viewB. Parts listC. BalloonsVI. Review how to place views and annotate them in the layoutA. Place the partsB. Annotate themVII. Students create their own C-ClampVIII. Assessment | It is recommended to make a PowerPoint presentation in conjunction with the lesson outline.* Show the students the completed example of what their C-Clamp should end up looking like.
* Have students start to create their own C-Clamp. Grade using the C-Clamp Parametric Modeling Skill Builder Rubric.
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| **Guided Practice \*** | The teacher will show students how to make one part of the five parts, assemble, exploded view, and create the layout per the example and rubric. |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | The students will create the five parts, assemble, exploded view, and create the layout per the example and rubric. |
| **Lesson Closure** | The students will be able to use these skills in the next more complicated skill builder problems, without the teacher needing to show them how to do each step. |
| **Summative/End of Lesson Assessment \***  | **Informal Assessment:*** The teacher will observe students working on the *C-Clamp*.

**Formal Assessment:*** Students will be graded using the *C-Clamp Parametric Modeling Skill Builder Rubric.*
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| **References/Resources/****Teacher Preparation** | * *Layout Page 1*, *Layout Page 2*, and *Layout Page 3* provided with lesson
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| **Additional Required Components** |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy****Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies****Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication****90 Second Speech Topics** |  |
| **Other Essential Lesson Components** |
| **Enrichment Activity**(e.g., homework assignment) | Students will be allowed to come up with their own *C-Clamp* design if they finish early, or start the next skill builder problem. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSATechnology Student Association |
| **Service Learning Projects** |  |
| **Lesson Notes** | The purpose of this lesson is to help students build their 3D/parametric modeling skills. When the skill builder problems are completed, students will begin their own designs and prototypes. However, to get to this stage, they must know how to do the building steps.**Days 1-3**Show: The completed layout of the C-ClampSay: This is what you will be working on over the next week to two weeks.Ask: How many parts does this problem have? o Answer: fiveAsk: How would you start to create this problem?Answer: create a folder for the project; create the five parts and save to this folder; create assembly; create exploded view; place all views and annotate to match the example/rubric.Ask: What are these measurements given in? English standard or Metric?Answer: MetricShow: How to start drawing by modeling the Shaft ScrewAllow students two to three days to model all of the parts**Day 4**Show: How to change the parts materials and/or colorsAllow students one day to change the materials and/or colors**Days 5-6**Show: How to start assembling the partsAllow students one to two days to assemble all of the parts**Days 6-7**Show: How to explode the assemblyAllow students one to two days to explode the assembly**Days 7-8**Show: How to place the exploded views into the layout; how to create the parts list, and how to use the balloonsAllow students one to two days to do this**Days 9-10**Show: How to place all the views into the layout and annotate them o Allow students two to three days to do this |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)