



Center for Community  
Solutions



Sustainability



# Advancing Sustainability Literacy in the University of California

*Experience & Findings from UC Riverside's  
Inaugural Assessment*

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# Acknowledgements

January 2026

*Advancing Sustainability Literacy in the University of California: Findings from UC Riverside's Inaugural Assessment was prepared by the UCR Office of Sustainability and the UCR Center for Community Solutions. This report and project were funded directly by the University of California, Office of the President (UCOP), and the Global Climate Leadership Council (GCLC).*

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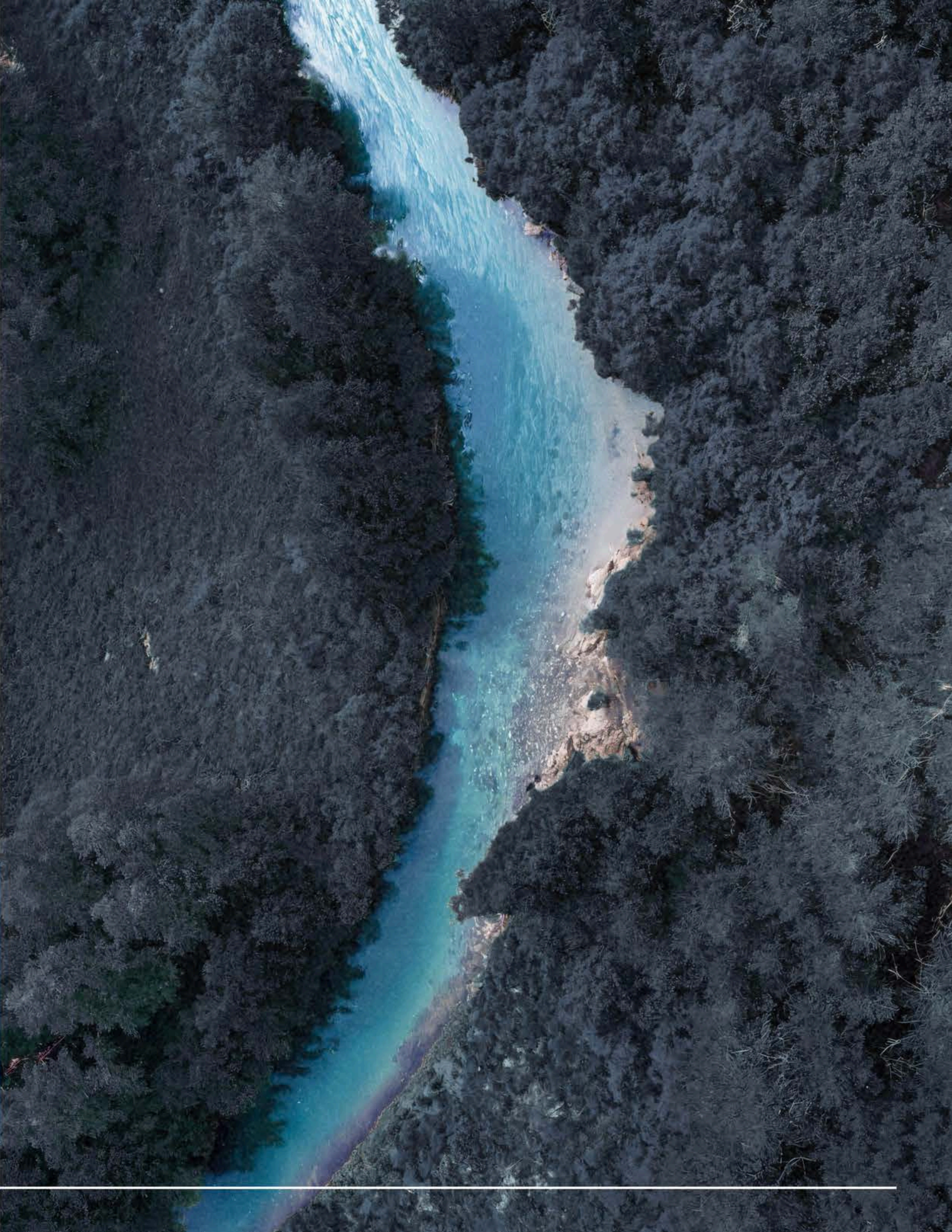
# Executive Summary

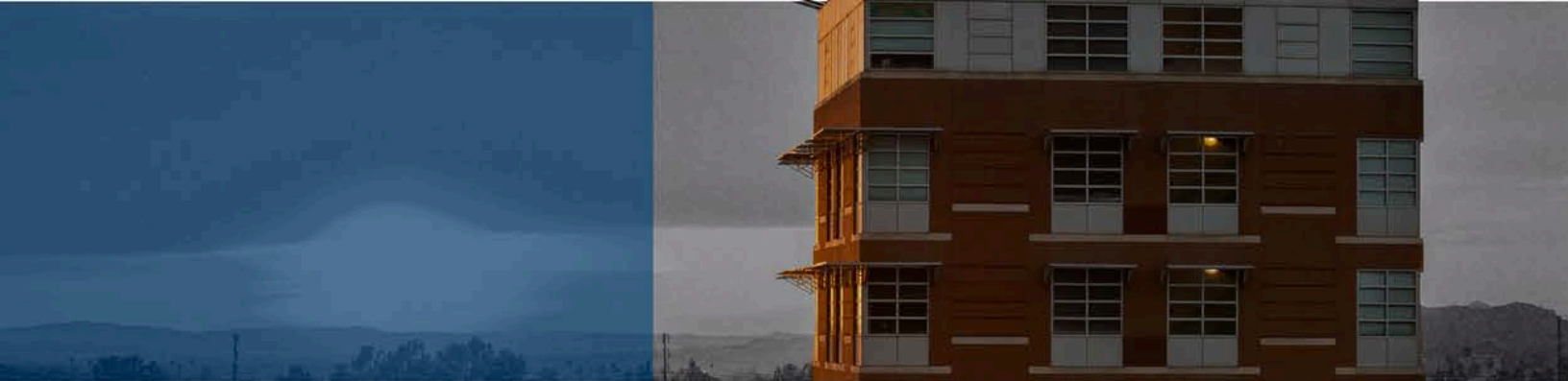
Sustainability literacy, or the knowledge, skills, and mindsets necessary to make informed and effective decisions for a sustainable future, is increasingly recognized as essential for preparing students to address environmental, social, and economic challenges. With generous financial support from the UC Office of the President (UCOP) and their Global Climate Leadership Council (GCLC), in 2025, the University of California, Riverside (UCR) administered an inaugural sustainability literacy assessment to measure student knowledge across the environmental, social, and economic domains of sustainability. The assessment was developed through a rigorous process, drawing from over 400 literature-based questions and refined to 14 validated items, each reviewed by academic and professional experts. Pilot testing in select courses informed final revisions before campus-wide administration, which yielded over 2,400 responses from a broadly representative sample.

Results provide some indication that students are gaining sustainability knowledge as they progress through their education. The mean score for all respondents was 9.5 out of 14 (68%), with seniors scoring significantly higher than freshmen (71% vs. 61%,  $p < 0.001$ ). Scores varied across colleges, with the School of Public Policy achieving the highest mean. While no significant differences were observed by gender, first-generation students scored statistically significantly lower than non-first-generation students, although the difference in means is relatively small (65% vs. 71%,  $p < 0.001$ ). This difference highlights potential areas for targeted education support. Overall, these results provide some preliminary evidence that a UCR education fosters sustainability literacy, and the assessment results provide opportunities for curriculum development and campus-wide sustainability initiatives.

The assessment also offers practical guidance for other institutions aiming to measure and enhance sustainability knowledge. Effective implementation includes piloting, multi-modal promotion, strategic timing, and modest incentives to increase participation. Designed to be adaptable, this survey-based assessment framework and instrument can be tailored to individual campus priorities, local environmental issues, and institution-specific initiatives. By generating standardized, comparable evidence of student sustainability knowledge, the UCR sustainability literacy assessment supports campus-level planning, contributes directly to AASHE STARS reporting, and advances broader systemwide efforts to strengthen sustainability education.







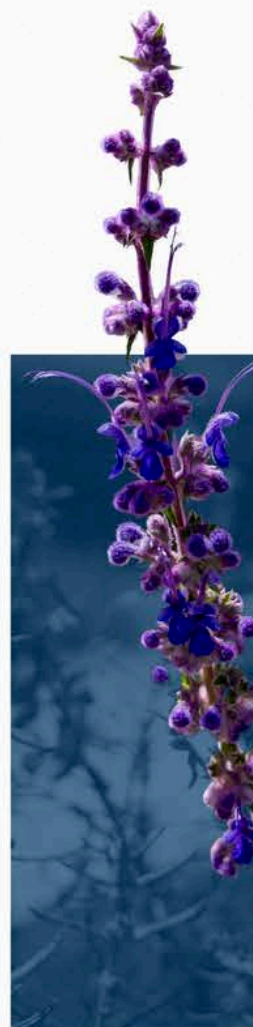
## Introduction

Sustainability literacy is defined as the “knowledge, skills and mindsets that allow individuals to become deeply committed to building a sustainable future and assisting in making informed and effective decisions” (Raising Awareness and Assessing Sustainability Literacy, 2018). As environmental issues related to climate change become more prominent, fostering sustainability knowledge in younger generations is increasingly important. Many within the field of sustainability literacy posit that a population equipped with credible and actionable sustainability knowledge is a necessary precondition for achieving a more sustainable society (Kuehl et al., 2023).

In partial recognition of this precondition, the Association for the Advancement of Sustainability in Higher Education (AASHE) integrated sustainability literacy assessments directly into their Sustainability Tracking, Assessment & Rating System (STARS), a system to delineate sustainability efforts on university campuses. AASHE STARS provides a standardized, credible framework for integrating and measuring sustainability across institutions. In this way, sustainability literacy assessments offer direct evidence that students are acquiring the knowledge and competencies necessary to advance sustainability beyond the campus and after the conclusion of their studies.

As the demand has increased for both sustainability research and practice, so has the demand for direct measures of student sustainability knowledge and literacy (Kuehl et al., 2023). UCR’s sustainability literacy assessment contributes to this growing body of assessment efforts by providing institution-level evidence of student learning across the social, environmental, and economic domains of sustainability.. Funded by the University of California Office of the President (UCOP), the inaugural sustainability literacy assessment was administered during the Winter and Spring Quarters of 2025.

The planning for UCRs sustainability literacy assessment started in 2023, focused on organizing sustainability literacy and environmental literacy questions or “items” into a question bank. After the item pool was attenuated, each question was modernized for the purposes of this assessment and corresponds in substance to one of the domains of sustainability, the triple bottom line: planet, profit, people. The remainder of this report outlines the assessment’s design and piloting process, presents and discusses the results of the inaugural administration, and concludes with practical guidance for future sustainability literacy assessments.



# Assessment Design + Guiding Literature

A few theoretical frameworks are commonly used to structure sustainability literacy assessments. Common assessment frameworks draw on the United Nations Sustainable Development Goals and institution-specific priorities. Some assessments instead adopt some version of a cognitive, affective, behavioral framework model to evaluate what students know, believe, and do as part of their literacy assessments. The UCR assessment, like many others, uses the triple bottom line as a guiding framework to measure sustainability literacy. Each question in the assessment corresponds to one of the social, economic, or environmental domains of sustainability. Environmental sustainability focuses on protecting natural systems and resources, and social sustainability centers on people, communities, and their needs. Finally, economic sustainability involves maintaining economic systems that are viable and resilient over time.

To begin the assessment construction process, a review of sustainability literacy literature was necessary. After the primary searches were completed and the abstracts were reviewed, 57 articles were selected for full review. Research on sustainability and environmental literacy assessments is grounded in several overlapping theoretical frameworks that conceptualize sustainability literacy as a multidimensional construct, commonly, but not exclusively, encompassing cognitive (knowledge), affective (attitudes and/or values), and behavioral (actions, choices and behaviors) domains (Liang, 2018; Lloyd-Stravas, 2017). Many assessments additionally draw implicitly or explicitly on environmental literacy theory and education-for-sustainability frameworks. Assessment instruments, particularly those used for large-scale sustainability knowledge evaluations, are often structured around conceptual models that integrate the triple bottom line: the environmental (planet), social (people), and economic (profit) dimensions (Zwickle & Jones, 2017).

Psychometric theory increasingly informs assessment development, with item response theory, Rasch modeling, and factor analysis used to examine whether sustainability knowledge constitutes a coherent latent construct or a set of loosely connected competencies (Marshall, 2018; Kuehl, 2021; Hereen et al., 2016). This work highlights theoretical tension between top-down, expert-defined frameworks and bottom-up, empirically derived structures, with some studies questioning whether sustainability knowledge can be meaningfully unified. Recent approaches further distinguish between disciplinary and interdisciplinary learning, aligning assessment design with theories of interdisciplinary education that emphasize the importance of disciplinary grounding for integrative understanding (Marshall, 2018).

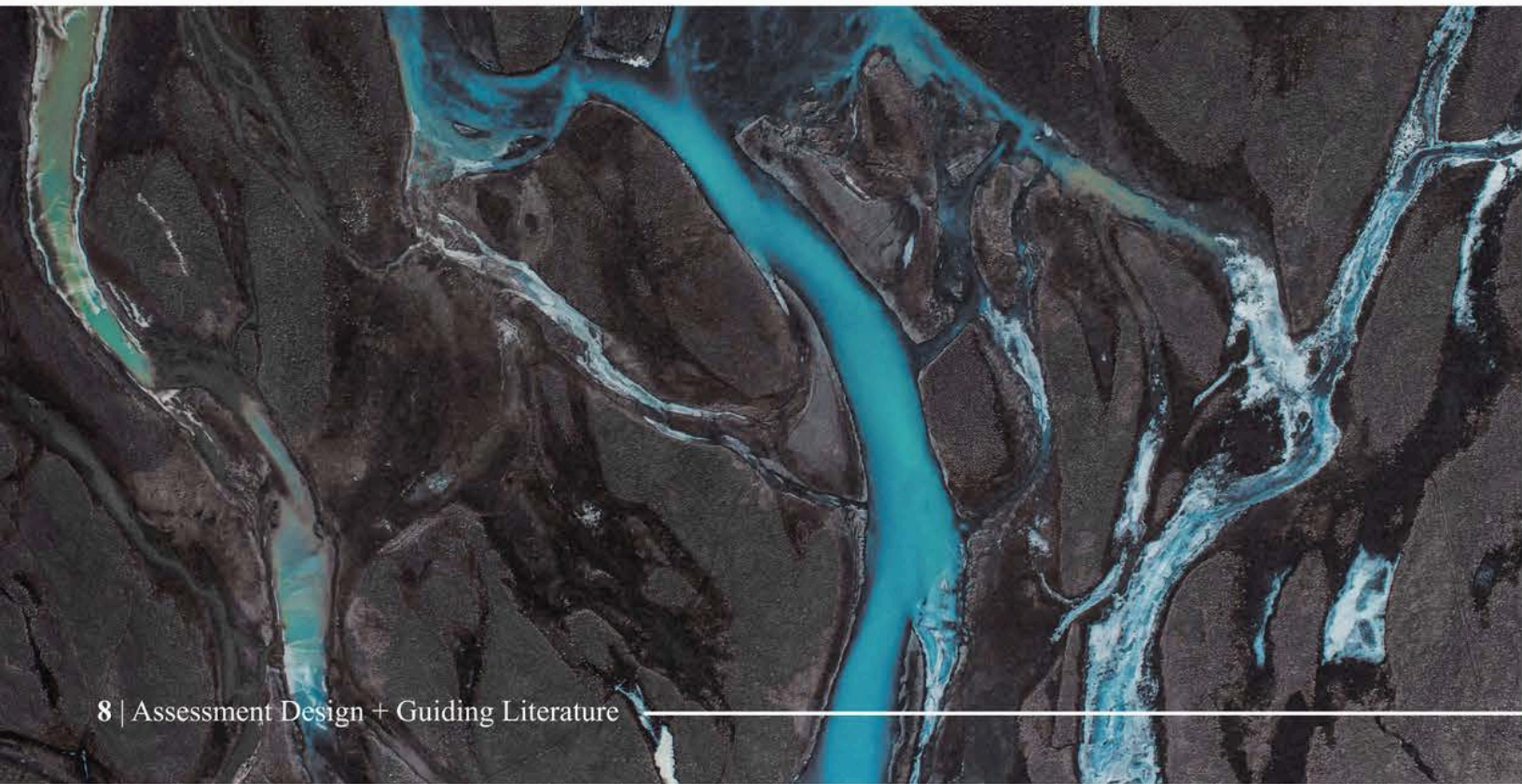
Institution specific frameworks have also shaped the theoretical and practical orientation of sustainability literacy assessments, situating student learning within the broader context of campus culture, institutional performance, and policy incentives (Callewaert, 2017; Horvath, 2013). By linking assessments to institutional metrics, these approaches reinforce a systems-level understanding of sustainability, where knowledge, attitudes, and behaviors are influenced by both curricular and organizational factors.

Collectively, this literature reflects an ongoing negotiation between normative sustainability frameworks, learning + sustainability theory, measurement theory, and institutional context, suggesting that sustainability literacy may be best understood and assessed as a context-dependent, pluralistic construct rather than a single, stable body of knowledge. Due to the wide breadth and diversity of sustainability literacy literature, as a basis for developing our own assessment, our review focused on identifying questions that have been commonly used for the assessment of college-level sustainability literacy. During the review process, any

complete questions (that contained full question stem and all answer choices) were compiled into a question bank; over 400 sustainability and environmental literacy questions were collected.

To fully develop our instrument, we administered a bottom-up development approach utilizing our compiled question bank, emulating the method found in Kuehl et al., 2023. This development approach begins with a large, diverse pool of questions which is then refined through multiple rounds of student pre-testing, expert review, and/or inclusion/exclusion criteria. This approach is valuable because it captures multiple conceptualizations of sustainability, creating a more robust instrument overall. Through successive rounds review utilizing expanding exclusion criteria, the 400 compiled questions were narrowed to 20. The objective of the elimination process was to retain items that most effectively assessed students' sustainability knowledge within specific domains of the triple bottom line. Questions were excluded if they exhibited substantial content overlap, inappropriate difficulty levels, or knowledge that was overly specific or beyond the intended scope of the assessment.

Subsequently, the remaining 20 questions were fact checked and modernized, incorporating updates or novel information where appropriate. To assess content validity, the remaining questions underwent three iterative rounds of review by both professional and academic experts. Content expert review is a standard step in assessment development in which subject-matter and methodological experts evaluate draft assessment items to determine whether the instrument adequately represents the construct (sustainability literacy) it is intended to measure. One round of expert review was conducted with faculty experts solely at UC Riverside; another round was conducted with faculty experts across the 10-campus UC system. Finally, a third round of review was facilitated by the Inland Southern California Climate Collaborative (ISC3), a group that includes environmental and climate experts in Riverside and San Bernardino counties. After incorporating expert review, the literacy assessment was narrowed to 14 final questions, or items.



# Testing, Results, & Discussion

## Item Testing + Pilot

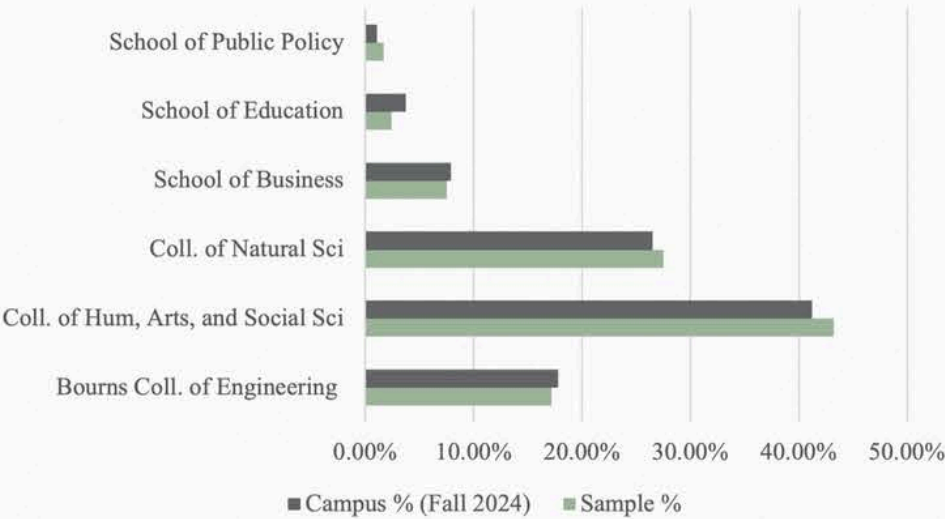
Our assessment was tested with one undergraduate honors energy seminar, one graduate level qualitative methods course, and one environment and society undergraduate course. In total, the assessment was tested on about 125 students. After the series of tests, the project team collected feedback and modified the assessment where necessary. The pilot assessment was administered to about 300 students in one undergraduate introductory public policy course.



## Assessment Participants



The sustainability literacy assessment was sent by email to all undergraduate students enrolled at UC Riverside. Additional reminders were sent intermittently during the assessment period. Incentives to participate were provided including gift cards and physical prizes. In total, the assessment received a response rate of about 11%, accounting for over 2,400 responses. Respondents were evenly distributed in terms of college composition at UC Riverside, included as Figure 1. In our sample, men were underrepresented (36% our sample vs. 46% UCR pop.) and women were overrepresented (59% vs. 51% of UCR pop.); other gender categories were not large enough for statistical power. The median GPA for our sample was 3.4 / 4.



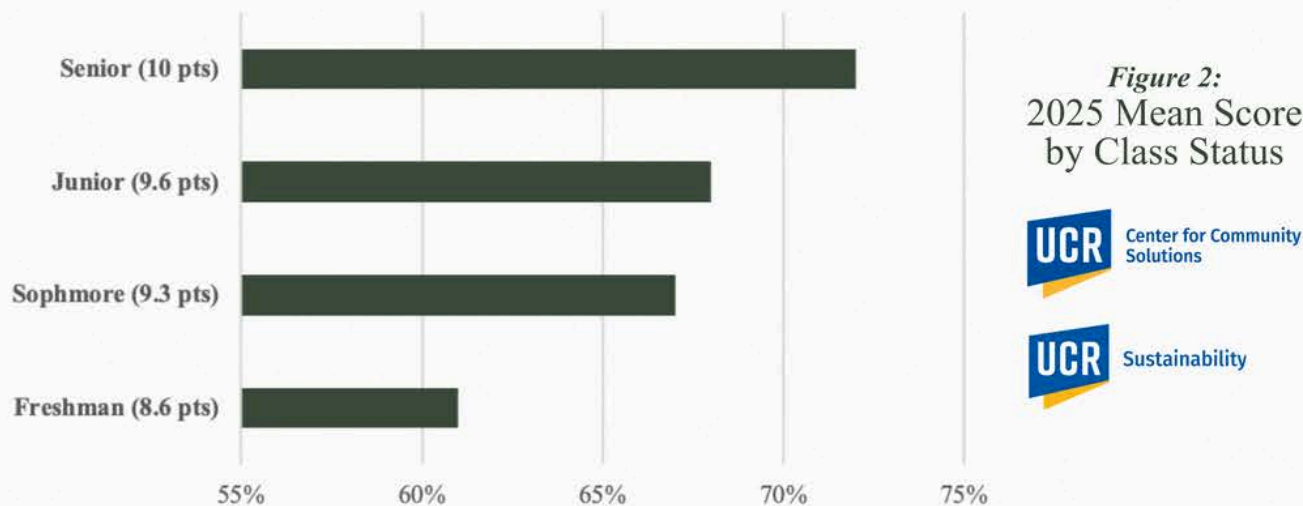
*Figure 1:*  
Sample & Campus  
Representativeness by  
College

With respect to underrepresented minority status, 38.9% of respondents identified as underrepresented minorities, compared to 43.8% of the total campus population, indicating a modest underrepresentation in the sample. Low-income students comprised 35.0% of the sample, slightly lower than their proportion in the UCR population (36.6%), while non-low-income students were somewhat overrepresented (63.4% vs. 61.0%). In contrast, first-generation student status closely mirrored the campus population: 48.0% of respondents identified as first-generation students compared to 49.1% campus-wide. Overall, our sample aligns closely with the UCR population on most measures, including both college enrollment and first generation student status.

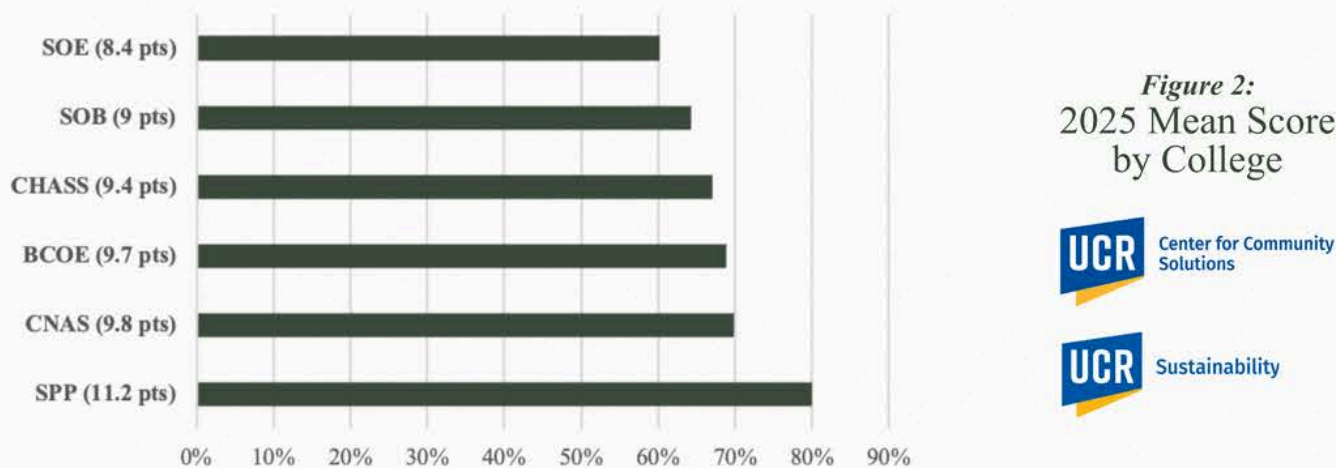
Results

Data was collected by UCR and transferred to the project team for analytical processing. Descriptive statistics were computed to summarize the dataset, followed by analyses of mean score differences across class status, gender, and first-generation status. Group-level differences were then evaluated using both ANOVAs and independent sample t-tests to assess statistical significance.

The total possible score for our assessment was 14; the mean score for the 2025 assessment sample was 9.5 points (68%), with the median falling just slightly higher, at 10 points (71%). The mean score by class status is included as Figure 2. The mean score for freshmen was 8.6 points or 61%, and the mean score for seniors was 10 points, or 71%. A one-way ANOVA revealed statistically significant differences in mean scores among classes ( $p < 0.001$ ). This provides preliminary evidence that students, at least in part, are gaining sustainability knowledge over the course of their education at UCR.



39% of respondents were underrepresented minorities; 35% of respondents were low income students. Men, on average had a mean score of 9.46 (68%), women had a mean score of 9.44 (67%). The difference in mean scores by gender was not statistically significant, as indicated by an independent sample t-test ( $p = 0.93$ ). The mean score for first generation students (65%) and not first generation students (71%) differed by about 1 point (9.03 vs. 9.95); the difference of means was statistically significant (ind. samples t-test),  $p < 0.001$ . Mean scores by UCR college are included as Figure 3; the School of Education had the lowest average score at 60% and the School of Public Policy scored the highest, on average, at 80%.



School of Public Policy (SPP) students score significantly higher on the sustainability literacy assessment compared with College of Humanities Arts and Social Sciences (CHASS) ( $p = .006$ ), School of Business (SOB) ( $p = .001$ ), and School of Education (SOE) ( $p < .001$ ) students. Finally, College of Natural and Agricultural Sciences (CNAS) students scored significantly higher than SOE students ( $p = .040$ ). Other pairwise comparisons do not show significant differences ( $p < 0.05$ ) after Bonferroni correction, however some results are marginally significant ( $p < .10$ ). Typically, SPP students score higher on the assessment than Bourns College of Engineering (BCOE) students ( $p = .051$ ), and SOB students generally score higher than CNAS students ( $p = .073$ ), but these differences are suggestive, and overall not strong enough to be considered significant.

The comparatively high mean score observed for the School of Public Policy (SPP) warrants further discussion. Several potential explanations may account for this outcome, though the possibilities outlined here are not exhaustive. First, the number of SPP students included in the sample is small ( $n = 42$ ), comprising approximately 2% of respondents. This reflects the broader institutional context: SPP is the smallest academic unit at the university, representing roughly 1% of total enrollment. Small sample sizes can increase the likelihood that observed means are influenced by atypical characteristics of the respondents.

Second, curricular and instructional factors may play a role. One of the instructors for both graduate level and undergraduate level Introduction to Public Policy, a course taken by many SPP students, is an environmental scientist. Exposure to sustainability-focused material early in public policy curriculum may contribute to elevated performance on a sustainability literacy assessment. Another potential explanation relates to the profile of students who typically pursue public policy degrees. Public policy students often exhibit strong interests in civic engagement, community issues, and sociopolitical processes. Higher levels of political and community engagement may correlate with increased familiarity with sustainability concepts, thereby contributing to higher assessment scores.

Finally, it is important to acknowledge the possibility of design-related bias. The assessment instrument was developed in part by staff and faculty affiliated with the School of Public Policy. Their involvement may have inadvertently shaped the assessment in ways that align more closely with public policy perspectives, potentially advantaging SPP students relative to other academic units. Additionally, the pilot's placement within an introductory public policy course may have introduced bias and advantaged students who later completed the inaugural assessment.

Overall, the sustainability literacy assessment offers valuable insights that can inform campus-wide sustainability initiatives and strategic planning. More specifically, the results can guide where existing coursework can be finetuned towards sustainability topics. In addition, the assessment highlights opportunities for the development of new courses or learning experiences aimed at addressing demonstrated gaps in sustainability knowledge across the student population. The assessment results provide preliminary evidence that education at UCR creates more sustainability literate individuals. This trend could reflect learning that occurs both within formal curricular settings and through co-curricular or extracurricular experiences. It is also possible that students, or young people in general, naturally develop greater sustainability knowledge as they progress through their academic and personal trajectories, independent of their specific duration of enrollment at the university.

# Practical Guidance for Sustainability Literacy Assessments

To promote the sustainability literacy assessment effectively, careful planning and multi-modal outreach are essential. At UCR the assessment was administered across two separate academic quarters which allowed the research team to update materials, re-engage students, and ultimately increase response rates despite the fast-paced quarter schedule. Promotion strategies should include both physical and virtual channels. Email marketing, campus flyers, and collaboration with campus facilities can help maximize visibility; as a more concrete example, the project team worked with the recreation center to promote the assessment on TVs at the campus gym. Timing is also important: survey administration should be scheduled to avoid overlap with other campus surveys and/or assessments, or alternatively, sustainability literacy questions can be incorporated into larger institutional surveys and/or assessments. Finally, offering modest incentives, such as e-gift cards or physical prizes, can further encourage participation and improve overall response rates.

When developing a sustainability literacy assessment, piloting the instrument in a small number of courses can help evaluate its clarity, engagement, and completion quality. Brief in-class administration allows for real-time feedback while minimizing burden on students. Following the pilot, sharing the results widely across the campus can strengthen future participation by highlighting the assessment's impact and results. Publicly accessible reporting also facilitates institutional tracking, including benchmarking for AASHE STARS and other assessment purposes.

Looking ahead, this project, sponsored by University of California, Office of the President to support sustainability practice across the University of California system, offers an assessment that can be adapted for repeated administration over time and implemented across UC campuses, supporting longitudinal analysis and cross-campus comparison and implemented by other UC campuses. We welcome collaboration to further refine and expand the use of this instrument package tool. Future applications should consider tailoring the assessment to align with each campus's specific sustainability literacy goals, incorporating institution-specific initiatives or local examples, and including optional modules that address regional environmental issues, local transportation systems, or other campus-specific sustainability challenges. Such adaptations can enhance the relevance and impact of the assessment while supporting systemwide efforts to advance sustainability literacy among students.



## Conclusion

The inaugural UCR sustainability literacy assessment establishes a foundational benchmark for understanding student sustainability literacy across the environmental, social, and economic domains, and demonstrates the value of institution-wide literacy measurement within the University of California system. Supported by the University of California Office of the President (UCOP) and its Global Climate Leadership Council (GCLC), this project aligns with systemwide priorities to advance climate leadership, accountability, and evidence-based sustainability education. Findings indicate that UCR students demonstrate moderate levels of sustainability knowledge overall, with statistically significant gains across class standing, providing preliminary evidence that sustainability learning occurs during the course of students' academic pathways. Differences observed by college and first-generation status point to opportunities for targeted curricular and co-curricular strategies that can help ensure sustainability education is both effective and equitable. These insights support UCOP and GCLC goals to embed sustainability across teaching and learning while using data to inform institutional decision-making. Beyond UCR, this assessment offers a scalable model for other UC campuses seeking to

measure sustainability literacy, support AASHE STARS reporting, and strengthen alignment between campus-level initiatives and systemwide climate leadership objectives. Continued refinement of the instrument, expanded longitudinal analysis, and coordination across campuses would further enhance its utility and comparability. Through sustained investment and collaboration supported from other UC campuses, sustainability literacy assessments can play a central role in advancing a shared, systemwide approach to preparing students to address complex climate and sustainability challenges.



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