How To: Use Decision-Making Tasks

DQ4: HELPING STUDENTS GENERATE AND TEST HYPOTHESES

Element 22
Strategies for Engaging Students in Cognitively Complex Tasks Involving Hypothesis Generation and Testing

Decision-making tasks require students to select between equally appealing alternatives. The teacher needs to structure the task for the students. The alternatives can be determined by the teacher, the students or both. The students predict which alternative will be determined to be the best. They then judge the alternatives using previously defined criteria and select the most appropriate alternative based on the criteria provided. A decision matrix can be used to help organize the data (see example below). Students should then contrast their original predictions with the actual outcomes from the analysis or activity to explain how the task confirmed or denied their original opinions. Their conclusions should be stated using supportive evidence based on grounds and backing and any qualifiers need to be identified. The following stimulus questions may be used to guide students through the task:

1. What alternatives am I considering?
2. What criteria am I using to select among the alternatives?
3. What do I predict will be the best alternative?
4. Which alternative came out on top?
5. Do the results fit with my original prediction?
6. If not, how should my thinking change?

A template is provided to assist with Decision-Making Tasks at the end of this discussion.

Examples:
Physical education: The PE teacher asks the students to use data from their most recent physical fitness test to decide what parts of their personal fitness need attention.

Technology: The teacher tells the students the data they just imported into their spreadsheet has a major flaw. Everything shifted by one column so the column names identify the wrong data. The students are asked to determine how to restore and reimport the data. They are to consider two different methods to accomplish the task and use at least two criteria to make the final decision. They must be able to explain their reasoning for all decisions made.

Science: Your town council wants to add an electricity generating plant outside of town. Which type of electricity generating plant would work best in your area?

*The above examples came mostly from A Handbook for the Art and Science of Teaching (Marzano & Brown, 2009)
**Decision Matrix:**
To assist the students in the decision-making process, a decision matrix can be used. The decision-matrix below is completed by the students for the following decision-making task. The teacher asks the students to determine which literary work qualifies as a classic based on criterion she provides.

The literary works are: Romeo and Juliet, One Flew Over the Cuckoo's Nest, To Kill a Mockingbird, Failsafe, The Most Dangerous Game and 2001: A Space Odyssey. The criteria the students are to use are:

- The work was recognized by literary scholars as an example of good literature.
- The work is typically required reading in high school or college literature classes.
- The work has a story line that is applicable over decades.

The completed matrix for this task is below. The “X” means the work possesses the criterion. The “0” means the work does not possess the criterion and “?” means the students are not sure. Since Romeo and Juliet have the most X’s, it is determined to be the best alternative.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Romeo &amp; Juliet</th>
<th>One Flew Over the Cuckoo’s Nest</th>
<th>To Kill a Mockingbird</th>
<th>Failsafe</th>
<th>The Most Dangerous Game</th>
<th>2011: A Space Odyssey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized by Literary Scholars</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>0</td>
<td>?</td>
<td>X</td>
</tr>
<tr>
<td>Required Reading for High School or College</td>
<td>X</td>
<td>0</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>?</td>
</tr>
<tr>
<td>Story Line is Applicable over Decades</td>
<td>X</td>
<td>0</td>
<td>?</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

There is another more quantitative, more precise system that can be used in a decision-matrix. In this method a score indicating the importance of each criterion is determined: 3 = critically important, 2 = important, but not critical and 1 = not very important. Each alternative is assigned a score as well using the following scale: 3 = completely possess the criterion, 2 = possesses the criterion a great extent, but not completely, 1 = possesses the criterion a little bit and 0 = does not possess the criterion at all. A new decision-matrix using these scales for the previous example is shown below. Notice the criterion have been given a score or rating in the left column as determined by the student(s) completing this matrix. This number is the first number in
each cell. The second number in the cell represents the alternative rating (0-4) as determined by the students for each alternative (literary work in this example). The two ratings are multiplied to get a score for the cell. The student(s) completing this matrix believe(s) that Romeo and Juliet completely possess the first criterion so they assigned the second number as a 3. When you multiply the criterion score (2) by the alternative rating (3) you get a score of a 6 for that cell. The product scores are then summed up so the alternatives can be ranked by the extent to which they possess all of the criteria. Using this method it appears that 2001: A Space Odyssey possesses the most criterions and is therefore the best alternative.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Romeo &amp; Juliet</th>
<th>One Flew Over the Cukoo's Nest</th>
<th>To Kill a Mockingbird</th>
<th>Failsafe</th>
<th>The Most Dangerous Game</th>
<th>2011: A Space Odyssey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized by Literary Scholars</td>
<td>(2) x 3 =6</td>
<td>(2) x 2 =4</td>
<td>(2) x 3 = 6</td>
<td>(2) x 1 = 2</td>
<td>(2) x 2 =4</td>
<td>(2) x 3 = 6</td>
</tr>
<tr>
<td>Required Reading for High School or College</td>
<td>(1) x 2 = 2</td>
<td>(1) x 1 = 1</td>
<td>(1) x 3 = 3</td>
<td>(1) x 3 = 3</td>
<td>(1) x 3 = 3</td>
<td>(1) x 1 = 1</td>
</tr>
<tr>
<td>Story Line is Applicable over Decades</td>
<td>(3) x 2 = 6</td>
<td>(3) x 1 = 3</td>
<td>(3) x 2 = 6</td>
<td>(3) x 0 = 0</td>
<td>(3) x 1 = 3</td>
<td>(3) x 3 = 9</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>8</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>
Decision-Making Task

**List the Alternatives:**
A.  
B.  
C.  
D.  
E.  

**List the Criteria:** (What criteria am I going to use to select among the alternatives?)
1.  
2.  
3.  

**My Predictions:** (What do I think is the best alternative?)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which Alternative came out on top?

Do the results fit with my original prediction? If not, how should I change my thinking?