Pennsylvania College of Technology
A Penn State Affiliate

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Manufacturing Externship – Application in the Home School Acknowledgement*

1. Educator Name: Mark Easterday
2. School District and School: West Perry Senior High School
3. Date(s) of Manufacturing Unit: October 12-22, 2021
4. Length of lesson or unit: About 2 weeks with formative assessments and group revision
5. Number of students: 100
6. Grade level of students: 11

Description of Activity:

1. Students examine European landmarks and use manufacturing terms to draw conclusions about building methods.
2. Students identify patterns in landmarks, classify shapes, and predict geometry nets to recreate the landmark.
3. Students design and construct models of those landmarks in class.
4. Students make observations and critique their own work.
5. Students use the attached worksheets to apprise teamwork and assess construction methods used.

What elements from your Manufacturing Externship were used in the preparation or delivery of the unit? (i.e. mini mill, PPTs provided, information gathered from discussions or tours, etc.)

1. The Dr. Welch Workshop. It was a makerspace dedicated for students to learn hands-on, listen to each other, and collaborate. More schools should look like this. In this lesson, I try to mirror that approach by giving students the materials and time to explore a variety of construction ideas without judgement. It's a combination of math, history, and art.
2. Computer Aided Design. The idea of having students identify patterns in European landmarks into basic shapes is a concept I learned from the PCT computer lab. In my classroom, I have art supplies to emulate that computer process. Instead of free drawing a shape, it makes more sense to stop, think about the overall product design, and break it down into a series of geometric shapes to work on separately. By using geometry nets, students apply math concepts to save time and create a more uniform project.
3. Vocabulary building. Throughout the lesson, I emphasized manufacturing terms like additive, reductive, and joining. I wanted students to examine the landmark, think about the materials available in the time period, and distinguish changes in construction methods.
4. CNC 3018-PRO and Easel online software. Available to students with an educators account. Only one student used it for their project. An excellent tool for discussions in class and to demonstrate reductive manufacturing.
5. Collect and Display. During an on-campus PCT tour we were shown a production assembly line that is torn down and rebuilt with directions written by students. I wanted to emulate that experience by having students write before, during, and after their

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construction process what they were doing and how someone else may go about reconstructing it.

How were students engaged with the unit? What hands-on activities occurred?

1. All students were engaged in the unit. It was taught to 5 classes that varied in academic achievement and age.
2. Students began to delegate tasks, but collaborated frequently when the various worksheets re-directed them.
3. Hands-on activities involved the geometry nets and the construction of the European landmarks

Explain connections that were created/discussed between manufacturing careers and higher education.

1. In class discussions, we inferred materials and how these landmarks were constructed.
2. In small groups, we identified methods that were used as additive, reductive, or joining.
3. In one class discussion, we speculated about how these landmarks would be built today (including materials and methods)
4. Before one lesson, I explained the skills gap we see in our own state; and how manufacturing jobs are in demand and attainable.
5. For students who wanted to learn more, I told them about the opportunities I saw at Lycoming Engines and through the Pennsylvania College of Technology. Students were also directed to our guidance office provided materials on higher education in our area.

How did students respond to the unit?

1. It was a success, and probably the most memorable project of the year.
2. Some groups were frustrated, but really seemed to embrace the core concept of a makerspace: it's about collaboration and tinkering.
3. In general, students did not like the "time-out" parts of the lesson when we would stop building and complete a worksheet about what we were doing. I find it to be a necessary step, to keep students focused and provide evidence of formative assessment. But, in reflection, a class discussion would have sufficed.

Were parents involved or aware of the unit? What was their response to the activities?

1. Students were required to leave their projects in class. That way, they could not work ahead or allow one person to do all of the work.
2. Some materials were brought-in from home. A requirement was to make/manufacture all parts – through additive, reductive, or joining – and not to use retail available modeling materials. Students commented that some materials were bought by parents in support of the project.
3. One project was displayed for scheduling night and will be kept for next year's parent-teacher night.

A goal of this program is to make advanced manufacturing education and information available to high school students. As such, Penn College is attempting to build a repository of activities that can be used across the K-12 environment. In the subsequent pages, please provide additional information on the lesson/units you implemented so that others can implement similar activities in their classrooms. Please be sure to include any material lists, photos/evidence of student work (not of student participants), and any other relevant information required to implement in another school.

*By submitting this form, you acknowledge all information is accurate and correct to the best of your knowledge and you agree to the sharing of this information via publicly accessible websites.