ENGINEERING DRAWING · MODULE 3: 3-VIEW DRAWING

Planning Guide

Duration: ~1 Week (5 Class Periods) | Grades 6–8

Georgia Tech · STEM Innovation & Design

Activity Overview and Pacing

Activity	Name	Day	Time	Essential Question
1	Introducing 3-View Drawing	Day 1	~45 min	How can we show all sides of a 3D object using 2D drawings?
2	Changes of Plane — Shading	Day 2	~45 min	How do we show a step or ledge in a flat drawing?
3	Practice Problems	Days 3–4	~1.5–2 days	How do we apply engineering notation to more complex structures?
4	Draw and Build Challenge	Day 5	~45 min	How do we go from 3D to 2D — and back to 3D?

Activity Descriptions and Materials

Activity 1 — Introducing 3-View Drawing | Day 1 | ~45 min

Essential Question: *How can we show all sides of a 3D object using 2D drawings?*

Building on the Module 1 discovery that one angle is never enough, students meet the engineering solution: a 3-view drawing that shows an object from the Top, Front, and Right at once, arranged in an 'L' on the page and drawn to scale. Students draw the three views of a single cube and then a two-cube structure, with kinesthetic teacher modeling of each viewpoint.

Materials:

- Large (4") demonstration cubes — 2, with faces labeled
- Small (1") wooden cubes for each student
- Graph paper and small rulers
- Student journals

Activity 2 — Changes of Plane — Shading | Day 2 | ~45 min

Essential Question: *How do we show a step or ledge in a flat drawing?*

Students work with a structure whose top surfaces sit on different levels, discovering the problem of representing a change of plane. Shading is introduced as a stepping stone — darker means closer — before the two rules of engineering notation: a solid line for a visible change of plane, a dashed (hidden) line for one behind the object, and no line at all between coplanar faces.

Materials:

- Small (1") wooden cubes — 3 per student
- Graph paper
- Pencils for shading
- Student journals

Activity 3 — Practice Problems | Days 3–4 | ~1.5–2 days

Essential Question: *How do we apply engineering notation to more complex structures?*

Students deepen fluency through a differentiated sequence from simple to complex, first practicing the Back, Left, and Bottom views, then tackling a 7-cube challenge (an incomplete 2×2×2 cube) in full engineering notation. Optional flash cards let students build a structure and self-check the 3-view solution, advancing at their own pace.

Materials:

- Wooden cubes — up to 7–8 per student
- Graph paper and pencils
- Flash cards (green / yellow / red for differentiation, optional)
- Student journals

Activity 4 — Draw and Build Challenge | Day 5 | ~45 min

Essential Question: *How do we go from 3D to 2D — and back to 3D?*

Students apply the full convention: build an eight-cube structure with a change of plane, draw it in engineering 3-view notation, then hand only the drawing to a partner who tries to rebuild it. Comparing the rebuild to the original tests whether the drawing communicated completely and closes with a reflection on why engineers need a shared drawing language.

Materials:

- Wooden cubes — 8 per student
- Graph paper and pencils
- Student journals

Standards Alignment

This module was designed to support the Next Generation Science Standards (NGSS) Engineering Design performance expectations and Science & Engineering Practices, the Georgia Standards of Excellence, and the Common Core State Standards for Mathematics. The tables below summarize the strongest alignment points and where they show up in the module.

NGSS Engineering Design Performance Expectations

Standard	Description	Where It Shows Up	Classroom Connection
MS-ETS1-1	*Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.*	*Activities 1–4*	*Students apply the constraint that an engineering drawing must be complete and unambiguous — sufficient for another person to reconstruct the original structure without further guidance.*
MS-ETS1-2	*Evaluate competing design solutions using a systematic process.*	*Activity 4*	*Students evaluate whether their 3-view drawing met the communication requirement when a partner rebuilds from it.*
MS-ETS1-3	*Analyze data from tests to determine similarities and differences among design solutions.*	*Activity 4*	*Students compare a partner's rebuild against the original to identify where drawing information was unclear.*
MS-ETS1-4	*Develop a model to generate data for iterative testing and modification.*	*Activity 4*	*Students test their drawing by having a partner attempt reconstruction, then refine based on the result.*

Science and Engineering Practices & Crosscutting Concepts

Learning Dimension	Where It Shows Up	Classroom Connection
SEP: Constructing Explanations and Designing Solutions	*Activities 1–4*	*Students learn and apply 3-view conventions as a structured solution to communicating 3D designs in 2D, moving from shading to formal notation.*
DCI: MS-ETS1-1 & MS-ETS1-4	*Activity 4*	*Students test that a drawing carries sufficient information for reconstruction — a solution tested and refined on the basis of results.*
CCC: Patterns	*Activities 2–3*	*Solid and dashed lines are a systematic pattern that lets any trained reader reconstruct a 3D object from a 2D drawing.*

Aligned Content Standards

Standard	Details
Georgia Standards of Excellence	*Grade 6: EET-1, EET-7 | Grade 7: II-3, II-7 | Grade 8: TS-2, TS-7*
NGSS — MS-ETS1: Engineering Design	*Performance Expectations MS-ETS1-1 through MS-ETS1-4 (see table above).*

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