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| UBD  Dave Maimone and Carl Peitz  While there are a few learner-centered principles embedded in the original lesson, it really wasn’t suitable as a true learner-centered lesson. First, there was very little choice in terms of how content was represented. Students were only given an article for Edison to read. In addition, while there was a weak attempt at giving choice in how to document the engineering journal, the choices were outdated and not very engaging to students. This lesson had no self-assessment. Because of this there was no responsibility on the student to take ownership of their learning. Most everything was teacher directed. No part of the lesson attempted to make a relevant connection to the students’ lives. In terms of challenge, we did think the original lesson was challenging. The process of designing an engineering journal and documenting the engineering process seemed to be very rigorous. The problem here is that if the content is too rigorous without the students being engaged, the students will shut down. In addition while there was a group aspect to the original lesson, we felt that it could be expanded to increase cooperation in other aspects such as the assessment piece. | | | | | | | |
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| **Stage 1 - Desired Outcome** | | | | | | | |
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| **Established Goals:** | |  |  |  |  |  | **G** |
| * STL 11-Students will develop abilities to apply the design process. * STL 12-Students will develop abilities to use and maintain technological products and systems. | | | | | | | |
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| **Understandings:** | |  | **U** | **Essential Questions:** | | | **Q** |
| *Students will understand that…*   * *Documentation of the Engineering Design Process is essential so that the solution can be communicated to the intended audience.* | | |  | * Why is important to document your design process? * Why is it important to effectively communicate through writing? * What are different ways that you can use to protect your work? | | | |
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| *Students will know . . .* | | | **K** | *Students will be able to* | | | **S** |
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| * Cite examples for a short story * Communicate their observations, processes, and results of the design process. * Use appropriate verbal, graphic, quantitative, virtual, and written means to communicate final solution. * Present their design process using appropriate oral and written techniques. * Use the final solution to build a three-dimensional object. | | | | | | | |
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| **Stage 2 - Assessment Evidence** | | | | | | | |
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| **Performance Tasks:** | |  | **T** | **Other Evidence:** | | | **OE** |
| These activities will be completed to demonstrate understanding:  Student will answer questions on article and be graded for accuracy.  Students will complete their outline for their own engineering design journal which will be assessed from a rubric.  Teacher will lead questioning throughout PowerPoint lecture.  Students will answers high level questions from teacher and bounce ideas and comments off of each other.  Students will asses themselves and others after completing robotic arm design project.  Through what authentic performance tasks will students demonstrate the desired understandings? | | | | How will students reflect upon on self-assess their learning? | | | |
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| **Stage 3 - Learning Plan** | | | | | | | |
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| **Learning Activities:** | |  |  |  |  |  | **L** |
| What learning experiences and instruction will enable students to achieve the desired results?  To students achieve the desired objectives that the teacher tends to reach students will:  Engagement  Students will read the story about Thomas Edison from the Franklin Institute (File 2.6.1).  As students read the article, they will address the following questions:  1. Why is it important to document your work?  2. What would have happened if Edison had not properly recorded the various filament  tests?  Students will cite examples from the Edison story. The teacher will lead a discussion based  on student responses.   * Give students choice on how to get the information in the Edison article. They could read it, listen to it, or maybe watch a short video on the same topic. * Afterward have the students work in partners or small groups to discuss and answer the questions in this section. * Additional assignment (The students can each be broken into small groups and given a section to be a expert in and present the information how they would like to the class. Then each student would answer the two questions individually )   Exploration  Students will develop the outline for an electronic engineering journal (File 2.6.2) using  Google Docs, a Wiki, or a blog. The electronic engineering journal should reflect all of the components in a typical Engineering Design Journal or folio, including the following sections:  Name, Title, Class Period  Define the Problem  Brainstorm Possible Solutions  Research Ideas and Explore Possibilities (with citations)  Specify Constraints and Identify Criteria  Consider Alternative Solutions  Select An Approach  Develop a Written Design Proposal, including Sketches of the Final Design  Make Model/Prototype  Test and Evaluate  Refine/Improve  Create/Make Product  Communicate Results  Teacher Note: Students will be required to input information from the extension activity into the electronic engineering journal. This lesson requires the students to develop an electronic engineering design journal. This has been successfully completed using Google Docs, a Wiki, or a blog. Many of those resources are available online, at no cost. If teachers are not familiar with those technologies, they can have students complete the Engineering Design Folio electronically and save the document as a webpage. Students should insert pictures, video, etc., to demonstrate the engineering design process electronically. The webpage can then be posted to a class website or on the school intranet.   * Give students choice how they want to organize their engineering journal (online or hardcopy, how the sections are organized, and how the data will be recorded). Let the students choose their own format. This will give them choice and will allow them to organize the information in a way that makes sense to them. * Additional activity- The teacher uses a class discussion where students will make the choices of how and where to create a class engineering journal. Majority rules in this activity and each person will have the same digital journal to add to for the robot arm. This way leads students to discuss and compromise the problem at hand and have a universal journal more than personalized.   **Explanation**  The students take notes in their EDJs on the content delivered by the teacher and actively participate throughout the presentation. The teacher, involving students in the following discussions as they contribute their experiences from the Engagement and Exploration activities along with any prior knowledge they may have about the subject, will deliver a presentation on the importance of documenting the Engineering Design Process so that the solution can be communicated to the intended audience (Presentation 2.6.1): The Engineering Design Process can be recorded physically in an Engineering Design Journal or electronically. Either format should include the day-to-day activities and major accomplishments throughout the Engineering Design Process. Engineers and designers communicate their process and solutions to problems to many different audiences, such as clients, manufacturing companies, government agencies, and marketing companies. The purpose of the communication involves the reflection on the process, to gather ideas and feedback from others, to communicate successes and failures during the design process, and to communicate the final design to the target market. To communicate effectively to each stakeholder group, engineers and designers must utilize effective communication skills and incorporate different presentation formats depending on the purpose and audience for the presentation. Review the basics of a good presentation.   * Another way to give students choice is to allow them to choose the format in which they’d like to communicate their design process. For example, it can be a written plan, maybe a PowerPoint, could be done orally or in a podcast, or any other format the student chooses. Again, giving students the choice makes the lesson more student centered.   **Extension**  The teacher will present the Robotic Stacker Design Brief (File 2.6.3). Students, working in groups of two, will develop a hydraulic robot to assemble a cube tower in the shortest amount of time. As students work through the Engineering Design Process, they will record notes in their previously developed electronic engineering journal. In the electronic journal, students should post pictures and video of the process and their solution. The electronic journal should reflect the entire Engineering Design Process and allow a viewer to interact with the student group. Through the electronic journal, the teacher may choose to provide comments as students work through the Engineering Design Process.  Teacher Note: The teacher may also choose to have students use technology that is available in the classroom such as the tools that were used to create a student website in Unit 1, Lesson 2. Many teachers employ the electronic engineering journal throughout the remainder of the class (in addition to the EDJ) as a way to demonstrate student work in the Foundations of Technology course.   * Students in groups of two will develop a hydraulic robot arm to assemble a cube in the shortest amount of time. They will record all information in their created journal. After a few sections students should exchange with another group to check to make sure they are completing the journal work properly if they are both lost consult a teacher on the topic. Students will then submit their findings after they test their robot arm.   **Evaluation**  Student knowledge, skills, and attitudes are assessed using the multiple choice or brief  constructed response items and performance rubrics for class participation, discussion, and  design briefs. The rubrics are presented in advance of the activities to familiarize  students with the expectations and performance criteria. They are also reviewed  during the activities to guide students in the completion of assignments. The  teacher may wish to develop a collection of annotated exemplars of student work based on  the rubrics. The exemplars will serve as benchmarks for future assessments and may be  used to familiarize students with the criteria for assessment.   * Students could self-assess or assess their partner using the rubric. This can be used as a formative assessment to help improve their design and their project. Giving students some control over how they are evaluated may increase the learner-centeredness of this section. Students will evaluate themselves, partners, and the teacher will have some say in the final grade. Using a rubric would be efficient here. | | | | | | | |
| W = Help the students know Where the unit is going and What is expected? Help the teacher know Where the students are coming from (prior knowledge, interests)? | | | | | | | |
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| H = Hook all students, and Hold their interest? | | | | |  |  |  |
| E = Equip students, help them Experience the key ideas and Explore the issue? | | | | | | | |
| R = Provide opportunities to Rethink and Revise their understandings and work? | | | | | | | |
| E = Allow students to Evaluate their work and its implications? | | | | | |  |  |
| T = be Tailored (personalized) to the different needs, interests, and abilities of learners? | | | | | | | |
| O = Be Organized to maximize initial and sustained engagement as well as effective learning? | | | | | | | |
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How the lesson was modified to be more learner-centered.

When looking at this lesson, we began by examining the non-negotiables and looking for ways to incorporate them into the lesson to make it more learner-centered. We gave a lot of opportunities for choice and control. For example, instead of reading an article on Edison, the students have the choice to still read the article or they can watch a short video on the topic. Another example of choice and control in the lesson is with the engineering journal. We allowed choice in how students format the journal. Giving students both digital and paper and pencil options increases choice. We added responsibility by incorporating a self-assessment in which students assess themselves and other students. Students have to take responsibility to clearly understand the learning goals of the lesson. To increase relevance, we updated the technology options. The original lesson called for a wiki or Google Doc. Students are able to use any technology that they would like for this part of the lesson. We thought the idea of challenge was already imbedded in the lesson with documenting the engineering process. Connection was already in the lesson with the lesson activities and content directly related to the Big Idea. Competence occurs with the assessment piece. Students will self-assess but will also be held responsible for those learning goal when they assess others. The teacher, in this, can also judge competence through the final product and also monitoring the documentation of the engineering process. There were a lot of opportunities for cooperation in the revised lesson. We increased the times where students can work with partners or in groups. In addition, students have the opportunity to work with groups other than their own. We increased the opportunities for evaluation all through the lesson. For example, students are able to evaluate through the reflection activity and with the self- and peer-assessments. In addition, the teacher can evaluate the process through the engineering journal and the final project.