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Implementation of Equity-Focused Teaching and Transparent Assignment Design Across Diverse Engineering and Architecture Disciplines

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Introduction

This paper is a theory/method research brief work. In recent years, engineering and architecture education have increasingly prioritized equity and inclusion, which have been traditionally overlooked, in response to increasing diversity in student enrollments and recognizing that diverse perspectives strengthen learning and innovation [1] - [4]. Equity-focused teaching practices aim to engage all students, particularly those historically underrepresented or with weaker academic backgrounds, by addressing structural barriers and adapting instructional approaches to diverse learning needs [5].

This project involved five engineering and architecture faculty members from the University Hartford, a small private teaching-focused university in the northeastern United States, who received a semester-long professional development training on equity-focused teaching and transparent assignment design from the Provost's office in Fall 2024 semester, and collaboratively implemented the selected teaching strategies beginning in Spring 2025 semester and continuing thereafter. The teaching strategies were drawn from the University of Michigan Center for Research on Learning & Teaching (CRLT)'s framework for equity-focused teaching by emphasizing three of its five practical elements - Critical Engagement of Difference, Academic Belonging, and Transparency [5]. In addition, many existing course assignments were redesigned following the Transparency in Learning and Teaching (TiLT) framework [6].

Literature Review

The CRLT at the University of Michigan has developed a framework for equity-focused teaching that centers on five practical elements: Critical Engagement of Difference, Structured Interactions, Academic Belonging, Transparency, and Flexibility [5]. These elements guide instructors to acknowledge and address systemic injustice in higher education and to foster more inclusive learning environments. Research underlying CRLT's equity-focused teaching framework shows that classroom climate, sense of belonging, and stereotype threat strongly influence students' learning and persistence, especially for historically underrepresented students and those with weaker academic backgrounds. Studies demonstrate that inclusive learning environments and practices that affirm students' intellectual ability improve academic performance and belonging, while reducing identity-based threat [7] - [11]. The three elements that were tied closely to this study are critical engagement of difference, academic belonging, and transparency, with the full strategy list from CRLT attached in Appendix C.

Transparency in assignment design, as formalized by the TiLT framework [6], has a strong evidence base for boosting equity and improving student success. TiLT encourages instructors to clearly articulate the purpose, tasks, and criteria for success for each assignment, reducing hidden barriers that often disadvantage underprepared students or those with language challenges. Empirical studies have demonstrated that these transparency practices can significantly enhance students' perceptions, performance, and persistence [12] - [15]. This suggests that the explicit

assignment redesigns in the courses could play a critical role in narrowing equity gaps and improve students' performance in STEM education.

Research Significance

Although interest in inclusive and equitable pedagogy is growing, adoption within engineering and architecture programs remains relatively new, and the published literature is limited in number and scope [3], [16]. Existing studies are often single-course or discipline-specific case reports. While systematic reviews call for broader, more rigorous evaluations, the previous literature does not yet test multi-disciplinary implementations that combine CRLT's equity-focused teaching elements with TiLT transparent assignment designs [17]. In addition, several reports identify that structured faculty professional development and institutional supports are critical to scaling inclusive practices, as the field's methods are heterogeneous with limited standardization across studies [3], [18], [19].

To address those gaps, this project provided structured, rigorous training and regular progress-review meetings for all five participating faculty members in Fall 2024 semester. Instructional interventions were implemented in seven sophomore and junior level undergraduate courses across civil, mechanical, electrical, biomedical engineering, as well as architecture, beginning in Spring 2025 and continuing thereafter. Each class enrolled several international and academically underprepared students, based on instructors' reports. Pre- and post-surveys of participating students and faculty, along with selected direct assessment results, were collected during the Spring 2025 semester to evaluate the effectiveness of the interventions and faculty perceptions of specific strategies. The project aims to address the following research questions:

- RQ1: Which CRLT-recommended strategies, including TiLT transparent assignment design, are perceived by the five participating faculty as effective, feasible to implement, and preferable in practice?
- RQ2: Do disciplinary differences affect the effectiveness and implementation of these strategies?

Methodology

Courses and Interventions

An overview of all participating courses and the corresponding interventions are outlined in Appendix B - Table 1. The interventions included selected elements from CRLT's equity-focused teaching framework, tailored to each faculty member's preference, as well as assignment redesigns based on the TiLT framework. The mapped CRLT strategies shown in parentheses in the last column of Table 1 are denoted as CED (Critical Engagement of Difference), AB (Academic Belonging), and T (Transparency), followed by the ID number within each category. Refer to Appendix C for the full list and practice descriptions.

To streamline the transparent assignment redesign process, instructors in ADT and ES courses employed generative AI tools to draft and refine assignment purpose, tasks, and grading rubrics. Sample prompts for the ES242 course assignment are shown below. Bold text in parentheses indicates the structural components of the recommended prompts and is provided for readers'

reference only; it does not appear in the actual prompt. The transparent assignment example part and accompanying PDF document are unnecessary if users continue to use the same chat for future assignment design tasks. Several complete redesigned assignment examples are presented in Appendix D.

*"**(Transparent assignment example)** I have attached one PDF document "Example L" from TilT program, which illustrates how to convert a traditional assignment into a more transparent one, by explicitly outlining its purpose, detailed tasks, and grading criteria. (**Background information about the class and assignment)** I want to develop a 3D modeling assignment for my Engineering Design class following the same format. In the class, students work in groups to design and create innovative engineering designs to solve daily life problems. In this assignment, they need to create a 3D modeling of their prototype prior to fabrication. (**Expected format)** Based on the information above, could you help me draft the three sections? Please present Purpose and Detailed Tasks as bullet points with brief introductory sentences before each list, and format the Grading Rubric as a table"*

Data collection

To evaluate intervention effectiveness, all seven participating courses administered pre- and post-semester surveys consisting of 23 Likert-scale items (Appendix B - Table 2) to measure changes in students' perception of belonging, engagement, and course transparency (IRB Protocol ID 25-02-402). All survey items were drawn from peer-reviewed, validated sources [11], [20] - [22]. For all items, response scales ranged from 1 (most negative) to 4 or 5 (most positive), depending on the question, such that higher scores indicate more positive expressions of constructs. The first three personal information questions (P1-P3) were used solely to match pre- and post-survey responses at the individual level without collecting identifying information. For the ES242 class, which comprised five sections, the same post-semester survey was administered in two non-intervention sections taught by non-participating faculty to serve as control groups. In addition, two assignment grades potentially influenced by transparent design were compared between the intervention semester (Spring 2025) and the prior non-intervention semester (Spring 2024). Student survey responses (*N=151, including paired responses N=53 and control group N=32*) and performance data (*N=72*) were analyzed using statistical t-tests conducted in IBM SPSS Statistics software, supplemented by instructors' observations to contextualize some findings. In addition, preference survey data on CRLT's suggested intervention list were collected from five faculty members at the beginning and end of Spring 2025 semester to identify favored and emerging strategies.

Results And Discussion

Student Survey

An initial screening of survey items was conducted based on item wording and conceptual intent to identify questions that might reasonably be grouped as measuring the same underlying construct. Pearson correlation and Cronbach's alpha reliability analysis were used to assess construct validity for pairs and groups of three or more conceptually related survey items, respectively. Based on these results, pre- and post-semester composite scores were computed by averaging the respective items and used in subsequent analyses. The final grouping of survey

items was defined as follows: Q1 - Q5 were retained as separate items; Q6 - Q13 were combined as Activities Frequencies (AF); Q14 - Q15 were combined as Confidence (C); Q16 - Q17 were combined as Belonging & Enjoyment (BE); Q18 - Q21 were retained as separate items; and Q22 - Q23 were combined as Instructor Practices (IP). Throughout this student survey analysis, survey outcomes refer to both individual survey items and composite scales derived from multiple items.

Paired-sample t-tests (Appendix B - Table 3) were conducted to examine pre–post changes in individual survey items and composite scales for students in all classes with matched pre- and post-survey responses linked based on the first three personal information questions ($N = 53$). Descriptive statistics indicated modest to moderate increases in several outcomes, which were evaluated for statistical significance at $\alpha = 0.05$. Significant pre–post increases were observed for Q1, Q2, Q4, Q18, Q19, Q20, and Q21 ($p<0.05$), as well as for the composite scales Activities Frequencies (AF) and Instructor Practices (IP). In these cases, post-semester mean scores were higher than pre-semester scores except for Q2, indicating improvements in these constructs over the course of the semester. In contrast, no statistically significant changes were detected for Q3 ($p = 1.000$), Q5 ($p = 0.662$), Confidence (C) ($p = 0.714$), or Belonging & Enjoyment (BE) ($p = 0.416$), suggesting relative stability in these constructs. The alignments between observed pre-post statistical changes and CRLT's pedagogical emphases on critical engagement of difference, academic belonging, and transparency including transparent assignment are discussed below. Results should be interpreted with caution, however, as multiple interventions were implemented simultaneously, and observed gains may reflect the combined effect of bundled strategies rather than any single approach.

Critical engagement of difference - Gains in Q1 (sharing personal perspectives) and Q4 (valuing ideas from individuals with different backgrounds), together with increases in AF items related to diversity-focused activities, integrating ideas across contexts, and connecting coursework to societal contexts (Q6–Q10), indicate enhanced opportunities for students to engage meaningfully with difference, both within and beyond the classroom. These findings are consistent with CRLT's framing of critical engagement of difference as active and reflective participation rather than passive exposure [5].

Academic belonging **-** Although the composite scale for BE did not show a statistically significant change, several significant gains nonetheless speak indirectly to academic belonging. Increased frequencies of student–faculty interactions captured in the AF scale (Q11–Q13), along with greater clarity regarding course work expectations, steps, and evaluation (Q18–Q21), likely contributed to students' sense of belonging with strengthened structural supports. Prior work shows that clarity, access to faculty, and explicit instructions contribute to students' sense of belonging [14]. The observed gains therefore suggest that belonging may have been reinforced structurally, even if affective perceptions remained relatively stable over the semester.

Transparency - The most robust improvements were observed for Q18–Q21 and the IP composite (Q22–Q23), which directly measure dimensions of instructional transparency. These results align with the CRLT's transparency emphasis and TiLT framework, which demonstrates that explicitly articulating assignment purpose, task, and evaluation criteria improves student understanding, reduces ambiguity, and supports equitable student success [13], [14]. In addition,

when comparing post-survey responses between intervention (*N*=25) and non-intervention (*N*=32) sections of the ES242 class, only the IP composite score showed a statistically significant difference (non-intervention mean=3.297, intervention mean=3.640, *p*=0.043). The magnitude and consistency of these gains and differences suggest that transparency, especially transparent assignment, was a central and impactful component of the implemented interventions.

For each survey outcome, change (delta) scores were computed as the difference between post- and pre-semester responses. These delta scores were analyzed using one-way ANOVA, with course section specified as the between-subjects factor, to examine whether the magnitude of change differed across classes. Results indicated that only a couple of outcomes showed statistically significant class-level effects, suggesting that disciplinary differences were not strongly associated with overall student outcomes. This indicates that the equity-focused teaching strategies examined in this study may be broadly applicable across disciplines with few discipline-specific barriers, thereby addressing RQ2. It should be noted, however, that among the matched cluster size (N=53), several courses had very small sample sizes (3/14/17/16/3), which have limited statistical power to detect class-level effects.

Direct Performance Assessment

The two assignments used for direct performance assessment in the ES242 course consisted of a group project proposal report (Assessment #1), administered around the seventh week of the semester, and the corresponding group proposal presentation (Assessment #2), conducted one week later. Both assignments were redesigned to incorporate transparent assignment principles (Exposure = 1) in Spring 2025 based on the TiLT framework, in contrast to the non-transparent formats used in Spring 2024 (Exposure = 0). The tasks, content requirements, and grading rubrics remained unchanged for both assignments across semesters. Welch's independent-samples *t*-tests were used to compare group means (Appendix B - Table 4) given observed unequal variances indicated by Levene's tests. Results indicated that the transparent redesign of Assessment #1 yielded significantly higher performance relative to the non-transparent condition, consistent with TiLT's emphasis on clarifying assignment purpose, tasks, and evaluation criteria. In contrast, performance differences for Assessment #2 were only marginally significant, likely because both groups were provided with a presentation template and evaluation emphasized delivery rather than technical rigor. When the two assessments were averaged, students in the transparent condition exhibited higher average score compared to those in the non-transparent condition, suggesting that transparent design likely supports more consistent and higher-quality student work, particularly for assignments that require students to independently interpret expectations. The course instructor also reported receiving substantially fewer student emails inquiring about assignment content requirements and submission format during the intervention semester (Spring 2025) compared to prior semesters.

Faculty Survey

All five participating faculty completed pre- and post-surveys assessing their experiences and preferences for CRLT list of strategies to capture shifts in attitudes and perceptions toward equity-focused teaching. The survey scale is shown in Appendix B - Table 5, and the mean ratings and standard deviations for all practices are presented in Appendix A - Figure 1. Based on the survey

results and to address RQ1, some favored (mean rating above 3.0 in both pre- and post-surveys) and emerging (mean rating increased high from pre- to post-survey) practices are listed in Appendix B - Table 6 as preliminary results.

Conclusion

Five engineering and architecture faculty went through structured training and regular progress-review meetings for equity-focused teaching, and implemented CRLT and TiLT instructional interventions in seven sophomore- and junior-level undergraduate courses. The effectiveness of these interventions was evaluated using a mixed-methods approach, including pre- and post-surveys of students and selected direct assessments of student performance collected during the Spring 2025 semester, supplemented by instructor's observations for some outcomes and all five faculty's perception and preferences regarding all teaching strategies. Key findings include**:**

- Transparency-oriented practices served as a foundational support, enabling increased engagement with difference and reinforcing conditions conducive to academic belonging.
- While not all outcomes exhibited statistically significant changes, the overall pattern of results aligned with CRLT's frameworks for critical engagement of difference, academic belonging, and transparency.
- Direct assessment results indicated that TiLT's transparent assignment design appears to support higher and more consistent student performance, particularly for assignments requiring independent interpretation of expectations.
- No clear disciplinary differences were observed in the effectiveness of the implemented strategies, suggesting that equity-focused teaching practices tend to be broadly applicable across engineering and architecture courses. While small sample size in some courses may have limited detection of subtle differences, the findings support the transferability of these strategies across disciplines.

Limitations and Future Work

This study poses several limitations: First, these statistical analyses were exploratory, and multiple comparisons increase the likelihood of Type I error. This was addressed using the Benjamini–Hochberg false discovery rate procedure, and only a subset of outcomes remained statistically significant. Second, while modest clustering by course section was observed (ICCs ranging from 0.038 to 0.12 for primary outcomes), the small number of sections and uneven class sizes made multilevel modeling unreliable. Third, the control group of ES242 class did not include pre-survey assessments. Consequently, the study was not able to examine whether changes over time differed between the intervention groups and control group. The current findings should be interpreted as preliminary evidence of intervention-related change rather than definitive support of causal influence.

Despite these limitations, the study provides initial support for changes in several outcomes, and the directionally consistent effect sizes across multiple measures suggest that the observed patterns are not purely due to chance. Future research with larger samples and replication in independent cohorts is needed to confirm these findings and establish causal effects.

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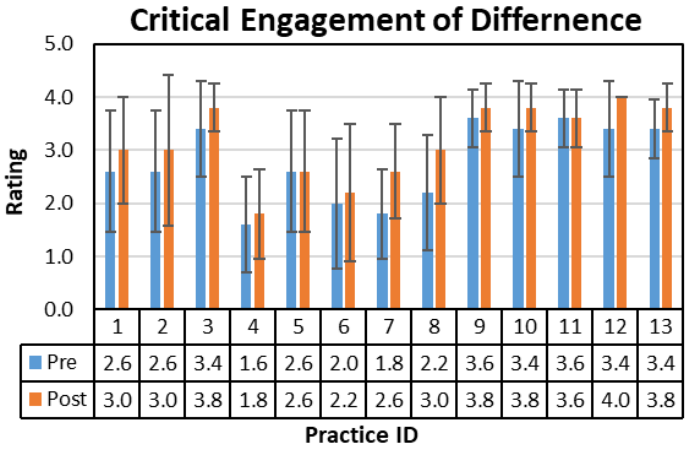
Appendix A - Figures



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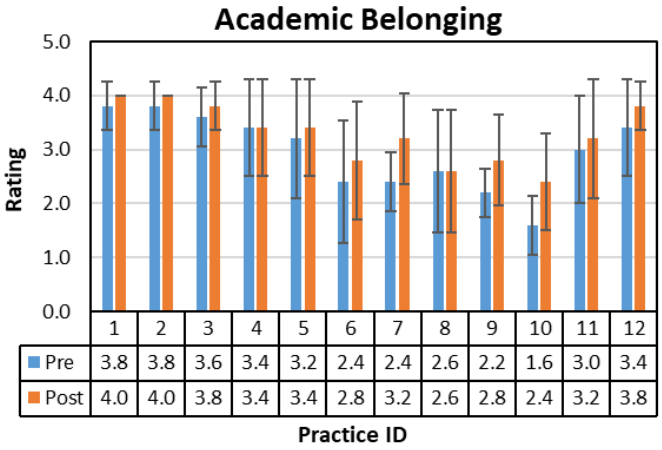
Post	3.0	3.0	3.8	1.8	2.6	2.2	2.6	3.0	3.8	3.8	3.6	4.0	3.8

(a)



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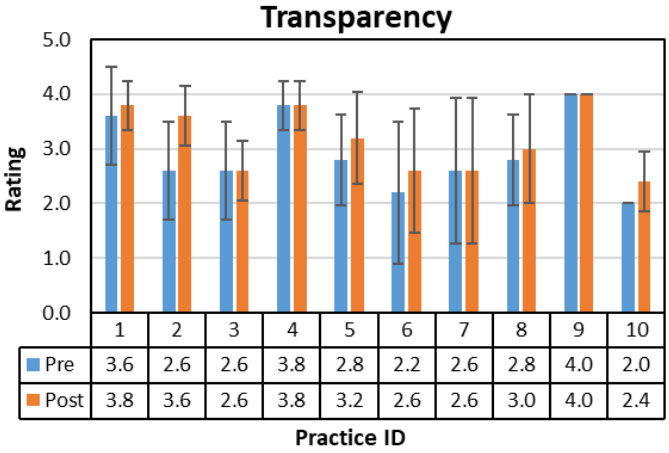
Pre	3.8	3.8	3.6	3.4	3.2	2.4	2.4	2.6	2.2	1.6	3.0	3.4
Post	4.0	4.0	3.8	3.4	3.4	2.8	3.2	2.6	2.8	2.4	3.2	3.8

(b)



	1	2	3	4	5	6	7	8	9	10
Pre	3.6	2.6	2.6	3.8	2.8	2.2	2.6	2.8	4.0	2.0
Post	3.8	3.6	2.6	3.8	3.2	2.6	2.6	3.0	4.0	2.4

(c)

Figure 1. Mean ratings and standard deviations for all practices within (a) critical engagement of difference; (b) academic belonging; and (c) transparency

Appendix B - Tables

Table 1. Participating courses and implemented interventions

Course Discipline and ID	Course Level	Number of Students	Implemented Interventions
ADT241 - Environmental Systems for Architectural Design	Sophomore	24	▪ Grouped students in projects based on students' strengths and personalities (CED_3 & 7) ▪ Students rotated roles in a class-wide presentation (AB_3) ▪ TiLT transparent assignments (T_1, TiLT)
ME341 - Heat Transfer	Junior	19	▪ Used interactive coding sessions for diverse learning (CED_12) ▪ Highlighted mistakes as learning opportunities in example problems and low-stakes tests (AB_7) ▪ Explained the *"why"* behind class activities to boost engagement (T_2)
ES110 - Statics / ES211 - Dynamics	Sophomore	27 / 14	▪ Students shared personal information through a survey (CED_3 & 7) ▪ Offered take-home quizzes to reduce high-stakes pressure (AB_3) ▪ TiLT transparent assignments (T_1, TiLT)
ES242 - Engineering by Design	Sophomore	31	▪ Grouped students in projects based on students' strength and interests, and incorporated think-pair-share in group discussions (CED_3 & 7) ▪ Students created LinkedIn profiles and shared them within and outside the class (AB_3) ▪ TiLT transparent assignments (T_1, TiLT)
ECE362 - Electronic Circuits / ECT363 - System on Chip	Junior	16 / 7	▪ Increased accessibility of course materials and the instructor to students from diverse backgrounds (CED_8 & 9) ▪ Provided students with guest lectures, open-ended design projects, and research opportunities (AB_3 & 9 & 10) ▪ Clearly communicated course structure and expectations to students (T_2)

Table 2. Student survey items

Category	**Question Description (Post-Survey as Example)**
Personal Information	P1. Provide the same 4-digit code that you used in the pre-survey at the beginning of the semester
	P2. What's your favorite color?
	P3. What's your favorite animal?
Student voice	Q1. In this semester, how much has this course emphasized on sharing your own perspectives and experiences?
	In this semester, about how often have you had discussions with people from the following groups?
Cross-racial interaction	Q2. People of races or ethnicities other than your own
Cross-national interaction	Q3. People from countries other than your own
	Reflect on your experience in this semester
Valuing diversity	Q4. I recognize that people with different backgrounds from my own might have better ideas than I do
Learning openness	Q5. I am willing to learn from others who have different areas of expertise
	In this semester, about how often have you done the following?
Activities frequency	Q6. Attended events, activities, or presentations that reflect an appreciation for diverse groups of people
	Q7. Worked with other students on course projects or assignments
	Q8. Combined ideas from different courses when completing assignments
	Q9. Connected your learning to societal problems or issues
	Q10. Connected ideas from your courses to your prior experiences and knowledge
	Q11. Talked about career plans with a faculty member
	Q12. Discussed course topics, ideas, or concepts with a faculty member outside of class
	Q13. Discussed your academic performance with a faculty member
	Reflect on your experience with this class
Confidence	Q14. How confident do you feel about completing all the work that is assigned in this class?
	Q15. How confident do you feel about learning all of the material presented in this class?
Belonging & enjoyment	Q16. I feel like I belong to this class
	Q17. I believe I enjoy the work done in this class
Understanding success	Q18. How well do you understand what constitutes successful work in this class?
Understanding purpose	Q19. In this class, I know the purpose of each assignment.
Clarity on steps	Q20. In this class, I know the steps required to complete my assignments.
Clarity on grading	Q21. In this class, I know how my work would be evaluated.
	In this class, to what extent have your instructors done the following?
Instructor practices	Q22. Clearly explained course goals and requirements
	Q23. Explained in advance the criteria for successfully completing your assignments

Table 3. Paired-sample t-test results comparing pre- and post-semester student survey responses for all classes (N = 53)

Outcome	Pre Mean	Post Mean	Mean Difference (Pre - Post)	95% Confidence Interval of the Difference	t	DF*	p-value	Cohen's *d*
Q1	2.300	2.750	-0.453	[-0.721, -0.185]	-3.392	52	0.001	-0.466
Q2	3.250	2.960	0.283	[0.039, 0.527]	2.327	52	0.024	0.320
Q3	2.660	2.660	0.000	[-0.315, 0.315]	0.000	52	1.000	0.000
Q4	4.170	4.420	-0.245	[-0.454, -0.037]	-2.358	52	0.022	-0.324
Q5	4.580	4.550	0.038	[-0.115, 0.190]	0.496	52	0.622	0.068
AF	2.587	2.776	-0.189	[-0.336, -0.042]	-2.575	52	0.013	-0.354
C	3.896	3.934	-0.038	[-0.243, 0.168]	-0.368	52	0.714	-0.051
BE	3.840	3.943	-0.104	[-0.358, 0.150]	-0.820	52	0.416	-0.113
Q18	3.720	4.000	-0.283	[-0.508, -0.058]	-2.520	52	0.015	-0.346
Q19	3.680	4.040	-0.358	[-0.613, -0.104]	-2.831	52	0.007	-0.389
Q20	2.920	3.190	-0.264	[-0.524, -0.004]	-2.038	52	0.047	-0.280
Q21	2.870	3.400	-0.528	[-0.785, -0.271]	-4.125	52	<0.001	-0.567
IP	2.896	3.425	-0.528	[-0.752, -0.305]	-4.742	52	<0.001	-0.651

*DF: degrees of freedom

Table 4. Direct assessment comparison between non-transparent (Spring 2024) and transparent (Spring 2025) assignments (N = 72).

Outcome	Exposure 0 Mean (Spring 2024)	Exposure 1 Mean (Spring 2025)	Mean Difference (0 - 1)	t (Welch)	DF	p-value
Assessment #1	80.575	94.141	-13.566	-2.265	48.024	0.028
Assessment #2	94.700	98.223	-3.523	-1.749	49.505	0.087
Average Score	87.638	96.182	-8.544	-2.624	48.335	0.012

Table 5. Scale and description for faculty survey

Scale	Description
4	I regularly use this or a similar strategy in my teaching
3	I sometimes use this in my teaching
2	I would like to try this, though I may need more information or resources
1	I do not or would not use this in my teaching / this is not applicable in my setting

Table 6. Favored and emerging equity-focused teaching strategies

	Category	Practice Description
Favored	Critical Engagement of Difference	9. Proactively invite requests for accommodation as a chance to include everyone more fully in learning (through a non-stigmatizing syllabus statement, a reminder in class, an email). 12. Present course material in a variety of modalities (readings, diagrams, lectures, podcasts) rather than relying on one mode of engagement.
	Academic Belonging	1. Communicate high expectations and your belief that all students can succeed. 2. Learn and use students' names and pronouns, and encourage them to learn and use one another's, accurately pronounced and spelled. Be aware that what students choose to be called may differ from the name that appears on your class roster.
	Transparency	1. Explicitly communicate the purpose, task, and assessment criteria for graded assignments. Also identify any assumed capacities, abilities, skills, or prior knowledge embedded in your assignments or course learning activities, and connect students to resources that help them bolster those skills if necessary. 9. Create dedicated opportunities (time during class, dedicated office hours, online forms, etc.) for students to ask questions about assignments and expectations.
Emerging	Critical Engagement of Difference	7. Use a background questionnaire early in the term to learn about individual students' past academic experiences, goals, concerns, or other information that could help you plan relevant and inclusive learning opportunities. 8. Deliberately choose course materials and activities with a range of student circumstances in mind (e.g., physical abilities and disabilities, financial and technological resources, time commitments such as work or family care obligations).
	Academic Belonging	7. Cultivate growth mindsets: Allow for productive trial and error (e.g., through low-stakes practice quizzes, drafting opportunities, modeling or discussion of interestingly productive wrong answers). Emphasize that risk, struggle, and failure can be important parts of any learning process and/or the scientific method. 12. Create intentional opportunities for students to provide feedback on their experience of the learning environment and share ideas for improving it. This could include short anonymous polls, check-ins at the beginning of a class meeting, or more substantial written feedback opportunities.
	Transparency	2. Explain the learning objectives of activities you use class time for (e.g., discussion of readings, lectures, critique of peers' work, independent work on projects). 10. Invite students to share information about their own expectations about the learning environment based on their prior experiences to help you understand where your expectations may be mismatched and what you might need to explain.

Appendix C - CRLT Strategy List

CRITICAL ENGAGEMENT OF DIFFERENCE: Acknowledging students' different identities, experiences, strengths, and needs; leveraging student diversity as an asset for learning

Examples of practices that align with this element include:

___ 1. Acknowledge the ways that campus or world events may be creating barriers to students' capacity to engage in coursework, or their sense of being welcomed and valued; acknowledge the differential impacts developments may have on different students.

___ 2. In order to support students' inclusive interactions with their classmates, ask them to be mindful of their own positionalities and the range of (more and less visible) identities among students in the course.

___ 3. Normalize the fact that students will have a range of background preparation, and find ways of highlighting those differences as assets for learning (e.g., learners who are new to material can often pose useful critical questions that help those familiar with the material identify gaps in their understanding or think about the material in new ways).

___ 4. Reflect upon and share the ways your own identities shape your relationship to your work or the discipline.

___ 5. Provide opportunities for students to consider the relevance of course concepts to concerns of communities that they are part of.

___ 6. Draw examples you use to illustrate course concepts from a range of social or cultural domains. Or invite students to identify examples from their own arenas of knowledge or expertise.

___ 7. Use a background questionnaire early in the term to learn about individual students' past academic experiences, goals, concerns, or other information that could help you plan relevant and inclusive learning opportunities.

___ 8. Deliberately choose course materials and activities with a range of student circumstances in mind (e.g., physical abilities and disabilities, financial and technological resources, time commitments such as work or family care obligations).

___ 9. Proactively invite requests for accommodations as a chance to include everyone more fully in learning (through a non-stigmatizing syllabus statement, a reminder in class, an email).

___ 10. Communicate concern for students' well-being, and share information about campus resources (e.g., Counseling & Psychological Services, Sexual Assault Prevention & Awareness Center, Services for Students with Disabilities).

___ 11. Ask students for concrete observations about content (e.g., simply describe an image, passage, or diagram) before moving to analytical questions. This can provide everyone a common starting point, highlight multiple different approaches, and model analytical processes you want to teach.

___ 12. Present course material in a variety of modalities (readings, diagrams, lectures, podcasts) rather than relying on one mode of engagement.

___ 13. Accompany verbal instructions with a written corollary. (Multiple modes can be helpful to students with processing disabilities as well as multilingual learners.)

What other strategies do you use to acknowledge or affirm students' different identities, strengths, or needs in your courses? What else could you do?

ACADEMIC BELONGING: Cultivating students' sense of connection to and ability to see themselves in your course, a broader community of scholars, or the discipline

Examples of practices that align with this element include:

____1. Communicate high expectations and your belief that all students can succeed.

____2. Learn and use students' names and pronouns, and encourage them to learn and use one another's, accurately pronounced and spelled. Be aware that what students choose to be called may differ from the name that appears on your class roster.

____3. Build rapport in the class through regular icebreakers, small group activities, collaborative thinking, etc.

____4. As a way of validating the range of backgrounds students bring, help students connect their prior knowledge or skills to new learning (e.g., when introducing a new topic, ask students to reflect on what they already know about the topic, or invite them to identify relevant skills they bring from different domains).

____5. Assess students' prior knowledge about your field and topics so you can accurately align instruction with their strengths and needs.

____6. Encourage or require students to visit office hours early in the term, and use that time to ask about their interests and experiences with course material.

____7. Cultivate growth mindsets: Allow for productive trial and error (e.g., through low-stakes practice quizzes, drafting opportunities, modeling or discussion of interestingly productive wrong answers). Emphasize that risk, struggle, and failure can be important parts of any learning process and/or the scientific method.

____8. Highlight the diversity of contributors to your discipline (through the authors you assign, the research you highlight, the guests you invite to meet with your students, etc.), and/or sponsor discussion about the reasons for a history of limited access to the field and current efforts to change it.

____9. When inviting outside critics or speakers, seek to identify professionals who bring a range of backgrounds, including identities that are different from yours.

____10. Prepare outside visitors to contribute to the inclusive environment of your class meetings (e.g., make sure they are aware of community norms, accessibility needs, etc.).

____11. Deliberately avoid generalizations that may exclude students who are already experiencing marginalization on campus; these are often communicated through phrases (e.g, "when you go home for Thanksgiving," "if you have a child some day," "just walk over to my office," "it only costs $x") that make implicit assumptions about students' physical ability, family structure, social identities, citizenship status, or economic means.

____12. Create intentional opportunities for students to provide feedback on their experience of the learning environment and share ideas for improving it. This could include short anonymous polls, check-ins at the beginning of a class meeting, or more substantial written feedback opportunities.

What other ways do you help facilitate students' sense of belonging in your class, discipline, or professional field? What else could you do?

TRANSPARENCY: Clearly communicating about norms, expectations, evaluation criteria

Examples of practices that align with this element include:

___1. Explicitly communicate the purpose, task, and assessment criteria for graded assignments. Also identify any assumed capacities, abilities, skills, or prior knowledge embedded in your assignments or course learning activities, and connect students to resources that help them bolster those skills if necessary.
___2. Explain the learning objectives of activities you use class time for (e.g., discussion of readings, lectures, critique of peers' work, independent work on projects).
___3. In course materials, meetings, and communications, express your commitment to creating an accessible, inclusive course, and invite student feedback about practices that do and don't facilitate that goal.
___4. Let students know how you'd like them to address you.
___5. Share guidance on how students should communicate with you (or others on your instructional team). This might include identifying which kinds of questions/topics are best to raise in office hours vs. over email vs. during class. Consider offering multiple options in order to maintain both transparency and flexibility.
___6. In discussion-based courses, communicate your sense of the instructor's and students' respective roles in shaping and guiding class discussions. (What are students' responsibilities, what are yours? When and why might these shift?)
___7. For writing assignments, explain your expectations around the relative importance of students' ideas/analysis and their sharing of information or ideas/words published by others. (This can be especially important if you have students who have previously learned in educational systems where deference for expertise is prioritized over original thought.)
___8. Offer guidance on how students might prioritize various course tasks or requirements and allocate their time strategically.
___9. Create dedicated opportunities (time during class, dedicated office hours, online forms, etc.) for students to ask questions about assignments and expectations.
__10. Invite students to share information about their own expectations about the learning environment based on their prior experiences to help you understand where your expectations may be mismatched and what you might need to explain.

What other ways do you seek to be transparent about norms and expectations? What are additional areas where you could be more explicit about your expectations or assessment process or criteria?

Appendix D - Sample Redesigned Transparent Assignments

Architecture Class Homework Assignment

Assignment 7 - A Vision for Light — Helping Professor Ellen

Assignment 7 - A Vision for Light — Helping Professor Ellen
Professor Ellen Hartwell is the newly appointed Dean of the Educational Building you've been designing. With a deep passion for creating inspiring learning environments, Professor Ellen firmly believes that natural daylight transforms the atmosphere of educational spaces — making them healthier, more engaging, and conducive to learning.
However, she has a specific concern. On the **third floor** of the building — dedicated to active learning classrooms and flexible study areas — the daylight performance isn't yet optimized. The current design risks either being too dim in some zones or causing glare and overexposure in others.
Professor Ellen has reached out to you, as the architect, with this simple yet crucial request:

"Help me create bright, welcoming spaces on the third floor. I need classrooms flooded with comfortable daylight, but I can't have my students blinded by excessive sunlight. Can you design the right system of overhangs, vertical fins, and light shelves to balance this perfectly? I trust your expertise!"

Your mission: **Design an effective daylighting strategy for the third floor**, using simulation tools to ensure the spaces meet both Professor Ellen's goals and best practice standards for daylighting.

Assignment Objectives

- Use **Climate Studio** to perform **Daylight Availability Simulations** for the third floor of the building.
- Implement and test **overhangs**, **vertical fins**, and **light shelves** as shading and daylight enhancement devices.
- Optimize your design to meet these performance targets:
    - **Spatial Daylight Autonomy (sDA) > 75%**
    - **Annual Sunlight Exposure (ASE) < 10%**

Steps

- **Set up your model in Climate Studio.**
    - Download the model in Week 12 in the Tuesday folder
    - Focus on the **third floor** of the building model.
- **Design and experiment with Shading Strategies.**
    - Test different configurations of overhangs, fins, and light shelves.
    - Aim to balance daylight penetration while controlling glare and overexposure.
- **Run Simulations.**
    - Perform daylight availability simulations.
    - Analyze both sDA and ASE results carefully.
- **Document Your Work.**

- Take screenshots of Climate Studio result windows (both sDA and ASE).
- Take screenshots of the Digital model.
- Prepare a short explanation of your design choices: How did you balance the daylighting strategies? What worked, and what didn't?

Deliverables

- **Screenshots** from Climate Studio result windows (sDA and ASE).
- **Screenshots or images of your building model**, showing your shading devices (overhangs, fins, light shelves).
- Include one paragraph of reflection or design explanation.
- Submit your complete assignment in both:
  - **Blackboard**
  - **OneDrive shared folder**

Rubric - Assignment 7 - A Vision for Light — Helping Professor Ellen

Criteria	Excellent (90–100%)	Good (80–89%)	Satisfactory (70–79%)	Needs Improvement (<70%)
Simulation Accuracy & Completion (30%)	Simulations are fully complete for both sDA and ASE. Results are accurately generated and clearly exceed the targets. Screenshots are clear and correct.	Simulations mostly complete with minor errors. Results meet or nearly meet targets. Screenshots provided.	Simulations are partially complete or contain noticeable errors. Results are close to targets but not fully justified. Some screenshots missing or unclear.	Simulations incomplete or contain major errors. Targets not achieved. Screenshots missing or inaccurate.

Design Strategy & Application of Shading Devices (30%)	Excellent integration of overhangs, vertical fins, and light shelves. Design decisions are well-justified and clearly improve daylight performance. Creative solutions demonstrated.	Good use of shading devices, mostly appropriate. Some room for optimization, but overall design improves daylight performance.	Basic application of shading devices, but limited impact or inconsistent strategy. Needs more refinement to meet targets.	Minimal or ineffective use of shading devices. Poor impact on daylight performance. Design lacks clarity or effort.
Clarity of Results (20%)	Visuals are clear, well-organized, and easy to understand. Result windows and model images effectively communicate the design intent and performance outcomes.	Visuals are mostly clear, with minor issues. Most result windows and model images support the design explanation.	Visuals are somewhat unclear or disorganized. Result windows or model images lack clarity or consistency.	Visuals are unclear, disorganized, or incomplete. Hard to understand the outcomes of the design.
Reflection & Explanation of Design Choices (20%)	Thorough and insightful reflection. Clearly explains design decisions and the impact of shading strategies on daylight performance. Demonstrates deep understanding.	Good reflection with explanation of main design choices. Shows understanding of daylight strategies, with minor gaps.	Basic explanation of design choices, but lacks depth. Limited understanding of the impact of shading devices.	Minimal or missing explanation. Shows little understanding of design strategies and outcomes.

Architecture Class Discussion Assignment

Objective:

The primary goal of this session is to enhance the quality of your project descriptions through constructive peer feedback. By assuming different roles—*Architect* and *Owner*—you will gain insights into your work from a fresh perspective and develop critical thinking and communication skills.

Roles and Responsibilities:

- **Architect:**
- Share your project description (maximum 300 words) in the designated discussion board on Blackboard.
- Clearly explain the key concepts, goals, and ideas behind your project description.
- Highlight any specific areas where you would like feedback or suggestions.
- **Owner:**
- Review your groupmate's project description carefully.
- Provide thoughtful, constructive feedback focusing on the clarity, coherence, and completeness of the project description in a conversation format with your groupmate.
- Pose insightful questions to challenge assumptions, encourage deeper thinking, and refine the project description.
- After the conversation, reply to the Project Description and provide thoughtful, constructive feedback focusing on the clarity, coherence, and completeness of the project description.

Discussion Structure:

- Form groups of two students.
- Each student will post their project description on the Blackboard discussion board.
- Each student is **required** to reply to their groupmate's project description with constructive feedback.
- Students are also **encouraged** to reply to other classmates' project descriptions to foster broader peer engagement (optional).

Guiding Questions for Owners:

- Is the project description clear and easy to understand?
- Does the description effectively communicate the project goals and intentions?
- Are there any areas that could be elaborated or clarified?
- What suggestions do you have to improve the project description?

Expected Outcomes:

- Refined and well-articulated project descriptions.
- Improved ability to communicate design ideas effectively.
- Enhanced critical thinking and peer feedback skills.

General Engineering 3 Class Homework Assignment

HW#7 3D Modeling

Instruction:
Upload the screenshot pictures and original file for the draft version (at least 70% complete) of the 3D modeling

Purpose:
This assignment is designed to immerse students in the engineering design process by transforming abstract ideas into concrete digital prototypes. It aims to enhance critical thinking and communication skills, enabling students to analyze design constraints and effectively present their innovative concepts.

- Encourage students to critically analyze design constraints, dimensions, parts, and sensor integration, and reflect those in the 3D model.
- Enable clear visualization of the design intent for audiences, sponsors, and potential fabrication partners during the midterm design proposal presentation.
- Provide a foundation for iterative design improvement and potential 3D printing of components.

Detailed Tasks
This section outlines a structured approach to creating a comprehensive 3D model prototype. The tasks ensure that students document both the technical and conceptual aspects of their design, leading to a well-rounded and communicative project deliverable.

- Use any 3D modeling software (e.g., SolidWorks, Fusion 360, SketchUp, Onshape) to create a draft model that is at least 70% complete.
- Model all individual components separately and assemble them into the full prototype.
- Clearly mark major dimensions and annotate sensor placements.

Grading Rubric

Criteria	Proficient	Emerging	Needs Improvement
Model Completeness & Accuracy	Model is >70% complete with all parts accurately designed, modeled, and assembled (15 pts).	Model is 50–70% complete with some design or assembly inaccuracies (10-15 pts)	Model is <50% complete or contains major inaccuracies in design and assembly (5-10 pts)
Design Annotation & Detailing	All major dimensions and annotations are clearly provided to enhance clarity (5 pts).	Some dimensions and annotations are provided, but clarity is inconsistent (2-5 pts).	Lacks sufficient dimensions and annotations, making the design unclear (0-2 pts).

Sample Work