STEM House
Agricultural Subsystem
– Recognizing the opportunity
– Specifications
– Brainstorming
– Evaluation
– Engineering Analysis
  Prototype/Model
– Summary and conclusions
• Mission Statement:
  – Create a business that will produce a virtual, educational, and sustainable STEM house focusing on agricultural aspects for 6-8 graders.
DEFINING THE PROBLEM

- Follow the educational standards of PA
- Technical
  - Levels, difficulty
- Social
  - Operation, parts, money
- Interviews
- Surveys
- Questions

![Mind Map Diagram]
- Safety
- Meets educational standards
- Simple/easy to use
- High-tech
- Affordable
- Aesthetically pleasing
- Durable
- Portable/Modifiable
- Interesting/Engaging
- Upgradable
- Sustainable
- Marketable

• Standard Area - CC.3.5: Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

• Standard Area - CC.3.6: Writing: Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.
• Virtual Room
  1. Single plant with adjustable factors that affect its growth
  2. Cross pollinate plants
  3. Water cycle
  4. Names of animals
  5. Photosynthesis/Aerobic Respiration
  6. Animal characteristics (mammals, birds, amphibians, reptiles, fish, insects)

• Physical
  – Students grow plants themselves

• Virtual/Physical
  – Based on adjustments online, students are to create their own physical environment to grow the plants
<table>
<thead>
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<th>Specifications</th>
<th>1) Virtual</th>
<th>a) Single plant with adjustable factors</th>
<th>b) Cross-Pollinate</th>
<th>c) Water Cycle</th>
<th>d) Animals</th>
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0 : Neutral
+ : Advantage
- : Disadvantage
## Specifications

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System integration

Agriculture

Educational

Business

Click one of the three boxes below to choose the seed type that you want to grow.

X seed

Y seed

Z seed
Plant the seeds of your decision

Do not forget to water your plants!

Adjust the acute angle of the light source that nourishes the plants

Adjust the room temperature...

....°C
Specify the roles of the factors that affect plant growth such as:
1. Water
2. Temperature
3. Light
4. Soil
5. Seed Type
1. Approach the housekeeper to pose questions and obtain task for the challenge (source of information as well as ID the challenge)

2. Options:
   1. Learning Module
      • Proceed to the Learning Modules
   2. Assessment Test
      • Pass: Proceed to the challenge
      • Fail: Proceed to the Learning Modules

3. Learning Modules:
   – Educational objectives addressed

4. Challenge:
   – Maximize the growth of the plant with given factors

5. After challenge

6. Assignment
   – Write a report of what you did and your outcomes.
Final design that meets specifications

- Safety
  - Virtual, no hazards
- Meets educational standards
- Simple/easy to use
  - By a click of a button
- High-tech
  - Computerized, Online interaction
- Affordable
  - Virtual
- Aesthetically pleasing
  - Graphics, media
- Durable
  - No physical decay of the structure
- Portable/Modifiable
  - Access from anywhere
- Interesting/Engaging
  - Interacting housekeeper
- Upgradable
  - Programmable
- Sustainable
  - No need for physical maintenance
- Marketable
  - Easy to advertise
## Gantt Chart

### Task Name
- **Recognize the Opportunity**
- **Define Problems**
- **How to focus on Agriculture**
- **Create a survey**
- **Possibilities of stakeholders (needs)**
- **Interviews**
- **Specifications**
- **Brainstorm**
- **Evaluate Ideas**
- **Analyze**
- **Test/Prototype**
- **Communicate Ideas**

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<th>Finish</th>
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Communicate design
Verbally – All
Written – Ed, Saeed
Graphically – Bolor, Kerim
LIGHT
1. Name the aspects.
Shape, size, color, and growth depend on light’s 3 important aspects:

/intensity, duration, and quality/

WATER
2. Choose the right answer.
Overwatering and under-watering are account for a large percentage of any types of plant losses.
Plant roots are usually in the bottom \(\frac{y}{x}\) of the pot, so do not water until the bottom \(\frac{y}{x}\) starts to dry out slightly. For a 6-inch pot, you can stick your finger about 2 inches into the soil. If the soil feels damp, don’t water.
a) \(\frac{y}{x}=\frac{4}{3}\)  
b) \(\frac{y}{x}=\frac{9}{7}\)  
c) \(\frac{y}{x}=\frac{2}{6}\)  
d) \(\frac{y}{x}=\frac{2}{3}\)

TEMPERATURE
3. Choose the right answer.
In general, indoor foliage plants grow best between \(X\) and \(Y\) F during the day and from \(M\) to \(N\) F at night.
a) \(X\) and \(Y = 70\) and \(80\) F ; \(M\) and \(N = 60\) and \(68\) F  
b) \(X\) and \(Y = 75\) and \(90\) F ; \(M\) and \(N = 50\) and \(55\) F  
c) \(X\) and \(Y = 80\) and \(95\) F ; \(M\) and \(N = 40\) and \(50\) F  
d) \(X\) and \(Y = 60\) and \(70\) F ; \(M\) and \(N = 70\) and \(80\) F

/SOLUBLE SALTS
4. Fill the blank
Reduced growth, brown leaf-tips, dropping of lower leaves, small new growth, dead root-tips, and wilting are all signs of ____________.
As the__________ in the soil become more and more concentrated, plants find it harder and harder to take up water.
To decrease the concentration, what do we have to do?
/high soluble water in the soil; salt/
/-Stop use of all fertilizer
-Flush the soil with as much as water you can for several days/

FERTILIZATION
5. Write the right answer in space.
Indoor plants, like most other plants, need fertilizers containing three major plant food elements:
1. 
2. 
3. 
/nitrogen (N), phosphorus acid (P), and potassium (K)/
1. Walk into the room “Agriculture (level 1)”
2. Approach the housekeeper to pose questions and obtain task for the challenge (source of information as well as ID the challenge)
3. Options:
   1. Learning Module
      • Proceed to the Learning Modules
   2. Assessment Test
      • Pass: Proceed to the challenge
      • Fail: Proceed to the Learning Modules
4. Learning Modules:
   – Educational objectives addressed
5. Challenge:
   – Maximize the growth of the plant with given factors
6. Approach the set up
   – Little garden with fresh soil
7. Choose the type of the plant to grow
   – Read provided summary for chosen plant
8. Adjust growth factors
9. Adjust secondary (maintenance) factors
10. Click “Grow”
11. Results (two pop up windows)
   – Specs of the grown plant
   – Processes that took place
12. Assignment
   – Write a report of what you did and your outcomes.
13. Depending on the grade teacher gave, you will either continue to level two or stay in level one in the room