



# INTEGRATING STEM TECHNOLOGY INTO VARIOUS DISCIPLINES

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# WHY STEM EDUCATION?

## CURRENT POSITION

- 8<sup>TH</sup> YEAR SPECIAL EDUCATION TEACHER
  - ENGLISH I, II, III, AND IV
  - WORLD HISTORY
  - CONSUMER ED
  - PSYCHOLOGY
  - CURRICULUM SKILLS RESOURCE
- HISTORY AND PASSION OF CONSTRUCTION AND THE TRADES
- LOVE THE OUTDOORS

## CONNECTION TO STEM

- STUDENTS WOULD BENEFIT FROM GREATER KNOWLEDGE OF JOB OPPORTUNITIES IN THE TRADES
- COLLEGE IS NOT FOR ALL
- REMOVAL OF STEREOTYPES

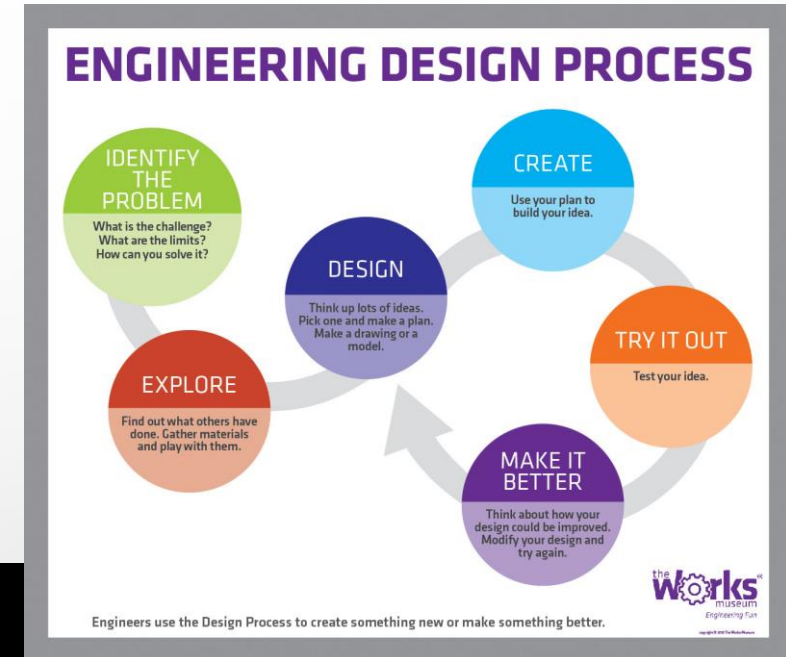


**CommonCore**  
**ScienceStandards**  
**DesignProcess**  
**RealWorldApplications**  
**MetacognitionCriticalThinking**  
**HigherDepthofKnowledge**  
**21stCenturyLearners**  
**ProblemSolving**

# 21<sup>ST</sup> CENTURY SKILLS

## DESIGN THEORY AND PROBLEM SOLVING

- **DEFINITION:** THE ENGINEERING DESIGN PROCESS IS A SERIES OF STEPS THAT ENGINEERS FOLLOW TO COME UP WITH A SOLUTION TO A PROBLEM. MANY TIMES THE SOLUTION INVOLVES DESIGNING A PRODUCT THAT ACCOMPLISHES A CERTAIN TASK.
- HOW DOES THIS CONNECT TO OUR VISITS?



# MY EDUCATIONAL APPLICATIONS

***Goal: Skills based instruction that promotes a higher depth of knowledge through problem solving tasks.***

## ENGLISH II

- INFORMATIVE TEXTS BASED ON CURRENT EVENTS
  - ENVIRONMENT
  - ENGINEERING MARVELS (OR BLUNDERS)
  - CONCEPTS IN THE WORLD OF SCIENCE
  - TECHNOLOGICAL ADVANCEMENTS
- DESIGN A SOLUTION TO A PROBLEM
  - PROMOTES COLLABORATION AND COMMUNICATION
  - HIGHER DEPTH OF KNOWLEDGE
  - VIEW OF DIFFERENT PERSPECTIVES

## CURRICULUM SKILLS RESOURCE

DEVELOPING SOLUTIONS FOR LIFE LONG  
PROBLEM SOLVING

- EXECUTIVE FUNCTIONING
  - SELF-ADVOCACY
  - METACOGNITION (THINKING ABOUT THINKING)
  - OVERALL INDEPENDENCE

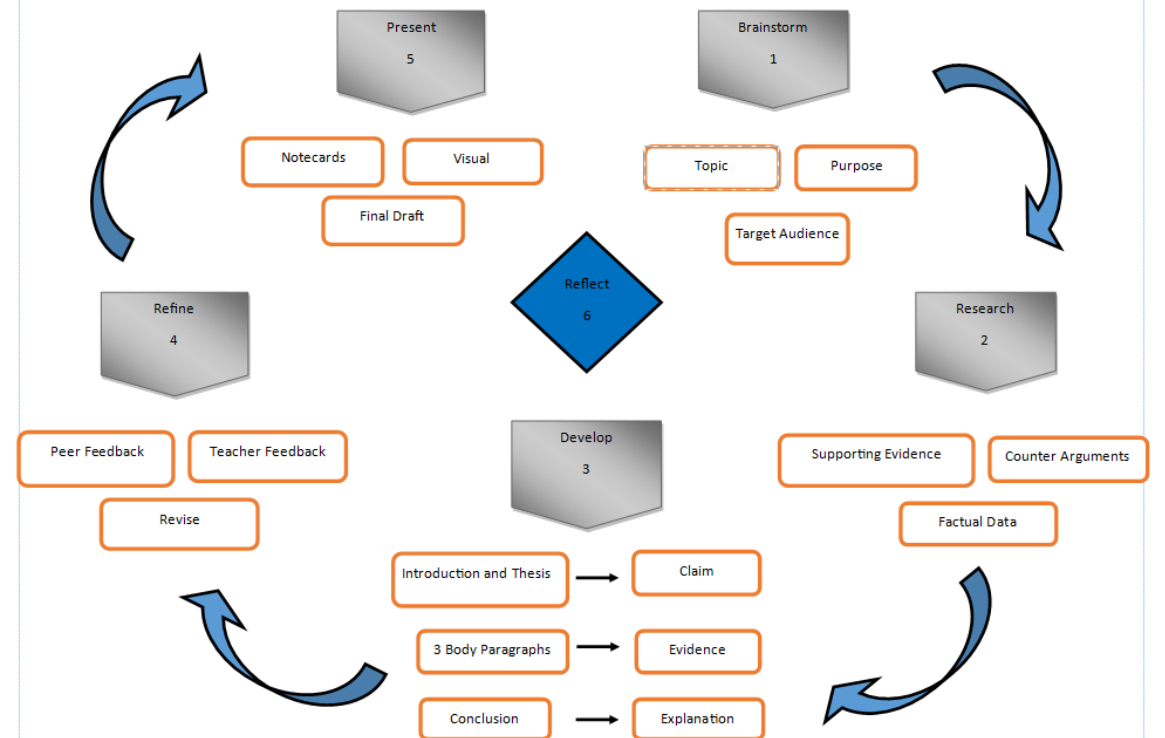
# Transfer of concepts

## THE DESIGN PROCESS



## THE WRITING PROCESS

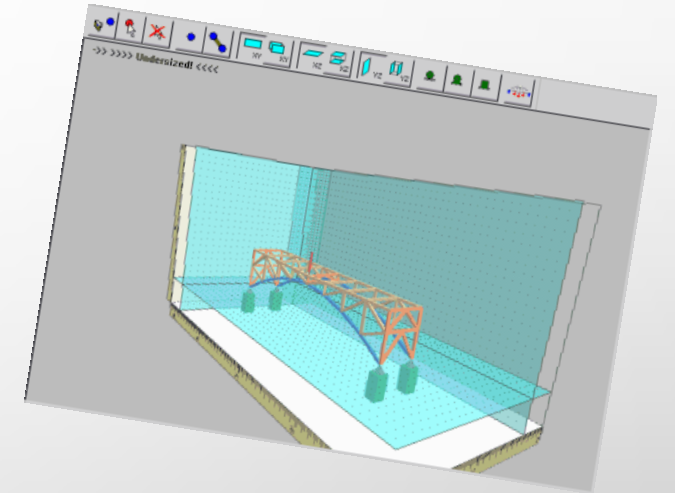
### The Persuasive Writing Process



# REAL WORLD APPLICATIONS RELATED TO APPLIED TECHNOLOGY

## WHAT IS APPLIED TECHNOLOGY?

- WOODWORKING
  - ALSO INVOLVES HOME MAINTENANCE AND REPAIR
- ENGINEERING
  - COMPUTER ANIMATED DESIGN (CAD AND AUTOCAD)
  - ROBOTICS
  - 3D PRINTING
- AUTOMOTIVE TECHNOLOGY
  - FROM BASIC MAINTENANCE TO FABRICATION AND CONSTRUCTION OF EXTENSIVE PROJECTS
- FOODS AND NUTRITION
  - OPTIONS OF BASIC COOKING SKILLS ALL THE WAY TO FOOD CHEMISTRY



# APPLIED TECHNOLOGY LESSON PLAN

- THIS PARTICULAR LESSON WOULD TRADITIONALLY BE TAUGHT IN AN ENGINEERING CLASS BUT COULD BE INTEGRATED INTO OTHER COURSES AS WELL.

- **OBJECTIVES:**

- AFTER THIS ACTIVITY, STUDENTS SHOULD BE ABLE TO:

- **DESCRIBE** HOW WIND TURBINES TRANSFER THE ENERGY OF THE WIND INTO ELECTRICITY.
- **COMPARE AND CONTRAST** TWO DIFFERENT TYPES OF WIND TURBINES.
- **LIST ADVANTAGES AND DISADVANTAGES** FOR USING WIND POWER.
- **IDENTIFY A PROBLEM** AND **DEFINE A POTENTIAL SOLUTION** WITH WIND ENERGY
- USE THE ENGINEERING DESIGN PROCESS TO **CREATE AND TEST A PROTOTYPE** WIND TURBINE.



- **ENDURING UNDERSTANDINGS:**

- STUDENTS WILL UNDERSTAND THAT ELECTRICAL ENERGY CAN BE CREATED FROM WIND POWERED GENERATORS
- STUDENTS WILL UNDERSTAND THE FACTORS AND FORCES THAT IMPACT THE PRODUCTION OF ELECTRICAL WIND POWER
- STUDENTS WILL UNDERSTAND THE NECESSARY DESIGN AND STRUCTURAL ELEMENTS OF A WINDMILL TURBINE



# GENERAL LESSON LAYOUT

1. THIS LESSON WOULD START BY **ENGAGING PRIOR KNOWLEDGE** OF THE TOPIC AS WELL AS THE MAJOR ISSUE OF GREEN ENERGY AND GLOBAL CLIMATE CHANGE.
  - LED THROUGH GUIDED DISCUSSION QUESTIONS AND OPENING VIDEOS
2. **RESEARCH** AND EXPLAIN THE DIFFERENCES OF VARIOUS TURBINES AND THE BENEFITS AND DOWNFALLS.
  - USE OF TECHNOLOGY AND PRACTICE OF RESEARCHING SKILLS
3. CHOOSE ONE TYPE OF WIND TURBINE AND **DESIGN A PROTOTYPE**
  - MODELS OF PROTOTYPES WOULD BE PROVIDED THAT DEMONSTRATED WEAK AND PROFICIENT EXAMPLES
4. **CONSTRUCT** PROTOTYPE USING AVAILABLE MATERIALS
  - REVIEW OF TOOLS AND MATERIALS

# GENERAL LESSON LAYOUT CONT'D

4. ONCE CONSTRUCTION IS COMPLETE, THE STUDENTS WILL **TEST THEIR DESIGN**
  - DATA ON PERFORMANCE WOULD BE COLLECTED USING A STRUCTURED OUTLINE
  
5. GROUPS WILL REVIEW THE DATA AND **IDENTIFY ISSUES AND DEFINE SOLUTIONS**
  - THIS WILL INITIALLY BE IN A WRITTEN EXPLANATION WITH A PLAN OF ACTION
  
6. APPLY THE NECESSARY ALTERATIONS TO THEIR MODEL
  - RECORD TESTING DATA

# ASSESSMENT, REFLECTION, AND ENRICHMENT

- **ASSESSMENT**

- ONGOING **FORMATIVES** WILL DRIVE DAILY INSTRUCTION
- **SUMMATIVE** ASSESSMENT WILL BE A COLLECTION OF STUDENT WORK AND COMPLETION OF FINAL ESSENTIAL QUESTIONS

- **ENRICHMENT ACTIVITY/REFLECTION:**

- OPTION 1: STUDENTS WILL RESEARCH THE EFFORTS BEING MADE IN THEIR LOCAL AREA OR STATE TO UTILIZE WIND TURBINE ENERGY AND CREATE A WRITTEN PIECE CONTAINING THEIR FINDINGS.
- OPTION 2: STUDENTS WILL RESEARCH THE ROLE OF AERODYNAMICS ON WIND TURBINES. THEY WILL WRITE A PARAGRAPH OR TWO ON THE EFFECTS OF FORCES SUCH AS LIFT AND DRAG ON MODERN TURBINES.

# BIG TAKEAWAYS

- FROM THIS EXPERIENCE AND OUR SITE VISITS I LEARNED...
  - INTEREST STARTS AT A YOUNG AGE. STUDENTS NEED EXPOSE TO VARIOUS OPTIONS.
  - THERE IS A VAST RANGE OF EDUCATIONAL BACKGROUNDS INCLUDED IN THESE FIELDS.
  - THERE'S A GREAT DEAL OF OPPORTUNITY FROM MOVEMENT, GROWTH, AND CAREER EXPLORATION
  - PEOPLE TRULY LOVE THEIR JOBS