Teaching for PROWESS Vision & Transformation Catalyst Tool - INSTRUCTION Rubric

Please read the entire Introduction before completing the Rubric

The Teaching for PROWESS (TfP) Vision & Transformation Catalyst Tool* is a diagnostic tool designed to be used in a self-study to evaluate the implementation of the recommendations of the AMATYC Standards (referring to *Crossroads in Mathematics*, *Beyond Crossroads*, and *IMPACT*) in mathematics departments. The work is based on the extensive work of Partnership for Undergraduate Life Science Education (PULSE)** which was focused on Biology in 4-year institutions. They have been modified based on the features expected in a 2-year college math department that has fully implemented all of the AMATYC recommendations. They are meant as tools to highlight the areas where departments stand out and areas where departments have made less progress.

The complete Teaching for PROWESS Vision & Transformation Catalyst Tool contains 8 rubrics**:**
1) Student Learning and the Learning Environment, 2) Instruction, 3) Curriculum and Program Development, 4) Assessment of Student Learning, 5) Diversity, Equity, and Inclusion, 6) Professionalism, 7) Climate for Transformation, and 8) Snapshot.

Terminology: The rubrics can be used to evaluate individual departments, or a division composed of mathematics faculty (either full-time or part-time) which will be referred to as 'departments' in this document. The use of the term 'faculty' throughout the rubrics is meant as a generic term for the range of possible titles for all those who are instructors in any course that is part of the department being evaluated.

Procedure: Once a department chooses an area, or areas, they would like to examine, the faculty should then individually determine scores for the rubrics. Each criterion begins with a **CONTEXT** section that should be read *prior to* reading the criterion's descriptors. Once a score for a criterion is determined it is important to document the justification in the appropriate section of the table. After the individual results are completed, the department should determine and report a consensus score for each criterion. For more information and suggestions on completing this process, refer to the Rubric FAQs on the teachingforprowess.wordpress.com website.

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Rubric II - Instruction (14 criteria)

This rubric assesses the extent to which mathematics faculty use a variety of instructional strategies that reflect the results of research to enhance student learning. Effective mathematics instruction requires a variety of resources, materials, technology, and delivery systems. Using multiple strategies in the classroom will increase the level of engagement of students and open opportunities for more students to be actively involved in the learning of mathematics. Categories include: A) Pedagogy, B) Student Higher Level Learning, and C) Learning Activities Beyond the Classroom.

A. PEDAGOGY

AMATYC's Standards for Pedagogy (*Crossroads,* 2023) that follow recommend the use of instructional strategies that provide for student activity and student-constructed knowledge. Evidence-based strategies which can be incorporated by most teachers without requiring substantial faculty development are highlighted in these standards. Furthermore, the standards are in agreement with the instructional recommendations contained in *Common Vision* (2015).

CRITERION A1: Active learning

CONTEXT*:* Faculty will facilitate active learning that promotes increased and deeper mathematical and statistical reasoning abilities in students. Widespread implementation of high-quality active learning can help reduce or eliminate achievement gaps in STEM courses and promote equity in higher education.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
1	**Active learning**	No faculty foster active learning in the classroom	Few faculty foster active learning in the classroom	Some faculty foster active learning in the classroom	Many faculty foster active learning in the classroom	Most faculty foster active learning in the classroom and are well aware of the Active Learning principles

Justification A1 (Required):

A. PEDAGOGY

CRITERION A2: Making mathematical connections

CONTEXT*:* Faculty will actively involve students in meaningful mathematics work that connects to students' experiences and focuses on broad mathematical and statistical themes that build connections within branches of mathematics, and with other disciplines. Students will view mathematics and statistics as relevant to their lives. Making mathematics and statistics relevant and meaningful is the collective responsibility of faculty, administrators, and producers of instructional materials.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
2	**Making mathematical connections**	No faculty actively involve students in meaningful mathematical problems	Few faculty actively involve students in meaningful mathematical problems	Some faculty actively involve students in meaningful mathematical problems	Many of faculty actively involve students in meaningful mathematical problems	Most of faculty actively involve students in meaningful mathematical problems

Justification A2 (Required):

A. PEDAGOGY

CRITERION A3: Multiple problem solving strategies

CONTEXT*:* Faculty should help students become flexible problem solvers by allowing students to discover multiple problem solving strategies and to identify efficient strategies.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
3	**Multiple problem solving strategies**	No faculty help students become flexible problem solvers	Few faculty help students become flexible problem solvers	Some faculty help students become flexible problem solvers	Many of faculty help students become flexible problem solvers	Most of faculty help students become flexible problem solvers

Justification A3 (Required):

A. PEDAGOGY

CRITERION A4: Multiple representations of mathematical concepts

CONTEXT: Mathematics faculty will provide opportunities for students to use, share, and make sense of multiple representations of mathematical ideas, including words, equations, different algebraic notations, graphs, diagrams, models, manipulatives, and computer code, to encourage and feature multiple approaches for solving problems.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
4	**Multiple representations of mathematical concepts**	No faculty model the use of multiple representations of mathematical concepts to solve problems	Few faculty model the use of multiple representations of mathematical concepts to solve problems	Some faculty model the use of multiple representations of mathematical concepts to solve problems	Many faculty model the use of multiple representations of mathematical concepts to solve problems	Most faculty model the use of multiple representations of mathematical concepts to solve problems

Justification A4 (Required):

A. PEDAGOGY

CRITERION A5: Teaching with technology

CONTEXT*:* Faculty will use appropriate technology to promote deeper student learning and will model the use of technology.

A		0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
5	**Teaching and technology**	No faculty use appropriate technology in the classroom	Few faculty use appropriate technology in the classroom	Some faculty model the appropriate use of technology in the classroom.	Many faculty model the appropriate use of technology in the classroom	Most faculty model the appropriate use of technology in the classroom

Justification A5 (Required):

A. PEDAGOGY

CRITERION A6: Experiencing mathematics and statistics

CONTEXT*:* Faculty will provide learning activities beyond the scope of the classroom that promote independent thinking and challenge students to persistently pursue efforts over an extended time period.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
6	**Experiencing mathematics and statistics**	No faculty provide learning activities such as long-term projects to promote independent thinking	Few faculty provide learning activities such as long-term projects to promote independent thinking	Some faculty provide learning activities such as long-term projects to promote independent thinking	Many faculty provide learning activities such as long-term projects to promote independent thinking	Most faculty provide learning activities such as long-term projects to promote independent thinking

Justification A6 (Required):

A. PEDAGOGY

CRITERION A7: Assessment of student learning

CONTEXT*:* Faculty will incorporate multiple strategies for formative and summative assessments to inform future pedagogical practices and to help students recognize their current understanding.

A		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
7	**Assessment of student learning**	No faculty provide learning activities such as long-term projects to promote independent thinking	Few faculty provide learning activities such as long-term projects to promote independent thinking	Some faculty provide learning activities such as long-term projects to promote independent thinking	Many faculty provide learning activities such as long-term projects to promote independent thinking	Most faculty provide learning activities such as long-term projects to promote independent thinking

Justification A7 (Required):

B. STUDENT HIGHER LEVEL LEARNING

CRITERION B1: Opportunities for inquiry, exploration, and generalization in courses

CONTEXT: This criterion is focused on the degree to which inquiry-based learning is incorporated into courses. In other words, to what degree do students have the opportunity to engage in inductive and deductive reasoning, analyze data, craft and test hypotheses, and create mathematical models. Another key point here is that class time should not be dedicated solely to presentation of facts, but instead should expose students to mathematical thinking (conjecturing, justifying, generalizing, finding examples and non-examples, modeling, and problem solving) and statistical reasoning (data collection, hypothesis generation, model generation, hypothesis testing, data analysis, and drawing conclusions based on probability).

B		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
1	**Opportunities for inquiry, exploration, and generalization in courses**	Most courses do not provide opportunities for inquiry, exploration, and generalization; students have little exposure	Few courses have opportunities for inquiry, exploration, and generalization; a subset of students are exposed	Some courses have opportunities for inquiry, exploration, and generalization; many students are exposed	Many courses provide opportunities for inquiry, exploration, and generalization; most students are exposed and have opportunities to practice	Opportunities for inquiry, exploration, and generalization are the norm in all courses; nearly all students are exposed and have multiple opportunities to practice

Justification B1 (Required):

B. STUDENT HIGHER LEVEL LEARNING

CRITERION B2: Student metacognitive development

CONTEXT: This criterion addresses the degree to which instructors encourage students to take ownership of, and to reflect on, their own learning. Metacognition (thinking about your own thinking) is defined as the process of setting challenging goals, identifying strategies to meet them, and monitoring progress toward them. For scores of 3 or 4, instructors integrate the practice of effective learning strategies supported by cognitive research and incorporate reflection on learning into course assignments and assessments.

B		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
2	**Student metacognitive development**	Faculty do not guide students to reflect on and understand how to use learning strategies that are supported by cognitive research	Few faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research	Some faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research	Many faculty guide students to reflect on and understand how to use learning strategies that are supported by cognitive research	Most faculty routinely and intentionally guide students to reflect on and understand how to use learning strategies that are supported by cognitive research

Justification B2 (Required):

B. STUDENT HIGHER LEVEL LEARNING

CRITERION B3: Students' demonstration of metacognition

CONTEXT: This criterion pertains to the degree to which students reflect on their own learning preferences, tendencies, or strengths in the context of the course or course assignments. Measures are developed to assess students' understanding of and use of learning strategies that are supported by cognitive research and their ability to reflect on their own learning strategies. Explaining how students' metacognition is evaluated and providing quantitative information about the frequency and prevalence of students' practice of metacognition would support scores of 3 and 4 on this criterion.

B		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
3	**Students' demonstration of metacognition**	Students are not asked to demonstrate metacognitive practices that are supported by cognitive research	Students rarely reflect on their learning and have some knowledge and understanding of learning strategies that are supported by cognitive research	Students sometimes reflect on their learning and have awareness of and ability to use learning strategies that are supported by cognitive research	Students often reflect on their learning and have awareness of and ability to use learning strategies that are supported by cognitive research	Students frequently reflect about their learning and are adept at using strategies supported by cognitive research to improve learning outcomes

Justification B3 (Required):

B. STUDENT HIGHER LEVEL LEARNING

CRITERION B4: Student higher-order cognitive processes

CONTEXT: This criterion is focused on the type of thinking required of students and whether assignments and assessments are designed to give students adequate practice, particularly in developing higher order cognitive skills. A cognitively demanding task is not working with more complex symbolic expressions, for example, but rather is a task that requires critical thinking and both excites and motivates students to solve problems. The tasks go beyond doing and understanding mathematics and move towards student ownership of the mathematics.

B		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
4	**Student higher-order cognitive processes**	Assignments and assessments across the curriculum are focused on low-level cognitive processes.	Assignments and assessments across the curriculum are typically at lower cognitive levels, but a few may require higher-order cognitive processes.	Some assignments and assessments across the curriculum require higher-order cognitive processes.	Many assignments and assessments across the curriculum require higher-order cognitive processes.	Student work at higher cognitive levels is the norm across the curriculum, and instructors are adept at developing assignments and assessments that require higher-order cognitive processes.

Justification B4 (Required):

C. LEARNING ACTIVITIES BEYOND THE CLASSROOM

CRITERION C1: Instructor disposition and availability

CONTEXT: This criterion addresses the need for quality student-faculty interaction outside of the classroom in which faculty are welcoming and supportive of their students' success. It addresses the extent to which instructors are perceived to authentically care about their students, understand obstacles they face, validate, and answer questions, and consistently monitor students' progress in the course.

C		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
1	**Instructor disposition and availability**	Instructors generally are not available beyond classroom hours and are perceived as distant, unresponsive, or uninterested in student success	Instructors are available beyond classroom hours, but are perceived as distant, unresponsive, or uninterested in student success	Instructors are typically available beyond classroom hours, and many of the instructors are perceived as available, welcoming, and supportive of student success	Instructors are typically available beyond classroom hours, and most instructors are perceived as available, welcoming, and supportive of student success	Nearly all instructors are routinely available beyond classroom hours and are perceived as available, welcoming, and supportive of student success

Justification C1 (Required):

C. LEARNING ACTIVITIES BEYOND THE CLASSROOM

CRITERION C2: Accessibility of supplemental assistance for student success

CONTEXT: This criterion addresses whether the department and/or institution offers supplemental assistance that meet the needs of students. The college must provide appropriate spaces and resources (such as technology) that support this assistance. Supplemental assistance must be available at convenient times for students, free to students, and have sufficient capacity. These opportunities may include tutoring, peer mentoring, supplemental instruction, academic advising, and student learning communities.

C		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
2	**Accessibility of supplemental assistance for student success**	Supplemental assistance opportunities are absent	One or two supplemental assistance opportunities are offered, but accessible to few students	Supplemental assistance opportunities are diverse, but only accessible to some students	Supplemental assistance opportunities are diverse, widely accessible to many students	Supplemental assistance opportunities are diverse, widely accessible to all students, and institutionalized by permanent funding

Justification C2 (Required):

C. LEARNING ACTIVITIES BEYOND THE CLASSROOM

CRITERION C3: Student participation in supplemental assistance opportunities

CONTEXT: This criterion assesses the percentage of students that actually utilize the supplemental assistance opportunities outlined in C2.

C		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
3	**Student participation in supplemental assistance opportunities**	Supplemental assistance opportunities are utilized by less than 10% students	Supplemental assistance opportunities are utilized by 10-25% of students	Supplemental assistance opportunities are utilized by 26-50% of students	Supplemental assistance opportunities are utilized by 51-75% of students	Supplemental assistance opportunities are utilized by greater than 75% of students

Justification C3 (Required):

C. LEARNING ACTIVITIES BEYOND THE CLASSROOM

CRITERION C4: Student opportunities for experiential learning activities outside of the classroom

CONTEXT: This criterion addresses whether the institution offers activities for the students to engage in outside of the classroom to enhance their mathematics education. These opportunities may include, but are not limited to: 1) interest-based or career oriented clubs (clubs organized around STEM and/or mathematics specifically) with multiple events throughout the year; 2) internships or service learning that includes a report about the experience; 3) competitions related to STEM and/or mathematics specifically (such as AMATYC's Student Mathematics League and Student Research League); or 4) undergraduate research.

C		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
4	**Student opportunities for experiential learning activities outside of the classroom**	No opportunities exist	One activity is offered to students within an academic year	Two activities are offered to students within an academic year	Three or four activities are offered to students within an academic year	Five or more activities are offered to students within an academic year

Justification C4 (Required):

C. LEARNING ACTIVITIES BEYOND THE CLASSROOM

CRITERION C5: Student participation in experiential learning activities outside of the classroom

CONTEXT: This criterion assesses the percentage of students that actually utilize the opportunities to engage in activities outside of the classroom outlined in C4.

C		(0) Baseline	(1) Beginning	(2) Developing	(3) Accomplished	(4) Exemplar
5	**Student participation in experiential learning activities outside of the classroom**	No mathematics students participate in these types of activities	Less than 5% of mathematics students engage in at least one activity within an academic year	About 5-10% of mathematics students engage in at least one activity within an academic year	About 10-15% of mathematics students engage in at least one activity within an academic year	More than 15% of the mathematics students engage in at least one activity within an academic year

Justification C5 (Required):