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Expanding the EvaluateUR Method and Aligning its Outcomes to ABET Student Outcomes with Support from the NSF ATE Program

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Jill Singer is a geologist interested in the transport and deposition of sediments. She has an MA and PhD from Rice University where she investigated glacial marine sediments in the bays and fjords of the northern Antarctic Peninsula. Dr. Singer is a SUNY Distinguished Teaching Professor and for the past 35 years has taught in the Earth Sciences Department at SUNY Buffalo State University. Dr. Singer has been actively involved in restoration efforts of the Buffalo River and her experiences include projects funded by the National Science Foundation, United States Environmental Protection Agency, and the US Department of Justice Environment and Natural Resources Division. For 20 years, Dr. Singer served as the director of the Buffalo State Office of Undergraduate Research and administered programs that supported students in all academic majors. With funding from the National Science Foundation Division of Undergraduate Education Dr. Singer has developed and disseminated an evaluation method designed to assess student learning and student growth from participating in undergraduate research. This method, known as the EvaluateUR method, is now available to support independent research, course-based undergraduate research experiences, collegiate competitions, and internships.

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Abstract

The EvaluateUR Method measures student learning by providing statistically reliable assessments in a wide variety of outcome categories, including disciplinary and employability skills. Four variants of the method allow it to be used in a range of different settings including independent research, course-based research experiences, business or industry internships, and collegiate competitions. The method serves as a learning tool preparing students to further their academic careers and enter the workplace by helping them identify and leverage disciplinary knowledge while building their strategies for overcoming obstacles, problem-solving and communication skills, and other technical skills essential for career readiness. The EvaluateUR Method fosters a cyclical process of planning, monitoring, and evaluating, which are core elements of metacognitive practice. All the EvaluateUR Method variants share common assessment phases, with each including opportunities for self-reflection and dialog with mentor(s) or internship supervisors. With support from the NSF Advanced Technological Education (ATE) program, the method is being expanded to allow greater flexibility by introducing options within each variant. To provide greater flexibility two scoring options are now available: (1) both students and mentors score the assessments, and (2) only the students score the assessments. A new option for shorter duration course-based research experiences has also been developed. The set of outcome categories and their defining components used by all four variants have been mapped to the performance indicators associated with ABET Engineering Accreditation Commission (EAC) and Engineering Technology Accreditation Commission (ETAC) Criterion 3 Student Outcomes. The EvaluateUR Method has been shown to reliably measure student learning and promotes metacognitive growth and reflective practice among students.

Background

The EvaluateUR Method is a web-based platform that provides statistically reliable assessments of student learning growth in a wide variety of outcome categories identified as essential to success in the workplace, such as communication capabilities, creativity, autonomy, ability to overcome obstacles, critical thinking, problem-solving capabilities, and project management. Details about the development and validation of the method are described in several papers [1], [2], and [3]. The EvaluateUR Method is integrated directly into the research and engineering design experiences and supports metacognitive growth by helping students learn and practice the discipline of realistic self-assessment. The initial development of the method took place at SUNY Buffalo State University and was led by Singer and Weiler and validated by Zimmerman as described in [4] and [5]. The initial variant of the method was designed to support students conducting summer research with faculty serving as a mentor for each student. With support from the NSF WIDER program, EvaluateUR was scaled to the national level and hosted by the Science Education Resource Center (SERC) at Carleton College. With additional funding from

the NSF ATE program, new variants were introduced to support more educational activities. As shown in Table 1, currently there are four variants of the method each designed to reflect differences in research settings: EvaluateUR for summer and academic year research; EvaluateUR-CURE for course-based research experiences; Evaluate-Internship for students conducting internships; and Evaluate-Compete for students participating in collegiate competitions. While each of these variants were designed to address differences in the nature of the experience, all variants share common features indicated in Table 2 and emphasize several key attributes including: (1) focus on using metacognitive skills to analyze problems and assess and adjust strategies to solve problems' (2) repeated scoring of assessments followed by conversations to encourage students' self-reflection, confirm their identification of strengths and weaknesses, providing opportunities for students to make adjustments as needed; and (3) increased awareness of workplace skills gained through the experience.

Table 1. Four Variants of the Method Designed for Specific Research Settings with Options for Each Variant

Variant	Intended Experience	Option	Recommended Use & Description	Availability
EvaluateUR	Academic year or summer undergraduate research	Standard	Student-mentor pairs with frequent interactions between student and mentor. Students complete initial assessment and both students and mentors complete mid-research and end-of-research assessments.	Annual subscription
		Student-Only	Student self-assessment is primary method of evaluation and only students score initial, mid-, and end-of-research assessments. Useful for larger research programs where mentors are less familiar with research student they are mentoring.	Annual subscription
		Small	Designed for smaller programs where a single individual is mentoring 3 or fewer students. Due to the small number of research students, no summary statistics are provided.	Available at no cost
EvaluateUR-CURE (E-CURE)	Course-based undergraduate research experiences (CUREs)	Standard	One Quarter/Semester CUREs where a research project is the primary activity in the course. CURE instructor selects outcomes categories best aligned with research component. Students score assessments (early, mid-point, and end) and CURE instructor scores mid- and end assessments for each student.	Available at no cost
		Extended	Two Quarter/Semester CUREs where research project is primary activity in both quarters/semesters of course. Similar to E-CURE Standard option but includes additional assessment providing feedback to students in both quarters/semesters.	Available at no cost
		Standard Student-Only	One Quarter/Semester CUREs where instructor-student interaction limited due to large class size, less frequent direct interactions between students and CURE instructor, or any situation where CURE instructor opts not to score students. Scored only by students.	Available at no cost
		Short Student-Only	One Quarter/Semester CURE with shorter duration or smaller-scale research projects. Designed for CUREs where research is partial course component. Due to smaller scale/shorter duration project, only two assessments are scored by students.	Available at no cost
Evaluate-Compete (E-Compete)	Team-based competitions (e.g., engineering and technology design, robotics, solar)	Standard	Assessments scored by both team advisor(s) and students. Intended for teams that have frequent interactions with team advisor(s).	Available at no cost
		Student-Only	Designed for situations with larger teams or teams that work independently with less regular interactions with team advisor(s).	Available at no cost
Evaluate-Internship (E-Internship)	Professional or industry internships	Student-Only	Student self-assessments to evaluate internship experience, providing insights into their learning and professional development.	Available at no cost

Table 2. Key Features of the EvaluateUR Method

Students assessed in range of outcome categories defined by components that include both content knowledge and outcomes important in the workplace.
Option to add additional outcomes that reflect specific course or program-wide objectives.
Before research/project begins, students answer open-ended questions to share their thoughts about the research/design process.
Multiple opportunities for students to score assessments using a five-point scale and accompanying scoring rubric to indicate how often an outcome was observed (5-Always to 1-Not yet).
Conversations/debrief sessions are conducted after assessments providing opportunities for students and mentors/advisors/internship supervisors to consider progress and help students understand their strengths and weaknesses in achieving these outcomes and developing or enhancing related metacognitive skills.
Following each assessment, students have access to report showing scores assigned to outcome components. Summary statistics are available to instructors/advisors and useful for conducting individual/group/whole class conversations.

To provide flexibility and account for the size of the cohort and degree of direct interactions between the student and the mentor, instructor, or internship supervisor, two scoring options are available: (1) assessments scored by both the student and mentor and (2) assessments scored only by the students. All assessments are done online and a tracking dashboard is provided to monitor completed steps and steps to be completed. The system has built-in reminders about actions that need to be taken as well as a built-in package that summarizes the assessment data with commonly used statistical measures.

Current Work

To expand the community of users while maintaining coherence with the established EvaluateUR Method, the current work funded by NSF #2325397 addresses several barriers to adoption. Our approach involves modifications to the key features (refer to Table 2) rather than introducing fundamentally different assessment procedures. The barriers and how they are being addressed include:

(1) ***Assessment participation and interaction constraints.*** Some faculty and lab directors are willing to mentor undergraduate research students but, due to cohort size, interaction patterns, or time constraints, face challenges in completing independent assessments of student progress as required by the EvaluateUR method. To reduce this barrier while maintaining the reflective function of the method, options were developed for each variant in which assessments are scored only by students.

(2) ***Addition of a variant for internships.*** Prior versions of the method did not explicitly support students participating in internships, where supervisory relationships and learning contexts differ from academic research settings. A new E-Internship variant was developed to reflect these differences while retaining common outcome components and assessment phases, enabling comparison of learning patterns across experiential contexts.

(3) ***Scale and duration limitations***. Many courses include research or design components that fall below the scale typically classified as a course-based undergraduate research experience

(CURE). To address this gap, an E-CURE option was developed for shorter-duration or smaller-scale research and design projects.

(4) ***Access and resource constraints.*** The subscription fee required to support essential technical infrastructure presents a barrier for community college and other faculty mentoring only a small number of undergraduate research students each year. To increase access, a no-cost option was developed for faculty mentoring three or fewer students, allowing participation in the shared assessment framework and inclusion in longitudinal monitoring.

(5) ***Community support and practice visibility.*** The absence of a centralized mechanism for supporting users limited opportunities for shared learning and consistent practice. To address this, a community forum will be introduced in early 2026 to allow members of the EvaluateUR community to pose questions, share implementation strategies, and share emerging practices.

In addition to these changes, the EvaluateUR Method website was reorganized to support asynchronous orientation and consistent implementation across variants and options. Navigation was improved and new resources were added, including theoretically aligned and updated informational videos and flowcharts outlining the steps for each variant.

The above changes are being monitored to ensure their effectiveness. The core structure and reflective cycle of the EvaluateUR Method have been previously developed and validated through multiple studies and years of use across diverse undergraduate research experiences. The current work does not alter the foundational assessment phases or outcome constructs of the method. Rather, it introduces additional variants and options designed to increase accessibility, flexibility, and contextual fit while preserving the underlying metacognitive and reflective conversations that define the method. As these variants and options continue to be refined, effectiveness will be monitored through an ongoing, developmental approach aligned with the method's emphasis on reflective practice. In addition, qualitative evidence drawn from reflective prompts, debrief conversations, and user feedback will inform iterative refinement of variants. This approach treats validation not as a one-time confirmation of a fixed instrument, but as ongoing stewardship of a reflective assessment practice.

Relevance of the ATE-funded project to Engineering Technology and Engineering Faculty

One aspect of the current project should be especially relevant to faculty in engineering technology and engineering programs that currently have or are interested in obtaining or renewing ABET accreditation. Preparing materials for ABET review, data that provide several assessment tools of student learning and program continuous improvement are valuable. The method's outcomes have been mapped to ETAC and EAC Criterion 3 Student Outcomes (SOs) using a set of performance indicators (PIs). Performance indicators provide a focused approach to measuring students' attainment of intended outcomes. Each ETAC or EAC ABET required SOs are further narrowed down to the set of PIs. These indicators are constructed based on capabilities, which in turn, are defined as what an individual is expected to know and be able to do by the time of entry into professional practice in a responsible role and consists of knowledge, skills, and attitudes. In the context of undergraduate engineering and engineering technology education, capabilities are considered as what students should know and be able to apply by the

time of graduation and therefore are considered as granular components of student outcomes. Compilation of PIs was based on NSPE body of knowledge capabilities necessary for entry into professional practice [6]. Side-by side comparison between granular performance indicators of Criterion 3 SOs and EvaluateUR method outcomes reveals similarities in construct with respect to wording and intent. The initial efforts showing the alignment between E-CURE outcomes and SOs is presented in [1]. The mapping was expanded to include E-Compete and described in [2]. This mapping of outcome components to ETAC and EAC has been further refined and expanded to include E-Internship. The mapped outcome components for the three variants are found on the website [7]. Examples of mapping E-CURE outcomes to ABET Criterion 3 Student Outcome 3 are presented in Table 3. While individual programs might define PIs differently, the mapping available on the project website gives examples of how using one of the EvaluateUR Method variants complements ABET criteria.

Table 3. Example of Mapping Evaluate UR-CURE Outcome Components to ABET Criterion 3

Evaluate UR-CURE Outcome Components	**ABET ETAC Outcome 3 "An ability to apply written, oral, and graphical communication in both technical and non- technical environments, and an ability to identify and use appropriate technical literature"**	**ABET EAC Outcome 3 "An ability to communicates effectively with a range of audiences"**
Communication		
1a. Uses and understands professional and discipline-specific language. 1b. Expresses ideas orally in an organized, clear, and concise manner. 1c. Writes clearly and concisely using correct grammar, spelling, syntax, and sentence structure.	PI1. An ability to apply written, oral, and graphical communication in both technical and non-technical environments.	PI1. An ability to apply written, oral, and graphical communication in both technical and non-technical environments.
Nature of disciplinary knowledge		
8c. Reads and applies information obtained from professional journals and other sources. 8a. Shows understanding of the criteria for determining what is valued as a contribution in the discipline. 8b. Shows awareness of important contributions in the discipline and who was responsible for those contributions.	PI 2. An ability to identify and use appropriate technical literature.	PI 2. An ability to identify and use appropriate technical literature.

Concluding Remarks

To serve the needs of engineering and engineering technology programs, the EvaluateUR method has variants and options for a wide range of course-based and independent undergraduate

research experiences, engineering and engineering technology design projects, and internships. While the method is designed to serve as a learning tool and be of greatest benefit to the students, data collected from open-ended questions and survey items provide evidence about learning outcomes as well as the identification of strategies to improve student and program outcomes. As the EvaluateUR Method continues to evolve, monitoring across contexts will ensure that new variants and options remain aligned with the method's intended purpose of fostering metacognitive growth, meaningful reflection, and increased awareness of disciplinary and workplace-relevant learning outcomes.

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