

THE PULSE VISION & CHANGE RUBRICS

Partnership for Undergraduate Life Sciences Education (PULSE) is a collaborative effort developed and funded by NSF, NIH/NIGMS, and HHMI to catalyze adoption of the principles outlined in the 2011 report *Vision and Change in Undergraduate Life Science Education: A Call to Action*. The PULSE Steering Committee selected 40 current and former life science department chairs or deans to serve as Vision & Change Leadership Fellows from September 2012-September 2013. One working group of Fellows, referred to as “Taking the PULSE”, developed the PULSE Vision & Change Rubrics during the fellowship year.

The PULSE Vision & Change Rubrics articulate fundamental criteria for evaluating the level of adoption of the principles of *Vision and Change* in life science departments. The rubric descriptors designate different levels of adoption of *Vision & Change* principles from first steps to full departmental transformation. The rubrics initially can provide a structure for departmental reflection and self-assessment and discussion regarding a host of topics relevant to program transformation. The utility of the PULSE Vision & Change Rubrics is to provide a basic framework of expectations, such that evidence of adoption of *Vision & Change* principles can be gathered and self-assessed by departments and a roadmap for continued transformation can be plotted. Ultimately, the rubrics are intended to serve as the basis for a tiered certification program for undergraduate life science departments that have adopted some or all of the principles outlined in the *Vision & Change* report and a blueprint for change in departments that have not yet adopted those principles. These rubrics are designed for flexible use by undergraduate life science departments at a broad range of institution types including two-year colleges, four-year liberal arts institutions, regional comprehensive institutions and research institutions. The core expectations articulated in the PULSE Vision & Change Rubrics can and should be translated into the language of individual departments and institutions, in order to evaluate and expedite departmental transformation in the context of each institution. An institution of any type should be able to achieve each level of certification.

We also anticipate that the rubrics could be used in STEM departments of all types with some modifications, particularly to concepts and competencies specific for life sciences. However, most of the rubric criteria are robust and could apply broadly to the range of STEM disciplines.

SCOPE OF THE RUBRICS

Multi-component rubrics have been developed that can assess department or program alignment with *Vision & Change* recommendations in five areas: Curriculum Alignment, Assessment, Faculty Practice/Faculty Support, Infrastructure, and Climate for Change. Each rubric has several categories with multiple criteria to be assessed. Although many of the scoring criteria are clear, we realize that some criteria may require more explanation, definition of terms, and specific examples to make them comprehensible. At present, we are working on assembling a detailed instruction manual to aid in use of the rubrics. Points are assigned for the levels of achievement in each category. Ultimately each rating criterion will be weighted to reflect the significance of the criterion for program transformation. The weighting will be established through a series of pilot certifications in 2014 (pending funding) and feedback is welcome.

CURRICULUM ALIGNMENT RUBRIC (11 criteria)

This rubric considers the degree to which the curriculum in a Life Sciences program addresses the core concepts for biological literacy and core competencies and disciplinary practice outlined in *Vision & Change*. This rubric has rating criteria for each core concept and core competency providing programs the opportunity to evaluate the integration of these ideas and skills into their curriculum. Most of these criteria are specific to Life Science education and *Vision & Change*, although many of the competencies would be applicable to other STEM fields.

ASSESSMENT RUBRIC (12 criteria)

This rubric addresses the degree to which programs have developed and employ curricular and course learning goals/objectives for students, and have developed and use assessments that are aligned with learning outcomes desired for students at both the course and whole curriculum level. There are two major rating categories, Course-Level Assessment and Program-Level Assessment. Only one criterion is specific to Life Science education and *Vision & Change*; all other criteria would be relevant to any STEM discipline.

FACULTY PRACTICE/FACULTY SUPPORT RUBRIC (21 criteria)

This rubric considers *Vision & Change* implementation issues that primarily are driven by or affect faculty. Overall, there are three main categories including Student Higher Level Learning, Learning Activities Beyond the Classroom, and Faculty Development with 5-10 rating criteria in each category. The Student Higher Level Learning category evaluates faculty efforts and student willingness to reflect on and engage in activities and processes that require higher level cognitive efforts. The category on Learning Activities Beyond the Classroom evaluates the range of opportunities and support mechanisms available to students. The Faculty Development category evaluates the support for faculty within the department and institution that enables them to learn and practice the recommendations of *Vision & Change* and scientific teaching principles. The term “faculty” in this rubric can and should include all applicable appointments including graduate teaching assistants, post-doctoral fellows, adjunct faculty and full time faculty. Also included in this category is recognition of the importance of effective teaching in yearly review, promotion and tenure decisions. The criteria included in this rubric would be broadly applicable to other STEM disciplines.

INFRASTRUCTURE RUBRIC (12 criteria)

This rubric deals with institutional infrastructure issues that facilitate *Vision & Change* implementation. There are three main categories in this rubric: Physical Infrastructure, Learning Spaces, and Resources and Support. The criteria in the Physical Infrastructure category assess the quality of the physical teaching spaces, and the degree to which they enable innovative teaching practices consistent with *Vision & Change*. Criteria in the Learning Spaces category assess whether informal learning spaces and Learning Center spaces are available on campus. The criteria in the Resources and Support category assess various types of staff support for teaching, including administrative assistants, laboratory instructors, and IT specialists. The accessibility of electronic resources is also considered under Resources and Support. The criteria included in this rubric would be broadly applicable to other STEM disciplines.

CLIMATE FOR CHANGE RUBRIC (11 criteria)

This rubric assesses the institution, administrative and department openness to and movement toward the type of change outlined for life sciences education in *Vision & Change*. Categories examine Administrative and Institutional Vision, Attitude and Action, as well as Departmental Support for administrative change efforts. There are 2-3 rating criteria in each category and while many of these criteria are out of the control of departmental faculty, they are critical for transformation and sustainability of reformed efforts in life sciences education.

To download the rubrics and for questions or feedback on the rubrics or the developing certification program, please contact the Taking the PULSE working group at <http://www.pulsecommunity.org> or the individuals listed below:

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CURRICULUM ALIGNMENT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
A. CORE CONCEPTS								0
1	Evolution core concept integrated into curriculum		Concept not included in any courses	Students are only minimally exposed to this concept	Students are exposed to this concept in significant detail in at least one required course	Students are exposed to this concept in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this concept in order to complete their degree	
2	Structure and function core concept integrated into curriculum		Concept not included in any courses	Students are only minimally exposed to this concept	Students are exposed to this concept in significant detail in at least one required course	Students are exposed to this concept in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this concept in order to complete their degree	
3	Information flow, exchange and storage core concepts integrated into curriculum		Concept not included in any courses	Students are only minimally exposed to this concept	Students are exposed to this concept in significant detail in at least one required course	Students are exposed to this concept in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this concept in order to complete their degree	
4	Pathways and transformations of energy and matter core concept integrated into curriculum		Concept not included in any courses	Students are only minimally exposed to this concept	Students are exposed to this concept in significant detail in at least one required course	Students are exposed to this concept in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this concept in order to complete their degree	
5	Systems core concept integrated into curriculum		Concept not included in any courses	Students are only minimally exposed to this concept	Students are exposed to this concept in significant detail in at least one required course	Students are exposed to this concept in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this concept in order to complete their degree	

ASSESSMENT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
A. COURSE LEVEL ASSESSMENT								0
1	Learning outcomes are well written and clearly related to core concepts and competencies		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	Learning outcomes are explicitly presented in the courses		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	Assessments linked to learning outcomes		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	Instructor-independent assessment tools are utilized		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	Course quality evaluation includes assessing time in student-centered activities		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	Use assessment pre- and post-instruction to measure effectiveness of instructional approaches		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	

ASSESSMENT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
7	Evidence of student preparedness and interests are used to inform curricular changes that reflect student preparedness and interest		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	
B. PROGRAM LEVEL ASSESSMENT								
1	Assessment of six V&C competencies at the program level		Competencies not assessed at the program level	Development of at least one of the competencies assessed	Development of 2-3 competencies assessed	Development of 4-5 competencies assessed	Development of all 6 V&C competencies assessed	
2	Direct and indirect data on program effectiveness are collected and analyzed; the results are used to strengthen programs		Overall program effectiveness is not assessed	Data collected but results are not used for improving the program	Data collected, results are used to try to improve the program but resulting change is not tracked	Data collected with clear purpose, and continual dialog regarding the results is used to guide efforts to improve the program but resulting change is not tracked	Data collected with clear purpose, and continual dialog regarding the results is used to guide efforts to improve the program, resulting changes are identifiable and measured	
3	Assess retention of all kinds of students in the program		Retention is not evaluated	Retention is measured only with enrollment figures	Retention is measured with enrollment figures as well as with attention to student populations of special interest	Retention is measured as for 2 but also includes students at critical transition points	Data collected as for 3; data are critically analyzed	
4	Retention assessment data are used for improving student retention		Data are not used	Data are collected but are not used in any clear way	Data are used in a coordinated capacity to improve retention	Data are used in a coordinated and consistent way across the areas of the program to improve retention	Data are used in a coordinated and consistent way with strategies implemented and assessed for levels of success	
5	Use assessments as tools to identify whether there are differences in learning outcomes and the nature of these differences among different student populations (e.g. women and under-represented minority students)		No effort made to identify differences	Assessments provide suggestions of differences, but no efforts are made to use the information to develop strategies to address achievement gaps	Assessments provide suggestions of differences, information discussed and used informally to address achievement gaps	Assessments provide suggestions of differences, formal interventions developed to address achievement gaps	Assessments provide suggestions of differences; interventions developed to address achievement gaps; achievement gaps between various segments of student body measured to assess the impact of interventions on the gaps	

CURRICULUM ALIGNMENT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
B. INTEGRATION OF CORE COMPETENCIES								
1	Integration of the process of science into the curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	
2	Integration of quantitative reasoning into the curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	
3	Integration of modeling and simulation into the curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	
4	Integration of the interdisciplinary nature of science into the curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	
5	Communication and collaboration through a variety of formal and informal written, visual, and oral methods integrated into curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	
6	An understanding of the relationship between science and society is embedded into the curriculum		Competency is not included in any courses	Students are only minimally exposed to this competency	Students are exposed to this competency in significant detail in at least one required course	Students are exposed to this competency in significant detail in at least one course and implicit understanding is expected in additional courses	Students get multiple opportunities to explore this competency in order to complete their degree	

FACULTY PRACTICE/FACULTY SUPPORT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
A. STUDENT HIGHER LEVEL LEARNING								0
1	Exposure to inquiry-based, open-ended research and interpretation in course labs: guided inquiry or research that requires hypothesis generation/data interpretation		All laboratory experiments have known outcomes ("cookbook labs")	Exposure is limited; <50% of students are not exposed	Inquiry modules are used a large fraction of lab courses; more than 70% of students are exposed	Inquiry modules are included in the majority of course labs. Every student has at least one exposure; Some students have several exposures	Inquiry is the norm in most labs. Students are accustomed to formulating questions and interpreting findings	
2	Exposure to inquiry, ambiguity, analysis and interpretation in non-lab courses		Most courses do not provide such opportunities; student have little exposure	25% or less of courses have such opportunities; a subset of students are exposed	Class sessions/ assignments in ~25-50% of courses have multiple opportunities; many student are exposed	Greater than 50% of courses have opportunities, most students are exposed	Such opportunities are the norm in courses; all student are exposed, many get multiple exposures	
3	Instructors encourage/teach student metacognition: instructors guide students to reflect on their learning styles and understand how to use learning strategies that are supported by cognitive research		Instructors do not encourage student metacognition	<25% of Instructors discuss and encourage effective learning strategies	25-50% of instructors discuss and encourage effective learning strategies	Students in >50% of courses are encouraged to reflect, and some instructors integrate practice of effective strategies within assignments	Instructors routinely intentionally integrate practice of effective strategies within assignments	
4	Students' Metacognitive Knowledge: students reflect on their learning styles and understand and use learning strategies that are supported by cognitive research		Students are unreflective and lack awareness or understanding	Students rarely reflect on styles and have only minimal knowledge	Most students have some awareness, but many lack the knowledge to effectively use	Most students have some awareness; many have the knowledge to employ	Students are adept at using strategies to improve learning outcomes for self and peers.	
5	Students Practice Higher-Order Cognitive Processes		Students use only lowest-level cognitive processes (memorization/recall) across the curriculum. Instructors are not aware and/or not encouraged to reflect on cognitive level of tasks	Students' cognitive processes remain at lower levels but may include understanding and application in addition to recall. Typically there is no organized effort among instructors to distinguish cognitive level of tasks	A small proportion of students (<25%) in specialized, upper-level courses are challenged to use higher-order cognitive processes (e.g., synthesize, evaluate, create). A few instructors may be leading efforts to move students to higher-order cognition	Higher-order cognitive processes are practiced by students at all course levels, but such practice is not yet ubiquitous across all courses, and not all instructors are adept at developing tasks for student practice at these higher levels	Students regularly work at higher cognitive levels in most courses, and instructors are adept at developing assignments and exams for practice at each level	

INFRASTRUCTURE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
A. PHYSICAL INFRASTRUCTURE								0
1	Classrooms and teaching laboratories can accommodate special needs and differing abilities		None of the classrooms serve students with diverse needs.	<10% of assigned classrooms comply, very limited ability to serve students with diverse needs	10-25% of assigned classrooms comply	26-75% of assigned classrooms comply	>75% of assigned classrooms comply	
2	Access to flexible, re-configurable teaching spaces to encourage student interaction, ability to work in small groups		All assigned classrooms are lecture style with fixed seating	< 10% of assigned classrooms are flexible and reconfigurable	10-50% of assigned classrooms are flexible and reconfigurable	50-75% of classrooms are flexible and reconfigurable; different types of classrooms are available for diverse teaching styles	>75% of classrooms are flexible and reconfigurable; different types of classrooms are available for diverse teaching styles	
3	Classroom IT infrastructure to encourages active-learning practices		All assigned classrooms have no IT technology	< 10% of assigned classrooms have at least one IT resources for active learning purposes	10-50% of assigned classrooms have at least one resource for active learning purposes	10-50% of assigned classrooms have at least two IT resources for active learning purposes	More than 50% of assigned classrooms have at least two IT resources for active learning purposes	
4	Access to intelligently-designed laboratory space flexible enough to allow different uses that blur distinction between lecture and lab		Laboratories are antiquated (possibly dangerous); prep and equipment space is not separated	<10% of laboratories are well designed with prep and equipment space separated	10 - 50% of laboratories are well designed with prep and equipment space separated; IT resources available	51 - 75% of laboratories are well designed with prep and equipment space separated; IT resources available	76% - 100% of all laboratories are well designed with prep and equipment space separated; IT resources available	
5	Equipment/supplies in teaching laboratories		Limited laboratory equipment available to students, >90% of equipment is old or antiquated, supplies for laboratories are very limiting	>25% of equipment is new, equipment is available for student use but not enough equipment for the student load, supplies for laboratories are limiting	>50% of equipment is new, equipment is comes close to meeting the student load, supplies for laboratories are adequate	51 - 75% of equipment is new, amount ouf available equipment matches the student load, supplies for laboratories are adequate	>75% of equipment is new, amount ouf available equipment matches the student load, supplies for laboratories are adequate	

CLIMATE FOR CHANGE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
A. ADMINISTRATIVE AND INSTITUTIONAL VISION								0
1	Vision is clear and specific		Administrative vision has not been written	Administrative vision is written, but uses vague or unclear language; department members do not understand or are not aware of the vision	Administrative vision is written, uses clear language, and department members express basic awareness and/or understanding of the vision	Components of 2 are present and vision has been distributed amongst dept. members and discussed. Feedback on feasibility and innovativeness have been collected from dept. members	Components of 3 are present and feedback has been incorporated into a new vision statement that is clear, innovative, and feasible	
2	Vision aligns with V&C priorities		Vision is not aligned with V&C priorities	Vision is aligned with 25% or less of the V&C priorities	Vision is aligned with 25-50% of the V&C priorities	Vision is aligned with 50-75% of V&C priorities	Vision is aligned with 75% or more of V&C priorities	
3	Commitment to vision is demonstrated through administrative action		No discussion of the implementation of the vision occurs	Casual discussion occurs about implementing the vision but no action items chosen	Casual discussion of how to implement the vision occurs and action items chosen but not followed through	Formal discussion of how to implement the vision occurs and all important players attend; action items are chosen and followed through but not formally recorded	Components of 3 are present plus formal recording/monitoring system exists for following up with delegated activities	
B. ADMINISTRATIVE AND INSTITUTIONAL ATTITUDE								
1	Administration is supportive of the need for change		Admin. expresses resistance to change, such as change items not included on meeting agendas, no funding support for change towards national initiatives, faculty report feelings of hostility from admin. regarding discussion of changing practices; difficulty in attaining meetings with admin. officials to discuss change	Administration does not openly express resistance to change, but avoids discussion of change by not supporting opportunities to discuss change; change items may be included in meeting agendas but not actively discussed/no action items taken	Administration verbally expresses support for change but does not put financial or other resources towards doing so (i.e. requires change to be sought out by individual faculty)	Administration verbally expresses support of change and provides some, but not enough, financial resources towards change and/or only some faculty are able to secure these resources	Administration is verbally and financially supportive of change initiatives across the entire department	

CLIMATE FOR CHANGE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
2	There is awareness and buy-in of national initiatives in higher education		Administration does not recognize/is not aware of national initiatives	Administration is aware of national initiatives, but no action is taken	Administration is aware of national initiatives and takes observable action to promote initiatives on occasion, but no long-term plan or funding is in place	Administration is aware of national initiatives and takes observable action to promote initiatives on a regular basis and/or short-term action plan is in place	Components of 3 are present and admin. allocates resources and establishes a long-term action plan	
3	Institutional evaluation and assessment reflects the importance of teaching		No institutional evaluation and assessment of learning gains and teaching portfolios	Institutional recognition of the need to evaluate and assess learning gains and teaching portfolios, but nothing formal available for departments	Faculty/departmental levels assessments of learning gains and teaching portfolios conducted but not aggregated at an institutional level	Institutional data includes assessments of learning gains and teaching portfolios conducted at the faculty/departmental level but not consistent in measurement across the institution	Institutional data includes consistent, formal in-depth assessments of learning gains and teaching portfolio aggregated at the institutional level	
C. ADMINISTRATIVE AND INSTITUTIONAL ACTION								
1	Strategies are in place to recruit and retain diverse teaching faculty		No active strategy for recruiting diverse teaching faculty either informally or formally	The need to recruit and retain diverse teaching faculty is mentioned informally as important, but no formal action is taken	Formal action is taken to seek diverse candidates, search committee chairs and department chairs are trained on how diversity is supported at the institution	Components of 2 are present and resources are provided to incentivize hiring diverse teaching faculty, candidates are exposed to the diversity on campus when they visit	Components of 3 are present and a process exists to measure success in recruitment and retention of diverse teaching faculty, diverse teaching faculty have achieved success via promotion	
2	Faculty incentives exist for transformative approaches in teaching		No incentives exist for faculty to be rewarded for creative teaching and some barriers exist	Informal recognition (i.e. email praise) exists but is rare and infrequent for faculty who teach in creative ways	Informal recognition is common for all faculty who teach in creative ways, formal awards exist that consider or emphasize a faculty's teaching merit; transformative teaching methods are mentioned but not heavily weighted in annual review, promotion and tenure (P&T)	Components of 2 are present and several formal awards exist for recognizing innovative teachers, transformative teaching methods and the scholarship of teaching and learning are actively considered in P&T	Components of 3 are present, transformative teaching methods and scholarship of teaching and learning are actively considered/weighted in P&T and this is widely understood throughout the department	

CLIMATE FOR CHANGE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplar)	Final Score
3	Resources exist for faculty to improve their teaching methods		Resources are not available for faculty to improve their teaching methods	Some resources are available for faculty to improve their teaching methods but are widely unknown and unused by faculty	Resources exist for improving teaching methods, and are used by a minority of the faculty; all faculty are aware resources exist	Components of 2 are present and resources are actively distributed, disseminated, or paid for by department leaders to improve faculty's teaching methods	Components of 3 are present and nearly all faculty use these resources and are aware resources exist	
4	Fundraising and development efforts support departmental transformation in alignment with V&C		Fundraising efforts are not aligned with V&C	Fundraising efforts aligned with V&C derive only from individual faculty members	There is at least one fundraising effort in support of V&C at the department level	There are fundraising efforts in support of V&C at the department level and a discussion of fundraising at the institutional level	There are successful fundraising efforts in support of V&C at the departmental and institutional levels	
D. DEPARTMENTAL SUPPORT								
1	There is a collaborative communication process in place, including disseminating new ideas		There is no department wide communication strategy for sharing new ideas about V&C	There is an informal communication strategy to discuss new ideas about V&C but includes only a small group of participants with infrequent, irregular meetings	There is an informal communication strategy to discuss new ideas about V&C and includes the majority of department members with frequent, but irregular meetings	There is a formal communication strategy including both face to face meetings and email exchanges to discuss new ideas about V&C, all department members are invited and some collaboration is discussed	Components of 3 are present and active collaboration around the V&C takes place	
2	There is faculty support for the administrative vision within the department		Department faculty are unaware of the administrative vision	Department faculty are aware of the administrative vision but express hesitancy to adopt the vision for the department (avoid discussing at meetings; express worry or negativity; express confusion on how to adopt this vision)	Department faculty are aware of the administrative vision and express verbal willingness/support for the vision, but no formal action is taken	Components of 2 are present and action is taken but no reporting or formal mechanism is developed for implementing the vision long-term	Components of 3 are present and formal reporting is conducted on current actions, and a plan is written on how to achieve the vision over long-term	

INFRASTRUCTURE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
B. LEARNING SPACES								
1	Informal gathering spaces that encourage collaboration		Informal gathering space not available	A space is available but not located near labs, classrooms, or faculty offices - use is not encouraged	A space is available but not located near labs, classrooms, or faculty offices; use is encouraged by administration	Several good spaces are available; at least one is near labs, classrooms, or faculty offices; use is encouraged by administration	Several good spaces are available; all are near labs, classrooms, or faculty offices; use is encouraged by administration	
2	Learning Center for Students - for example, college-wide writing centers, learning centers or dept. level center with staff, tutor meeting rooms, TAs, computers and printers, study space for students		None	Facility available; no staff; limited range of options; limited hours	Staffed facility available; limited range of options; limited hours	Facility available; multiple staff members (overseer, tutors), addressing multiple student needs (writing, math, bio); extended hours; multiple breakout rooms available	All characteristics listed for a score of 3 are present; also staffed with learning specialist; open most of the time to meet students needs	
C. RESOURCES AND SUPPORT								
1	IT support for innovative teaching, responds quickly to IT crisis; support includes hands-on technology training for faculty and proactive survey of new technology		No IT support	IT staff provides limited support; faculty are not satisfied with level of support when issues arise	IT staff provide support adequate to meet faculty needs when issues or problems arise	All characteristics listed for a score of 2 are present, in addition IT staff provide hands-on training	All characteristics listed for a score of 3 are present; proactive IT staff also suggest innovative technologies	
2	Staff support for teaching: administrative help to support teaching, lab managers/lab instructors, curriculum development/learning specialists, tenure-track faculty with education specialty		No staff support for faculty	Very limited support, e.g. part time administrative support or part-time lab support help	A minimum of the equivalent of one full time position dedicated to teaching support	Adequate administrative and lab managers/instructor support provided. Department has <u>either</u> a curriculum development position or biology education-based tenure-track faculty position	Adequate administrative and lab managers/instructor support provided. Department has <u>both</u> a curriculum development position or biology education-based tenure-track faculty position	

INFRASTRUCTURE

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
3	Institutional support for electronic resources, e.g. journal subscriptions and databases		No institutional subscriptions available	Very limited subscriptions available, only to top journals (e.g. <i>Nature</i> , <i>Science</i> , <i>PNAS</i>)	Subscriptions extend to the top journals in each subfield (e.g. <i>Ecology</i> , <i>Journal of Cell Biology</i> , <i>Nature Genetics</i> etc.), but specialty journals offerings are limited	Subscriptions extend to some specialty journals in selected subfields. But it is still common that articles that faculty and students require are not freely available	Wide range of electronic journals, databases are available for use by faculty and students without fee. Rare that a journal article cannot be freely obtained	

FACULTY PRACTICE/FACULTY SUPPORT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
B. LEARNING ACTIVITIES BEYOND THE CLASSROOM								
1	Availability of intramural and/or Extramural Mentored Research: Student opportunities		No opportunities exist	Limited opportunities available; <25% of students can be accommodated	26-50% of students can be accommodated	51-75% of students can be accommodated	>75% of students can be accommodated	
2	Availability of intramural and/or Extramural Mentored Research: Student exposure, % of students who graduate with one or more summer/semester of mentored research		No students participate in mentored research.	<15% students participate	16-30% students participate	31-60% students participate	>60% students participate	
3	Advisors and formal programs encourage and support student participation in research by proactively helping students find opportunities and understand the value through activities that showcase student research		No support mechanisms	Minimal informal support	Proactive informal support	Formal program and some informal mechanisms	Extensive programming and other mechanisms promote and support	
4	Instructors available and welcoming beyond classroom/lab hours; instructors interested in student success		Instructors not available	Instructors available, but >50% are perceived as distant, unresponsive	>50% of the instructors are perceived as available and welcoming	>75% of instructors perceived as available, welcoming, supportive	All instructors perceived as available, approachable, helpful, and supportive	
5	Opportunities for supplemental student engagement for thriving in STEM are provided, such as tutoring, peer mentoring, advising, interest-based clubs, internships, etc		Supplemental engagement methods are absent	Supplemental opportunities are minimal (e.g., one or two methods; few students offered opportunities)	Supplemental engagement methods are diverse, but only offered to a small subset of students	Supplemental engagement methods are diverse and widely available	All of level three criteria are met; Supplemental engagement methods are promoted by course instructors	
6	Student participation in supplemental student engagement opportunities		Supplemental engagement opportunities utilized by <10% students	Supplemental engagement opportunities utilized by less than 25% of students	Supplemental engagement opportunities utilized by 26- 50% of students	Supplemental engagement opportunities utilized by 51-75% of students	Supplemental engagement opportunities utilized by >75% of students	

FACULTY PRACTICE/FACULTY SUPPORT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
C. FACULTY DEVELOPMENT								
1	Awareness of National Efforts in Undergraduate STEM Education Reform		Instructors isolated from the national dialogue	Pockets of awareness of need for reform and national efforts exist	50% of the faculty aware of reform and national efforts	75% of the faculty aware of reform and national efforts	Awareness of the need for reform and national efforts is widespread	
2	Faculty Attendance at meetings and workshops related to Life Science education reform		Faculty do not attend conferences or workshops related to reform	Small fraction of instructors (<10%) have opportunity or desire to attend national meetings. Usually pay own expenses to such meetings	Cadre of instructors (25%) attend national meetings and workshops; limited financial support available	A large number (50%) of instructors attend national conferences and/or on-campus workshops, typically with financial support	>75% of instructors regularly participate in workshops and dialogue on STEM reform. Institutional support exists for attendance at conferences, etc	
3	Awareness/ Implementation of Discipline-based Education Research (DBER)		Faculty are unaware of DBER and its utility	A small subset of faculty is aware of DBER findings and use this information to inform class practice	At least 25% of the instructors are aware of and use DBER findings	At least 50% of the instructors are aware of and use DBER findings	At least 75% instructors are aware of and use DBER findings	
4	Sharing of information about evidence-based and effective pedagogy		No sharing of pedagogical methods, data about effective teaching practices with colleagues	There is little sharing of ideas data and techniques with colleagues	At least 25% of instructors regularly share ideas and techniques	At least 50% of instructors regularly share ideas and techniques	At least 75% of instructors regularly share ideas and techniques. Some formalized discussion groups exist	
5	Pedagogical Approaches Reflect Best Practices		Lecturing without student engagement is dominant practice in all life science courses.	Traditional lectures interspersed with student responses to prompts (e.g., < 25% of time students are engaged). More engaging pedagogies used by one or few instructors	A core group of practitioners is shifting department's attitudes and practices toward more widespread use of engaging pedagogies	All instructors are learning about and attempting to adopt best pedagogical practices, although reverting to lecturing for more than 25% of classtime is common	Students rarely sit passively listening to lectures. Students are engaged in discussion, guided inquiry, and other activities in class and lab	

FACULTY PRACTICE/FACULTY SUPPORT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
6	Instructors Pursue Shared Learning Goals		Learning goals (concepts, competencies, & dispositions) are unknown/not articulated.	Learning goals are vague or are professed in static documents, but they are not pursued with intentionality nor are they apparent to students	Learning goals are written (e.g., department web page), but goals are not readily apparent to students nor consistently pursued by all instructors	Learning goals are clearly documented (e.g., course syllabi) and discussed with students. However, not all instructors have mastered matching assignments and student practices to achieve goals	Learning goals are clear and intentionally pursued in courses across curriculum, courses are constructed to achieve goals, assignments give practice in learning outcomes, all syllabi reflect goals	
7	Support for Teaching/Learning Needs in STEM		No formal support, such as Teaching and Learning Center (T&L Center)	T&L Center or other formal support available but programming limited and awareness of STEM education needs also limited	T&L Center or other formal programming is broad in scope but does not address particular needs of STEM faculty	T & L Center or similar structure supports STEM faculty with customized workshops for STEM teaching and learning	T&L Center or similar structure offers responsive programming that includes workshops and consultation to meet the needs of STEM faculty; Center reaches out to STEM faculty	
8	Faculty orientation and mentoring for teaching role		Instructors receive no formal orientation to institutional or departmental policies and practices. Mentoring of any type is informal if present	Mandatory, single-session orientation for new faculty/staff to institution includes little or no orientation to development of scientific teaching. If present, mentoring for teaching is informal and rarely includes adjunct instructors	Orientation includes additional informal gatherings around development of teaching skills for first-year instructors (optional for adjunct instructors). Formal mentoring occasionally includes pedagogy	Multiple, formal orientation sessions around teaching are mandatory for new faculty/staff, including adjuncts, throughout the first year. Designated formal mentor is well-versed in pedagogy	All of conditions to achieve a score of 3 exist; in addition, on-going institutional/ departmental discussions around teaching encourage continuing effort to learn throughout the pre-tenure period	
9	Institutional support for faculty course development		Course development/ renovation is not recognized as an important activity; such work is discouraged; no impact on load	Course development/ renovation is not recognized as an important activity, but not actively discouraged; no impact on load	Course development/ renovation is recognized as an important activity; no impact on load	Course development/ renovation is recognized as an important activity; reduced load is granted	All the conditions to achieve 3 are present; faculty are encouraged to experiment and given flexibility to design pilots	

FACULTY PRACTICE/FACULTY SUPPORT

	Factors	Weight	0 (not observed)	1 (initial stages)	2 (average)	3 (very good)	4 (excellent, exemplary)	Final Score
10	Institutional support for faculty training in emerging areas		Faculty are discouraged from taking time for such training	Faculty who participate in such training do so without financial support	Faculty who participate in such training can request support; occasionally granted	Faculty who participate in such training can request support; frequently granted	The department/institution has funds designated for such activities and faculty are encouraged to use it	