Using PULSE Vision & Change Rubrics to Assess Departmental Transformation to Student Centered Learning

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Introduction-Background information about rubrics

Website

Snapshot Rubric

Action Plan
Intended Use of Rubrics

1) Departmental self-assessment

- Determine where department is on the path to implementation of V&C recommendations
- Help identify strengths and weaknesses as departments create strategic plans for change
- Compare to other life science programs
- Applicable to all institution types
Intended Use of Rubrics

2) V&C Recognition
Tiered recognition modeled after LEED for Sustainable Building Construction

• Motivation to engage in long term continuous improvement in teaching and learning, resulting in greater students success
Rubric development process

• Researched other certification/accreditation systems (ABET, LEED, ASBMB, BIOL. SOC of UK, etc.)

• Developed vision of ‘Transformed’ with input from community

• Developed rubric criteria to assess ‘transformed’ departments

• Revised criteria using feedback from workshops at scientific meetings, PULSE website, colleagues

• Collected data via online portal
## Data Analysis-Weighting Scheme

<table>
<thead>
<tr>
<th>Rubric category/Sub-category</th>
<th>Weighting Factor</th>
<th>Number categories</th>
<th>Possible Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curriculum Alignment Rubric</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core concepts</td>
<td>X 1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Core competencies</td>
<td>X 2</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td><strong>Assessment Rubric</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course-level assessment</td>
<td>X 2</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>Program-level assessment</td>
<td>X 4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td><strong>Faculty Practice/Faculty Support Rubric</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student higher-level learning</td>
<td>X 6</td>
<td>5</td>
<td>120</td>
</tr>
<tr>
<td>Learning Activities beyond the classroom</td>
<td>X 4</td>
<td>6</td>
<td>96</td>
</tr>
<tr>
<td>Faculty development</td>
<td>X 2</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td><strong>Infrastructure Rubric</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Infrastructure</td>
<td>X 1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Learning spaces</td>
<td>X 2</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Resources and support</td>
<td>X 1</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td><strong>Climate Rubric (all subsections)</strong></td>
<td>X 1</td>
<td>12</td>
<td>48 (8%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>66</td>
<td>596</td>
</tr>
</tbody>
</table>
Data and Analysis Overview

• Data
  – 26 complete data sets – 8 pilot institutions, 18 additional
  – Partial data for 31 additional institutions

• Analysis
  – Do the rubrics show bias by institution types? - Kruskal-Wallis Analysis; ANOVA on each rubric
  – Is each rubric section coherent in what it measures? – Factor analysis
  – What rubric elements are most important to discriminate among institutions? - Principal components analysis
26 Complete Data Sets
Total Weighted Score by Institution

Maximum Score (596)

Institution Type:
- R1
- RC
- LA
- CC

Brancaccio-Taras et al.
CBE-Life Sciences Education in press
Goal: ensure that the highest level of achievement is attainable regardless of institution type

- Do the rubrics show bias by institution type?
- Data is Likert scale data
  - Examined via ANOVAs on ranks (analogous to Kruskal-Wallis)
  - Also examined with ANOVAs on weighted scores
  - Results were the same with both of these approaches
Analysis by Individual Rubric

• Separate ANOVA for each of the five rubrics
• Four of the five rubrics show no differences by institution type
• Faculty Practice/Support rubric exhibits significant differences among institution types for the entire rubric
  – This rubric has three sections A, B, and C
  – There were statistical differences by section for both A (Student Higher Level Learning) and section B (Learning Activities Beyond the Classroom)
  – For details see Brancaccio-Taras et al. CBE-Life Sciences Education *in press*
<table>
<thead>
<tr>
<th>Criteria</th>
<th>0 (Baseline)</th>
<th>1 (Beginning)</th>
<th>2 (Developing)</th>
<th>3 (Accomplished)</th>
<th>4 (Exemplar)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. STUDENT HIGHER LEVEL LEARNING (go to instructions)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Inquiry-based, open-ended research and interpretation in course labs</td>
<td>No labs expose students to Inquiry-based, open-ended research and interpretation</td>
<td>Exposure to inquiry-based, open-ended research and interpretation is limited; less than 50% of students have this opportunity</td>
<td>Inquiry-based, open-ended research and interpretation modules are used in a large fraction of lab courses; more than 70% of students are exposed</td>
<td>Inquiry-based, open-ended research and interpretation modules are included in the majority of lab courses. Every student has at least one exposure; Some students have several exposures</td>
<td>Inquiry-based, open-ended research and interpretation is the norm in most labs. Nearly all students are accustomed to formulating hypotheses and interpreting data</td>
</tr>
<tr>
<td>2. Opportunities for inquiry, ambiguity, analysis, and interpretation in non-lab courses or course components</td>
<td>Most non-lab courses or course components do not provide opportunities for inquiry, ambiguity, analysis, and interpretation; students have little exposure</td>
<td>25% or less of non-lab courses or course components have opportunities for inquiry, ambiguity, analysis, and interpretation; a subset of students are exposed</td>
<td>~26-50% of non-lab courses or course components have opportunities for inquiry, ambiguity, analysis, and interpretation; many students are exposed</td>
<td>Greater than 50% of non-lab courses or course components provide opportunities for inquiry, ambiguity, analysis, and interpretation; most students are exposed</td>
<td>Opportunities for inquiry, ambiguity, analysis, and interpretation are the norm in all non-lab courses or course components; nearly all students are exposed and many get multiple opportunities to practice</td>
</tr>
<tr>
<td>3. Student metacognitive development</td>
<td>Faculty do not guide students to reflect on and understand how to use learning strategies that are supported by cognitive research</td>
<td>Less than 25% of faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research</td>
<td>25-50% of faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research</td>
<td>51 - 75% of faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research</td>
<td>Greater than 75% of faculty routinely and intentionally guide students to reflect on and understand how to use learning strategies that are supported by cognitive research</td>
</tr>
<tr>
<td>4. Student metacognitive knowledge</td>
<td>Generally students are unreflective and lack awareness or understanding of how to use learning strategies that are supported by cognitive research</td>
<td>10-20% of students are reflective and have some knowledge and understanding of learning strategies that are supported by cognitive research</td>
<td>21-50% of students reflect on their learning and have awareness of and ability to use learning strategies that are supported by cognitive research</td>
<td>51-75% of students reflect on their learning and have awareness of and ability to use learning strategies that are supported by cognitive research</td>
<td>Greater than 75% of students are reflective about their learning and are adept at using strategies supported by cognitive research to improve learning outcomes</td>
</tr>
</tbody>
</table>
Implementation of Vision and Change

• Most progress on Curriculum Alignment
  – no difference by institution type ($p = 0.31$)

• Least progress on Assessment
  – no difference by institution type ($p = 0.17$)
Snapshot Rubric 2.0

- Shorter rubric based on long rubrics
- Most criteria come directly from longer rubrics
- Useful for workshops
- Also used to collect data at PULSE regional meetings
- Online rubric data portal is available
- Applicable to all STEM disciplines with exception of first question about concepts
- Available here:
  http://www.pulsecommunity.org/page/recognition
### A. INTEGRATION OF CORE CONCEPTS INTO CURRICULUM

<table>
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<tr>
<th>Criteria</th>
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<th>4 (Exemplar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Students are exposed to the core concepts multiple times as they complete their degree</td>
<td>None of the core concepts are covered multiple times in the curriculum</td>
<td>One or two of the core concepts are covered multiple times in the curriculum</td>
<td>Four of the five core concepts are covered multiple times in the curriculum</td>
<td>All five core concepts are covered multiple times in the curriculum</td>
<td></td>
</tr>
</tbody>
</table>

Core concepts are: Evolution; Structure/Function; Information flow/exchange/storage; Pathways and transformations of energy and matter; Systems

### B. INTEGRATION OF CORE COMPETENCIES INTO CURRICULUM

<table>
<thead>
<tr>
<th>Criteria</th>
<th>0 (Baseline)</th>
<th>1 (Beginning)</th>
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</thead>
<tbody>
<tr>
<td>2  Students are exposed to the core competencies in significant detail in at least one required course</td>
<td>Students are not exposed to any of the core competencies in significant detail</td>
<td>Students are exposed to one or two of the core competencies in significant detail</td>
<td>Students are exposed to three or four of the six core competencies in significant detail</td>
<td>Students are exposed to all six of the core competencies in significant detail</td>
<td></td>
</tr>
<tr>
<td>3  Students are exposed to the core competencies multiple times in order to complete their degree</td>
<td>None of the core competencies are covered multiple times in the curriculum</td>
<td>One or two of the core competencies are covered multiple times in the curriculum</td>
<td>Three of the six core competencies are covered multiple times in the curriculum</td>
<td>Four or five of the six core competencies are covered multiple times in the curriculum</td>
<td>All six of the core competencies are covered multiple times in the curriculum</td>
</tr>
</tbody>
</table>

Core competencies are: Process of science; Quantitative reasoning; Modeling and simulation; Communication and collaboration; Interdisciplinary nature of science; Understanding of the relationship between science and society

### C. COURSE LEVEL ASSESSMENT FOR ITEMS BELOW TERM = SEMESTER OR QUARTER

<table>
<thead>
<tr>
<th>4  Linkage of summative assessments to learning outcomes</th>
<th>Summative assessments are not linked to learning outcomes</th>
<th>Some courses have summative assessments that measure learning outcome achievement</th>
<th>Many courses have summative assessments that measure learning outcome achievement</th>
<th>The majority of courses have summative assessments that measure learning outcome achievement</th>
<th>The majority of courses have summative assessments that measure learning outcome achievement as part of a coherent evidence-based assessment plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>5  Assessment of time in student-centered activities in course evaluation</td>
<td>Time spent in student-centered activities is not measured</td>
<td>Time spent in student-centered activities is documented by approximation after the fact in formal course evaluation at the end of term</td>
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### D. PROGRAM LEVEL ASSESSMENT

<table>
<thead>
<tr>
<th>6  Assessment of six V&amp;C competencies at the program level</th>
<th>Competencies not assessed at the program level</th>
<th>Development of at least one of the competencies assessed</th>
<th>Development of 2-3 competencies assessed</th>
<th>Development of 4-5 competencies assessed</th>
<th>Development of all 6 V&amp;C competencies assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>7  Use of data on program effectiveness, direct and/or indirect, to strengthen the program</td>
<td>Program is not revised in response to data on program effectiveness</td>
<td>Program revision occurs in response to one source of direct data on program effectiveness only</td>
<td>Program revision occurs in response to indirect data and one source of direct data on program effectiveness</td>
<td>Program revision occurs in response to indirect data and 2-3 sources of direct data on program effectiveness</td>
<td>Program revision occurs in response to indirect data and 4 or more sources of direct data on program effectiveness</td>
</tr>
</tbody>
</table>
PULSE Website
http://www.pulsecommunity.org/page/recognition

Long Rubrics
Portal
Snapshot
Portal
Mental Model

• Typically think of rubrics as assessment tool
• Also function as a guided pathway to implementation
Workshop Overview

Assess Current Reality
• Work with the Snapshot Rubric
• Work with institutional team members if possible
• Score your department
• Discuss

Action Plan Brainstorm
• Identify a goal
• Brainstorm strategies & actions to move forward
• Identify challenges
• Identify allies
• How will you maintain momentum?
Find another group and do a think-pair-share about 1-2 most significant learnings from completing the Snapshot Rubric

Were these findings surprising to you? If so, why?
Action Plan Report Out

Find another group and do a think-pair-share about

What is your main strategy to achieve your goal?

How do you plan to maintain momentum?
Next Steps?

Take a few moments and write down 1-2 specific action items that you will do to begin this process in your department.

Schedule them!!
Past & Present
Recognition Team Members

Karen Aguirre
Judy Awong-Taylor
Teri Balser
Loretta Brancaccio-Taras
Samantha Elliott
Tom Jack
Marcy Kelly

Sara Lindsay
Kate Marley
Kathy Miller
Marcy Osgood
Pamela Pape-Lindstrom
Sandra Romano
Akif Uzman

Data Analysis and graphics preparation
Michael Cahill, Gina Frey, and Jiuqing Zhao of CIRCLE
Additional data analysis by Michael Kelrick, Truman State University

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Thank you!

Questions?

Online Qualtrics portal for Snapshot

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