

## Letter to the Editor

### PULSE Vision & Change Rubrics

Karen M. Aguirre,<sup>\*</sup> Teresa C. Balser,<sup>†</sup> Thomas Jack,<sup>‡</sup> Katherine E. Marley,<sup>§</sup>  
Kathryn G. Miller,<sup>||</sup> Marcy P. Osgood,<sup>¶</sup> Pamela A. Pape-Lindstrom,<sup>#</sup>  
and Sandra L. Romano<sup>@</sup>

<sup>\*</sup>Department of Biology, Coastal Carolina University, Conway, SC 29528; <sup>†</sup>Soil and Water Science Department, University of Florida, Gainesville, FL 32611; <sup>‡</sup>Department of Biological Sciences, Dartmouth College, Hanover, NH 03755; <sup>§</sup>Department of Biology, Doane College, Crete, NE 68333; <sup>||</sup>Department of Biology, Washington University, St. Louis, MO 63130; <sup>¶</sup>Department of Biochemistry & Molecular Biology, University of New Mexico School of Medicine, Albuquerque, NM 87131; <sup>#</sup>Biology Department, Everett Community College, Everett, WA 98201; <sup>@</sup>Department of Biological Sciences, University of the Virgin Islands, St. Thomas, VI 00802

Dear Editor:

We want to inform *CBE—Life Sciences Education* readers about the release of the first version of the Partnership for Undergraduate Life Sciences Education (PULSE) Vision & Change Rubrics (available at the PULSE Community website: [www.pulsecommunity.org](http://www.pulsecommunity.org)). These rubrics were written and assembled by the PULSE Vision & Change Leadership Fellows to help stimulate the widespread adoption of the principles outlined in the 2011 National Academy of Sciences report *Vision and Change in Undergraduate Biology Education: A Call to Action* (American Association for the Advancement of Science [AAAS], 2011). Initially, these rubrics can be utilized for departmental self-assessment. In the longer term, the rubrics are intended serve as the basis of a tiered certification program for life sciences departments based on *Vision and Change* principles.

In 2006, the National Science Foundation (NSF) initiated a multi-year conversation with the undergraduate life sciences community, with assistance from the AAAS. That conversation, cosponsored by the National Institutes of Health/National Institute of General Medical Sciences (NIH/NIGMS) and the Howard Hughes Medical Institute (HHMI), resulted in the release of the *Vision and Change* report in 2011 (AAAS, 2011). Among the recommendations in the *Vision and Change* report was recognition that a 21st-century education requires modifications of faculty incentive

systems, academic departmental support, how curricular decisions are determined, and biology education pedagogy. In 2012, the NSF, NIH/NIGMS, and HHMI founded the Partnership for Undergraduate Life Sciences Education, or PULSE, to catalyze implementation of *Vision and Change* principles across all institutions of higher education. The PULSE community, open to all life sciences educators, now hosts more than 1000 members. Forty *Vision and Change* Leadership Fellows selected from among biologists with leadership roles at institutions of higher education of all types were charged with developing strategies to promote systemic changes in life sciences education.

The PULSE initiative is intended to catalyze change at the departmental and institutional levels by initiating and implementing new strategies to assist departments and institutions to move toward a shared vision and effect curricular transformation (Manning, 2013). Decisions regarding curriculum, hiring, teaching assignments, faculty evaluations, mentoring, and faculty development are typically made at the department level. Thus, a concerted effort at this level is needed to overcome the widespread resistance to change (Savkar and Lokere, 2010; Anderson *et al.*, 2011). During the past year, the 40 PULSE Leadership Fellows have designed and begun to implement several initiatives to facilitate educational transformation in life sciences departments. One of these initiatives, the PULSE Vision & Change Rubrics, is described briefly here.

The PULSE Vision & Change Rubrics articulate fundamental criteria for evaluating the level and degree of departmental adoption of the principles of *Vision and Change*. These rubrics assess department or program alignment with *Vision and Change* recommendations in five broad areas: curriculum alignment, assessment, faculty practice/faculty support, infrastructure, and climate for change. Each rubric has several categories with multiple criteria to be assessed (see Figure 1 for a sample rubric). The rubric descriptors designate different levels of implementation of *Vision and Change* principles from first steps to full departmental transformation.

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Address correspondence to: Thomas Jack ([thomas.p.jack@dartmouth.edu](mailto:thomas.p.jack@dartmouth.edu)).

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**ASSESSMENT**

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
<b>A. COURSE LEVEL ASSESSMENT</b>								<b>0</b>
1	<b>Learning outcomes are well written and clearly related to core concepts and competencies</b>		Learning outcomes are not related to core concepts and competencies	Learning outcomes are not clearly related to concepts and competencies	Learning outcomes are somewhat related to concepts and competencies	Learning outcomes are well written and are mostly related to concepts and competencies	Learning outcomes are well written and clearly related to concepts and competencies	
2	<b>Learning outcomes are explicitly presented in the courses</b>		Learning outcomes are not explicitly presented	Learning outcomes are explicitly presented in the syllabus but not discussed with students during the course	Learning outcomes are explicitly presented in syllabus along with an explanation of how outcomes will be measured during course	As in level 2; in addition outcomes and their measurements are discussed with students	As in level 3; in addition outcomes and their measurements are discussed with students numerous times during the course	
3	<b>Assessments linked to learning outcomes</b>		Assessments are not linked to learning outcomes	Some courses have assessments that measure learning outcomes	Many courses have assessments that measure learning outcomes	The majority of courses have assessments that measure learning outcomes	The majority of courses have assessments that clearly measure learning outcomes	
4	<b>Instructor-independent assessment tools are utilized</b>		No assessment tools are instructor independent	Less than 25% of assessment tools used are instructor independent but are generated within the department	At least 25% of assessment tools used are instructor independent but are generated within the department	At least 50% of assessment tools used are instructor independent and include some that are generated external to the department	At least 75% of assessment tools used are instructor independent with many generated external to the department	
5	<b>Course quality evaluation includes assessing time in student-centered activities</b>		Time spent in student-centered activities is not measured	Time spent in student-centered activities is informally estimated at the end of semester/quarter	Time spent in student-centered activities is documented by approximation after the fact in formal course quality evaluation at the end of semester/quarter	Time spent in student-centered activities is informally tracked at periodic points throughout the semester/quarter and reported in formal course quality evaluations at end of semester/quarter	Time spent in student-centered activities is formally documented at periodic points throughout the semester/quarter and reported in formal course quality evaluation at end of semester/quarter	
6	<b>Use assessment pre- and post-instruction to measure effectiveness of instructional approaches</b>		No assessment	Less than 25% of courses include pre- or post-instruction assessments	25-50% of courses include pre- or post-instruction assessments	51-75% of courses include pre- and post-instruction assessments	More than 75% of courses include pre- and post-instruction assessments	
7	<b>Evidence of student preparedness and interests are used to inform curricular changes that reflect student preparedness and interest</b>		No evidence is collected or used to inform curricular change	Less than 50% of instructors report occasionally using anecdotal reports	Instructors are encouraged to conduct regular surveys and/or assessments, at least 50% of instructors survey/assess their students but results are not used when planning curricular changes	All characteristics listed for a score of 2 are present but results are consulted in planning curricular changes and real world examples are aligned with student preparedness and interest; progress is reported annually	All characteristics listed for a score of 3 are present, at least 75% of instructors survey/assess their students, instructors track and report progress annually which is rewarded during annual performance review	

**Figure 1.** Sample from the PULSE Vision & Change Rubrics. The rubrics are organized with separate criteria listed on the left, with levels of achievement across the top, from zero (no achievement) to four (exemplary achievement). In total, 69 separate criteria are assessed in five broad categories: curriculum alignment, assessment, faculty practice/faculty support, infrastructure, and climate for change.

The set of rubrics has been designed for flexible use by undergraduate life sciences departments at a broad range of institution types including 2-yr colleges, 4-yr liberal arts institutions, regional comprehensive institutions, and research institutions.

We expect that the PULSE Vision & Change Rubrics will be used for a variety of purposes, including departmental self-assessment, engagement of senior academic administrators, and as the basis for a departmental certification program. Initially, the rubrics can provide a structure and “road map” for departmental reflection regarding a host of topics relevant to implementation of *Vision and Change* recommendations. A goal of the rubrics is to provide a basic framework of expectations, such that evidence of adoption of *Vision and Change* principles can be gathered and self-assessed by departments and a road map for continued transformation can be charted. We anticipate that the rubrics themselves can serve as an assessment tool to examine how changes in departmental practices over time affect student outcomes. Longer term, we intend the rubrics to serve as the basis for a tiered certification program for undergraduate life sciences departments that have adopted some or all of the principles outlined in the *Vision and Change* report. Certification

will serve both to reward departments that have made substantial progress in implementing *Vision and Change*, and to incentivize departments that have been slow to adopt these changes.

An underlying assumption of the PULSE Vision & Change Rubrics is that higher scores resulting from excellent/exemplar level of achievement will result in better student outcomes. At present, this is only a hypothesis, and we and others who use the rubrics will gather data to test this hypothesis. This evidence will guide future revisions of the PULSE Vision & Change Rubrics, to ensure that they reflect the criteria that “really matter” to improve student learning.

We are very interested in receiving feedback from the biology education community. This is most easily done via the PULSE Community website or by contacting one of the authors directly. During the past year of development, we have done our best to include the most relevant criteria for capturing and recognizing departmental efforts, but it is likely we have omitted key items or areas. We are depending on the community to provide feedback so as to make the rubrics as effective as possible. We anticipate that the rubrics will be revised over the next year, and we expect them to evolve in future years based on evidence of their effectiveness and

changing standards of knowledge and practice in undergraduate life sciences education.

## **MATERIALS FOR DEPARTMENTAL ASSESSMENT AND ONGOING REFORM**

The PULSE Vision & Change Rubrics are available for download from the PULSE Community website: [www.pulsecommunity.org](http://www.pulsecommunity.org).

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