Hands on Solutions to Everyday Teaching Challenges in Medical Physics

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Which is the best car?

A  B  C

Based on....?
Session Objectives

1. Distinguish between the contents and topics of a course and its learning objectives.
2. Define appropriate learning objectives for a course.
3. Demonstrate how rubrics can be used to clearly present goals and expectations for assignments.
How do Content/Topics differ from Learning Objectives?

<table>
<thead>
<tr>
<th>Content/Topics</th>
<th>Learning Objectives/Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Units for the course</td>
<td>• What the student will accomplish during the course</td>
</tr>
<tr>
<td>• Broad or specific topics to be covered</td>
<td>- 'Student will be able to...'</td>
</tr>
<tr>
<td>• Projects/tasks to be done</td>
<td>- Learning goals</td>
</tr>
<tr>
<td></td>
<td>- Focuses on the 'end' rather than the 'means'</td>
</tr>
</tbody>
</table>

"You need to know this material for the test"

"I want you to do a good job on this assignment"
"I want you to do a good job on this assignment.

"You need to know this material for the test."

What is "know"? — No criteria

What is "good"? — No scale descriptors
Learning Objectives

What do you want your students to achieve through your class?

Criteria

Instructional Strategies

Assessments
Learning Objectives

Communication of expectations
1. Clear
2. Specific
3. Measurable outcomes

Learning Objectives

List of concepts

Vague/general statements

Learning Objectives

Action Verbs
• Descriptive
• Aligned with level of learning
Example format

By when, who will do how much/how well of what

YOUR TURN!
By when, who will do how much/how well of what

By the end of this session, attendees will create a set of well-designed learning objectives for their course.
Rubrics

Objective assessment of our learners

Explicit Criteria with Clear Scale Descriptors

- Better intra/inter-grader consistency
- Well defined expectations
• When we clearly state expectations and assessment criteria we allow our students to **thrive** as learners

• Providing them with **structure** frees up student’s mental bandwidth to focus on their learning and pursue the higher cognitive levels

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**Assessment**

* What do you want...
  - Transmit information?
  - Develop their high order cognitive and professional skills?

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* What are you assessing...
  - Resources ('knowledge')?
  - Handling of complex situations ('analysis')?
Assessment

• What do you want...
  – Transmit information?
  – Develop their high order cognitive and professional skills?

• What are you assessing...
  – Resources (knowledge)?
  – Handling of complex situations (analysis)?

• How do you develop exam questions...
  – Going over the course materials?
  – Looking for a detail or exceptional element?
  – Unanswered questions from a past lesson?

Authentic Assessment

• What do you want...
  – Transmit information?
  – Develop their high order cognitive and professional skills?

• What are you assessing...
  – Resources (knowledge)?
  – Handling of complex situations (analysis)?

• How do you develop exam questions...
  – Going over the course materials?
  – Looking for a detail or exceptional element?
  – Unanswered questions from a past lesson?
**Authentic Assessment**

- Assessing process, product and discourse:
  - Realist
  - Favors creativity, judgement, even innovation
  - Demands students to achieve a goal
  - Simulates a real world or professional situation
  - Complex tasks
  - Favors consultation, feedback and improving

**Design of Authentic Assessment**

- Pair to Learning Objective and Level (Bloom’s Pyramid)
- Appropriate method to evaluate
  - question, class activity, project, etc.
  - Authentic situation (simulation of real life professional situation)
Design of Authentic Assessment

- Pair to Learning Objective and Level (Bloom’s Pyramid)
- Appropriate method to evaluate
  - question, class activity, project, etc.
  - Authentic situation (simulation of real life professional situation)
- Instructions for students must:
  - Delimitate their responsibility
  - State the Evidence of Accomplishment (product, process, discourse)
- Resources and guidance needed
- How to give feedback

Feedback for our students

- Oftentimes:
  - Just a number (grade)
  - Inconsistent
  - General
- Individual feedback (oral or written)
  - Time consuming
How can we provide feedback?

• Objective
• Fair, impartial
• Transparent
• Efficiently provide useful information on strengths and weaknesses

Analytic Rubrics

• Objective
• Fair, impartial
• Transparent
• Efficiently provide useful information on strengths and weaknesses

What do you want them to do and how well do they have to do it to get a particular grade on the assigned task

Analytic Rubrics

What do you want them to do and how well do they have to do it to get a particular grade on the assigned task

Short guide to making rubrics

• Identify the task to assess
• Identify the component to assess and assign a grade percentage to each
• Determine the assessment criteria
• Determine a standard scale for the level of achievement
• Determine the descriptor for each achievement level
Short guide to making rubrics

• Identify the task to assess
• Identify the component to assess and assign a grade percentage to each
• Determine the assessment criteria
• Determine a standard scale for the level of achievement

Example of Rubric:

<table>
<thead>
<tr>
<th>Standard Criteria</th>
<th>Below average (0 points)</th>
<th>Average (1 point)</th>
<th>Above average (2 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General analysis of physical situation (10%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Errors in dimensional analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition of symmetry relations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same as Average AND includes a physical interpretation of the situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 2 [and percentage]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 3 [and percentage]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 4 [and percentage]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 5 [and percentage]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Which is the best car?

A  B  C

How do we define “best”?

• Small
• Affordable
• Gas mileage

Rubric: Which car is the best car?

<table>
<thead>
<tr>
<th></th>
<th>0 points</th>
<th>1 point</th>
<th>2 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>&lt;$25,000</td>
<td>$25,000-$52,000</td>
<td>&gt;$52,000</td>
</tr>
<tr>
<td>MPG</td>
<td>&lt;20</td>
<td>20-30</td>
<td>&gt;30</td>
</tr>
<tr>
<td>Seat capacity</td>
<td>2</td>
<td>3-5</td>
<td>&gt;5</td>
</tr>
<tr>
<td>Size</td>
<td>&gt;200&quot;</td>
<td>150&quot;-200&quot;</td>
<td>&lt;=150&quot;</td>
</tr>
</tbody>
</table>

• Small
• Affordable
• Gas mileage
So this is good for the students...
but how does this help me as a teacher...

Plan Do Check Action Cycle
Plan

Do

Check

Action

Rubric

• Clarifies learning goals
• What the student does
• Not what the faculty teaches

Self Assessment

• Student checks learning achievement using rubric

ASSESSMENT FOR LEARNING
Thank you!!