Lesson 1 - Overview of Technical Drawing

Course: Mechanical Computer Aided Drawing

Grade: 10-12

STL Standards

Standard 12- Students will develop the abilities to use and maintain technological products and systems

Benchmark N- Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.

Benchmark P- Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information to communicate.

Standard 17- Students will develop an understanding of and be able to select and use information and communication technologies.

Benchmark Q- Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.

NGS Standards

HS-ETS1-4.- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Learning Objectives

1. Learners will be able to identify 4 different pieces of information on a technical drawing
2. Learners will be able to explain 2 reasons for creating technical drawings

3. Learners will be able to model parts in Autodesk Inventor by reading technical drawings

Vocabulary

• Technical drawing
• Orthographic projection
• Title Block
• Dimension
• Annotation

Procedure

1. Anticipatory Set
   a. Example of a car having 30,000 parts
   b. Mention that each part must go through the design process
   c. Point out that for each part there must be a CAD model and technical drawings

2. Summarize learning objectives in the form of essential questions

3. Recall prerequisite knowledge on technical drawings
4. Discuss the reasons for technical drawings
5. Discuss the reasons for 3D models
6. Show Example Technical Drawing 1
   a. Point out the different orthographic projections
   b. Point out the dimensions
   c. Point out the annotations
   d. Point out the title block information
7. Show Example Technical Drawing 2
   a. Point out the different orthographic projections
   b. Discuss the reason for only needing 2 orthographic projections vs 3
   c. Point out the dimensions
   d. Point out the annotations
   e. Point out the title block information
8. Work time for Inventor Parts 1-4
9. Recall learning objectives by asking students to answer the essential questions
10. Progress check on Inventor Parts 1-4

**Assessment**

*Informal:* Check for understanding throughout direct instruction by questioning, probing, and asking if learners need clarification

*Formal:* Technical Drawings for Parts 1-4, Unit Quiz

**Resources/Materials**

- Example Technical Drawing 1
- Example Technical Drawing 2
- Computer with Autodesk Inventor
- Inventor Parts 1-4 Technical Drawings
Lesson 2 - Dimensioning

Course: Mechanical Computer Aided Drawing

Grade: 10-12

STL Standards

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  Benchmark P- Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information to communicate.

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  Benchmark Q- Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.

NGS Standards

HS-ETS1-4.- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Learning Objectives

1. Learners will be able to explain the reason for dimensioning standards
2. Learners will be able to identify 4 rules of dimensioning
3. Learners will be able to create technical drawings for the parts they model in Autodesk Inventor

Vocabulary

- Dimension
- Dimension Line
- Extension Line
- Radius
- Diameter

Procedure

1. Anticipatory Set
   a. Example of working in a metal shop
   b. Describe two drawings for the same part that are completely different
   c. Point out that we follow dimension rules and standards for a reason
2. Summarize learning objectives
3. Recall prerequisite knowledge on dimensioning
4. Discuss the reasons for dimensioning
5. Show Dimensioning Example 1
   a. Discuss placement of linear dimensions
   b. Introduce process of adding the correct number of dimensions
6. Show Dimensioning Example 2
   a. Discuss dimensioning round objects
   b. Point out that circles are dimensioned with a diameter
   c. Point out that arcs are dimensioned with a radius
   d. Discuss dimensioning and annotating holes
7. Show Dimensioning Example 3
   a. Discuss locating round features on objects
8. Show Dimensioning Example 4
   a. Discuss dimensioning on the projected view that show the round object
9. Show Dimensioning Examples 5-8
   a. Discuss mistakes to avoid when dimensioning
      i. Dimensioning to hidden lines
      ii. Dimensioning on the object
      iii. Crossing dimension, extension, and leader lines
      iv. Over dimensioning
10. Work time for Inventor Parts 5-7
11. Recall learning objectives by asking students to answer essential questions
12. Progress check on Inventor Parts 5-7

Assessment

Informal: Check for understanding throughout direct instruction by questioning, probing, and asking if learners need clarification

Formal: Technical Drawings for Parts 5-7, Unit Quiz

Resources/Materials

- Dimensioning Examples 1-8
- Computer with Autodesk Inventor
- Inventor Parts 5-7 Technical Drawings
Lesson 3 – Alternative views

Course: Mechanical Computer Aided Drawing

Grade: 10-12

STL Standards

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Benchmark P- Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information to communicate.

Standard 17- Students will develop an understanding of and be able to select and use information and communication technologies.

Benchmark Q- Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.

NGS Standards

HS-ETS1-4.- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Learning Objectives

1. Learners will be able to explain the reason for adding a section view
2. Learners will be able to explain the reason for adding an auxiliary view
3. Learners will be able to create technical drawings that show a section view
4. Learners will be able to create technical drawings that show an auxiliary view

Vocabulary

- Orthographic projection
- Section view
- Auxiliary view

Procedure

1. Anticipatory Set
   a. Example of a house
   b. Drawings would show the outside of the house but how would we know what’s on the inside
2. Summarize learning objectives
3. Recall prerequisite knowledge orthographic projections
4. Discuss section views
5. Show Section View Example
6. Discuss Auxiliary Views
7. Show Auxiliary View Example  
8. Work time for Inventor Parts 8-10  
9. Recall learning objectives by asking students to answer essential questions  
10. Progress check on Inventor Parts 8-10  

Assessment  

*Informal:* Check for understanding throughout direct instruction by questioning, probing, and asking if learners need clarification  

*Formal:* Technical Drawings for Parts 8-10, Unit Quiz  

Resources/Materials  

- Section View Example  
- Auxiliary View Example  
- Computer with Autodesk Inventor  
- Inventor Parts 8-10 Technical Drawings