Card House Formal Proposal

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Rapid Prototyping

to: Professor Susan Finger
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**Introduction:**

Although easy to experience first hand, engineering outreach to children is a difficult concept to explain. Many people do not grasp the full meaning of what it means to take on an engineering, even when they arrive at college to major in an engineering field. The activity we propose has been created to aid teachers in communicating to students the idea of engineering design. The activity is an approach of using connecting pieces (as illustrated in the drawings below) hold together cards to create a free-standing structure. Students must work together to coordinate the placement of the cards; children gain a sense of static equilibrium when discovering combinations of pieces that yield more stable structures.
The House of Cards Activity

The activity itself is rather simple and fairly self-explanatory. Groups of 2 to 4 children each are determined. The building materials are one deck of cards and a set of connector pieces. The goal for the children is to build the tallest structure possible using the cards and the pieces. For older children, the goal becomes more challenging; they must not only build a structure that is as tall as possible, but one that holds as much weight as possible. The table below outlines the challenges given to different age groups of children:

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>CONNECTOR PIECES</th>
<th>HEIGHT REQUIREMENT</th>
<th>WEIGHT REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8</td>
<td>unlimited</td>
<td>6 in.</td>
<td>0</td>
</tr>
<tr>
<td>8-9</td>
<td>5 octagon 5 hexagon 5 pentagon 3 half pieces (hex. Or octagon)</td>
<td>6 in.</td>
<td>0</td>
</tr>
<tr>
<td>9-10</td>
<td>4 octagon 4 hexagon 4 pentagon 3 half-pieces</td>
<td>9 in.</td>
<td>0</td>
</tr>
<tr>
<td>10-11</td>
<td>3 octagon 3 hexagon 3 pentagon 3 half-pieces</td>
<td>12 in.</td>
<td>0</td>
</tr>
<tr>
<td>11+</td>
<td>3 octagon 3 hexagon 3 pentagon</td>
<td>12 in.</td>
<td>25 grams</td>
</tr>
</tbody>
</table>
Objectives:

The most important idea that the students will learn will be engineering design. The engineering design process is an iterative process; learning that ideas can fail quickly is something that many college students have difficulty learning. Also as this Rapid Prototyping course has tried to teach us, another lesson is to fail fast. This is one activity where an idea can be tried, and the results will be quickly known.

Cooperation and communication are valuable lessons that can be learned through the experience of this activity. People must work in groups. The design must be a group effort; each idea that an individual donates to the project will be added to the final project in some way or another. In engineering, no one ever works on a project alone. Therefore, people must learn to effectively collaborate and communicate in groups.

Static Equilibrium is another important concept the students learn. The placement of the cards and the connectors is important. The balance of the cards and connectors is another factor to deal with. The students will quickly learn from the failure of structures as to what types of joints and angles work well when designing a structure.

Schedule:

4/14: cards ordered
4/16: cards obtained
   material written for teacher
dataetermine final connector piece types and finalize piece dimensions
4/17: submit request for pieces
4/20: receive pieces and put together activity kits
4/23: project completed and turned in

Budget:

Cards:  
$3 /deck
*10 decks
$30

Poster:  
$2: foam core
$5: construction paper
$2: glue

Total: