Externship Lesson Plan for High School Intro to CAD class

Students are grades 9-12 with little or no experience with computers, CAD, construction, or reading plans. This is an introductory lesson that does not require student computer use and gets students familiar with plan reading, common Architecture, Engineering, and Construction terminology and abbreviations. This is a planned as a 2 or 3 day lesson (50 minute periods).

# KEY CONCEPT(S):

To introduce beginning CAD students to reading and understanding how building plans are organized.

To extract information from a set of building plans and use that information to create cost estimates.

**Standard(s):** AC06.01.01 - Interpret drawings used in project planning.

# OBJECTIVES:

* Students will be able to read and interpret a set of simple building plans.
* Students will be able to extract information from the building plans and use that information to perform surface area and volume calculations and unit conversions.
* Students will be able to use surface are and volume calculations to generate a cost estimate of building supplies.

# PROFESSIONAL SKILLS & KNOWLEDGE:

* None required

# ACADEMIC KNOWLEDGE & SKILLS:

* How to calculate surface area and volume of prisms
* Unit conversions (ft to inches, ft3 to yd3, etc.)

# INTEGRATION POSSIBILITIES / PROJECT-BASED LEARNING OPPORTUNITIES:

This could be combined with a woods or construction class

This could be part of work with an architectural or construction company to compare student estimates with the actual cost estimates and final project costs.

# RESOURCES/MATERIALS NEEDED:

* Set of simple building plans that include a cover sheet, foundation plan, floor plan(s), elevations and section drawings, and typical wall details. Drawings printed to scale are preferred. At least 2 sets per group.
* Architects scale – 2 per group
* Calculators – 1 or 2 per group
* Scavenger hunt form
* Cost Estimating Form – one per student

# MOTIVATIONAL OPENER:

* <https://youtu.be/U_s3hlwV9pc> - This video is a news report of cost overruns at the Bay Bridge in San Francisco. One interviewee compares the bridge project to a home renovation stating that ‘if you came in one day with an estimated cost, then came back the next day and said it would be double, I’d fire you.’ (3 minutes)

# LEARNING ACTIVITIES:

**Day 1**

* Have students divide into teams or 3-4. They can be pre-select them or have students self-select. (3-5 minutes)
* Have teams read through the set of drawings to see what they notice. Teacher should circulate amongst the groups listening to their discussions and asking guiding questions if group discussions are lagging. (What is this going to be? How tall is it? What’s it made of?) (5 minutes)
* Whole class discussion. Have groups tell something they noticed and where they saw it. (5 minutes)
* Describe the activity and the building. Go through each drawing in the plan point out key features of the set (information of the cover sheet, plans start at the foundation work up through each floor to the roof. Elevations and section drawings and symbols. (15 minutes)
* Have students work together in teams to complete the scavenger hunt form, which asks students for specific pieces of information found on various sheets of the drawing set (What is the overall height of the building from the ground? If you walk out the main entrance of the building, which direction would you be facing? How many windows/doors are in the building? What’s the thickness of the concrete floor slab? etc.) This could be a competition or a timed challenge with rewards for finding the most things or first to find them all. It could also be a homework assignment if you have enough plan sets for students to take home. (End of lesson day 1)

**Day 2**

* Review the scavenger hunt activity having students tell specifically where they found each piece of information. (5-10 minutes)
* Review team roles and have students reflect on how effective their groups were. (Name one thing your group did well and one thing you think your group could have done better. What could *you* have done to help your team be more effective?) (15 minutes)
* Tell students they are to create a cost estimate for some aspect(s) of this building project (How much concrete should be ordered? How much paint for the inside/outside of the building? How many packages of roofing shingles, etc.). Provide students with basic costs such as how many sq ft a gallon of paint will cover, cost per cubic yard of concrete, etc.). Each team must prepare a cost estimate and submit it by a certain time/date. Reinforce the ideas of effective team work to achieve the goal. (End of Day 2)

# ASSESSMENT / CULMINATING PROJECT / EVALUATION:

Day 3

* Have students complete their cost estimate to you by the designated time (late bids are not accepted).
* Display/share cost estimates from each group. Have them see how close they were to each other. (10 minutes)

# HOMEWORK:

* See learning activities above.

# CLOSURE:

* Show the estimate you prepared compare your estimate with theirs. Give them the opportunity to ask questions and/or challenge your costs. The team(s) closest to your estimate gets a reward.
* Have students fill out a reflection worksheet where they can evaluate their overall group performance, their own personal performance, what they did well, what they would do differently, and rate the contribution of their other group members.

# LESSON PLAN REFLECTION:

This is based on the activity done by P&C Construction and adapted to an Introductory CAD class with little to no construction or CAD experience. I have used this lesson and am impressed with how involved the students are. Doing this activity at the beginning of the term gives students an introduction to plan reading and helps them review their middle school geometry skills.