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Bridging the Sustainability Gap: A Investigation of Engineering Students' Perceptions

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ABSTRACT

BACKGROUND & CONTEXT

Engineering education must now prepare graduates not only with technical skills but also with interdisciplinary thinking, reflective learning, and a commitment to sustainability. Learner identity, especially self-concept and intellectual curiosity plays a key role in this. However, despite increased sustainability awareness, a gap persists between students' beliefs and actions, posing a challenge for ethical and sustainable engineering practice.

PURPOSE OR GOAL

This exploratory study explores how engineering students' self-concept and intellectual curiosity influence reflective and interdisciplinary learning. It also examines factors behind the gap between sustainability awareness and behavior, aiming to inform curriculum and teaching practices that better connect learning with real-world sustainability challenges.

METHODOLOGY

An exploratory quantitative study was conducted using a validated survey instrument adapted from prior engineering education research. Data were collected from 32 male second-year mechanical engineering. The survey covered 96 items addressing self-concept, career values, sustainability beliefs, and behaviors. Descriptive and inferential statistical analyses were used to identify trends and patterns across thematic domains.

OUTCOMES

The results show students have strong intellectual curiosity and self-concept, supporting interest in interdisciplinary and reflective learning. While they hold clear sustainability beliefs, their actions are mostly limited to low-effort behaviors. This intention-action gap is linked to limited hands-on experience, moderate confidence, and minimal exposure to social aspects of sustainability.

CONCLUSIONS

This study confirms the presence of strong foundational attributes among engineering students that support reflective and interdisciplinary learning. At the same time, it highlights the need for more intentional curriculum design to transform sustainability awareness into consistent practice. These findings contribute to the discourse on integrating identity development and sustainability education within engineering, particularly in underrepresented regional contexts.

KEYWORDS

Engineering education, sustainability behavior, learner identity.

Introduction

Higher education, especially in the field of engineering, is undergoing a significant transformation (Graham, 2018) driven by the urgent need to address complex global challenges such as climate change, environmental degradation, and socioeconomic inequality. These challenges call for a new generation of engineers who are not only technically competent but also self-aware, intellectually curious, and committed to sustainability principles (Mulder et al., 2012). In this context, two critical areas warrant deeper investigation: the role of self-concept and intellectual curiosity in shaping students' learning behaviors, and the persistent attitude-behavior gap in sustainability practices among engineering undergraduates. Self-concept refers to the perception individual's understanding of themselves shaped by their interactions with and interpretations of their surroundings (Marsh & Martin, 2011). Intellectual curiosity, on the other hand, is the intrinsic desire to acquire knowledge and explore new ideas (Litman, 2005). Both of these factors are essential components of learner identity and motivation, which significantly influence educational outcomes from a self-determination perspective (Deci & Ryan, 2000). In the context of engineering education, where problem-solving often requires interdisciplinary collaboration and reflective thinking, fostering these traits is crucial.

Despite growing awareness and inclusion of sustainability-related content in engineering education, a consistent challenge persists: many students exhibit a discrepancy between their stated values and their actual behaviors related to sustainability. This phenomenon commonly referred to as the “attitude-behavior gap” (Park & Lin; 2020) has been well documented in environmental psychology literature (Kollmuss & Agyeman, 2002). The engineering student population is particularly significant in this regard. As future designers, builders, and policymakers, engineers will play a decisive role in shaping sustainable technologies and infrastructures. Godwin et al. (2016) provided a robust affective model that links identity and critical agency to engineering career choice, emphasizing the importance of self-concept and motivation. However, if their academic preparation does not translate into sustainable behaviors and ethical decision-making, the impact of sustainability education remains superficial. Closing this gap requires more than theoretical instruction, it demands pedagogical interventions that embed sustainability in experiential learning, value reflection, and systems thinking (Wiek et al., 2011).

Grounded in the theoretical frameworks of self-determination theory (Deci & Ryan, 2000) and experiential learning (Kolb, 1984), this study proposes the following hypotheses:

H1: Engineering students with a strong self-concept and higher levels of intellectual curiosity are more likely to engage in reflective and interdisciplinary learning practices.

H2: The attitude-behavior gap in sustainability among engineering students is significantly influenced by perceived behavioral control, lack of experiential learning opportunities, and misalignment between curriculum design and real-world sustainability challenges.

This study is guided by two central research questions:

RQ1. How does engineering students' self-concept and intellectual curiosity influence their engagement with reflective and interdisciplinary learning practices within the university context?

RQ2. What are the underlying factors contributing to the gap between sustainability awareness and actual sustainable behaviors among engineering students, and how can educational interventions address this gap?

These questions are interrelated, as both explore the intersection of personal identity, educational experience, and real-world application. Understanding how students perceive themselves and their learning can provide key insights into how to design more effective interventions that not only transmit knowledge but also transform behavior.

The primary aim of this study is to contribute to a more holistic understanding of student development in engineering education by examining the roles of identity formation, intellectual motivation, and behavioral intention.

This study is timely and significant for several reasons. First, it adds to the growing body of literature that recognizes the importance of affective and motivational dimensions in engineering education. Second, by linking self-concept and curiosity with interdisciplinary learning, the study provides empirical insights that can inform curriculum design, particularly in the areas of general education, capstone projects, and cross-disciplinary initiatives. Third, the exploration of the sustainability attitude-behavior gap offers practical guidance for educators and policymakers seeking to make sustainability education more impactful. Moreover, the study is situated in a Middle Eastern higher education context, contributing to the relatively under-researched region in global engineering education discourse. The cultural and institutional dynamics of this context provide a unique lens through which to examine student identity and sustainability engagement.

Methodology

This study employed an exploratory quantitative research design to investigate the relationships between engineering students' self-concept, intellectual curiosity and sustainability-related behavior. Given the evolving nature of educational attitudes and practices within the context of engineering education, an exploratory approach was deemed appropriate to capture initial insights without the constraints of strict hypothesis testing. The primary research tool was a structured questionnaire derived from a validated survey instrument developed by Godwin et al. (2014) & Klotz et.al (2014), which have been widely used in engineering education research. Godwin et al.'s instrument was designed to measure constructs such as academic self-concept, identity, and agency, and has demonstrated reliability and construct validity across diverse student populations. Klotz et al. developed a companion survey focusing on sustainability beliefs and engineering as a socially transformative profession. Their work established links between students' perceptions of sustainability and their sense of belonging and purpose in engineering. For this study, core constructs from these validated surveys were retained and supplemented with additional items to capture high school experiences, career motivations, and sustainability behaviors. Items were pilot-tested for clarity and contextual relevance.

The study was conducted in the context of a second-year undergraduate course titled Introduction to Design, offered within the Mechanical Engineering program at Qatar University. The course serves as an early exposure to engineering design principles and team-based project work, making it a suitable environment to explore themes of identity formation and sustainability awareness. The study population consisted of 34 male students enrolled in this course during the academic semester in which the data was collected. The cohort was selected through purposive sampling, as all students in the course were invited to participate in the survey. The sample, although limited in size and gender diversity, reflects the demographic characteristics of the broader student population in engineering at the institution, which is predominantly male due to regional enrolment trends. The use of a single-course cohort provided a controlled academic setting and facilitated the administration of the survey under standardized conditions.

Data were collected using a printed version of the questionnaire (see appendix), which was distributed to students during a scheduled class session. The survey was administered in hardcopy form to ensure full participation and to maintain the integrity of the response process in a supervised setting. Prior to distribution, the purpose of the study was explained verbally, and students were provided with an information and consent form outlining their rights as participants, including the voluntary nature of their participation, the confidentiality of their responses, and assurance that their course grades would not be affected by participation or non-participation. All 34 students provided informed consent and completed the survey, resulting in a 100% response rate. From these, two responses were not complete and were

omitted. The data collection activity was conducted in a single session, minimizing the risk of external influences on students' responses. The study received ethical approval from Qatar University's Institutional Review Board (QU-IRB), ensuring compliance with established ethical standards for research involving human subjects. Given the exploratory nature of the study and the modest sample size, statistical significance was interpreted with caution. Emphasis was placed on identifying patterns and trends that could inform future research and educational interventions rather than establishing generalizable conclusions.

Results and Discussions

With regards to Figure 1, the analysis of average scores for Questions 1 to 12, which assess students' agreement with statements related to self-concept, intellectual curiosity, and learning preferences, reveals a generally positive trend. Most questions received average scores ranging between 3.0 and 4.5 on a five-point Likert scale, indicating a moderate to strong level of agreement among respondents. Notably, items such as *"I hope to gain general knowledge across multiple fields"* and *"I analyze projects broadly to find a solution that will have the greatest impact"* received some of the highest average scores. This suggests that students possess a strong sense of intellectual curiosity and a preference for holistic, systems-level thinking, traits that are essential for interdisciplinary learning and problem-solving in engineering education. Conversely, lower average scores were observed for items like *"I prefer to focus on details and leave the big picture to others,"* implying that students may be less inclined toward narrowly focused, detail-oriented approaches in isolation. The responses suggest that the students in this cohort have a well-developed academic self-concept and are predisposed to engage in reflective and integrative learning practices, which are critical attributes for success in modern engineering programs.

The analysis of average scores for Questions 13 to 22 (Figure 2), which assess the perceived association between various societal and ethical dimensions and the field of engineering, reveals a strong recognition of engineering's broad impact. Most items received average ratings between 3.5 and 4.5 on a five-point scale, indicating that students generally perceive these dimensions as significantly linked to engineering practice. Highest scores were attributed to items such as *"Improving quality of life"* and *"Saving lives,"* reflecting students' awareness of engineering's role in enhancing human well-being and public safety. Similarly, high average responses to statements like *"Creating economic growth"* and *"Protecting the environment"* suggest that students recognize both the economic and ecological dimensions of engineering responsibilities. Moderate scores for items such as *"Including women as participants in engineering"* and *"Including racial and ethnic minorities as participants"* indicate an emerging but not yet strong association between diversity and the engineering field. The lowest average scores were observed for *"Preserving national security,"* although this item still hovered around the midpoint, suggesting a partial recognition of engineering's contributions to defense and strategic sectors.

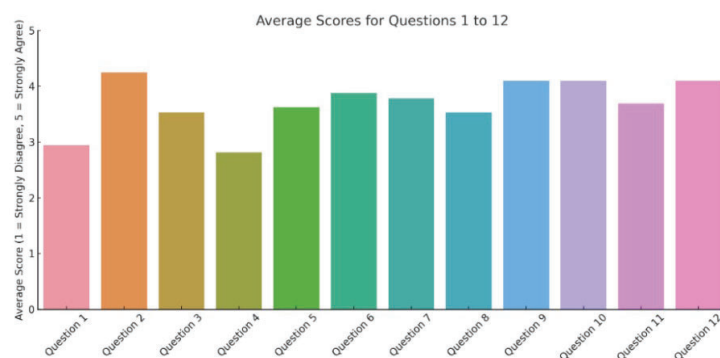


Figure 1: Average scores for Questions 1 to 12

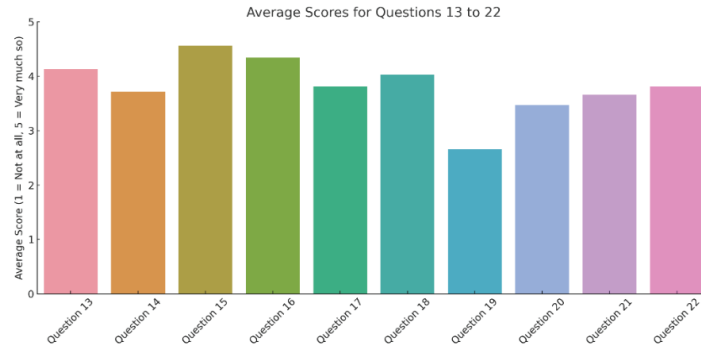


Figure 2: Average scores for Questions 13 to 22

From Figure 3, the average scores for Questions 23 to 37, which assess the importance of various factors contributing to future career satisfaction, reveal diverse priorities among engineering students. Most items received average scores between 3.5 and 4.5, suggesting that students value multiple dimensions of professional fulfillment rather than focusing solely on one area. High scores were observed for items such as “Having job security and opportunity,” “Making use of my talents and abilities,” and “Helping others,” indicating that students prioritize stable employment, personal competence, and social contribution. Similarly, “Developing new knowledge and skills” and “Doing hands-on work” were also rated highly, reflecting students’ desire for continuous learning and practical engagement, an alignment with the hands-on, problem-solving nature of engineering work. Moderate scores were seen for “Making money” and “Applying math and science,” showing that while financial compensation and technical aspects remain important, they are not the only drivers of career satisfaction. The lowest scores were given to items such as “Becoming well known” and “Having an easy job,” implying that recognition and low effort are less motivating factors for this group. The results suggest that students in this cohort are motivated by a blend of intrinsic (e.g., growth, purpose, competence) and extrinsic (e.g., job security) factors, with a stronger emphasis on meaningful, skill-based, and socially impactful careers over fame or ease. This insight can inform curriculum and career guidance to better align with students’ multifaceted career aspirations.

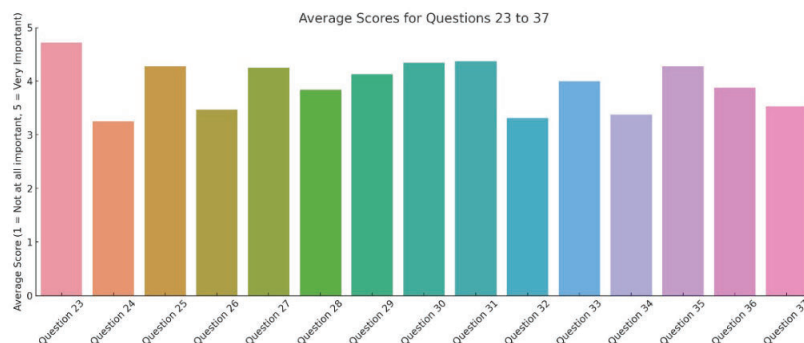


Figure 3: Average scores for Questions 23 to 37

The analysis of average rankings for Questions 38 to 47 (Figure 4), which asked students to reflect on their preferred career paths during high school, reveals notable trends in early professional aspirations. The ranking scale, with 10 as the top choice and 1 as the lowest, provides insight into which professions students most strongly considered before entering university. Engineering received one of the highest average rankings, confirming that a significant portion of the respondents had already identified engineering as a preferred career path prior to university. This aligns with their current enrolment in a mechanical engineering

program, indicating a degree of continuity in their academic and professional aspirations. Other careers such as computer science/information technology, medical professions, and business/law followed closely, suggesting strong interest in fields associated with innovation, societal impact, and economic opportunity. Professions like environmental science, chemistry, and biology received moderate rankings, while careers in physics and health sciences (e.g., nursing, pharmacy) were generally rated lower on average. This distribution reflects a preference for technically-oriented and applied disciplines that offer clear pathways to problem-solving roles and stable employment. It also suggests that students enter engineering programs with relatively well-defined goals, and that their high school interests play a role in shaping these decisions. Understanding these patterns can help educators develop tailored academic advising and career guidance that acknowledges and builds upon students' early motivations.

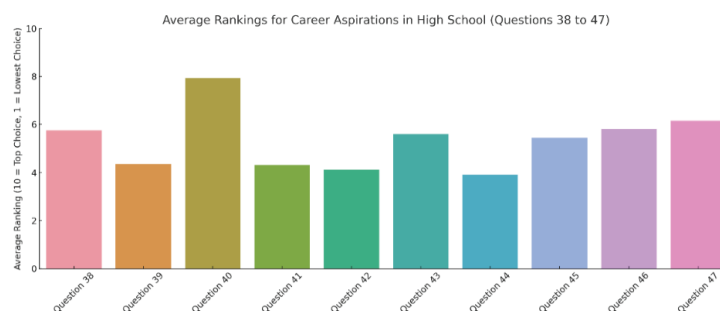


Figure 4: Average scores for Questions 38 to 47

Figure 5 shows the average rankings for Questions 48 to 57, which asked students to rate the importance of various global and societal issues they hope to address in their careers, highlight their priorities and values as emerging engineers. Rated on a scale from 1 (least important) to 10 (most important), the responses reveal a clear inclination toward topics of sustainability and social equity. Among the highest-ranked priorities were climate change, energy, and opportunities for future generations, indicating strong student interest in environmental sustainability and long-term societal impact. These results suggest that students recognize the urgent challenges posed by climate change and energy consumption, and they aspire to contribute to sustainable solutions through their engineering careers. Moderately ranked topics included water supply, environmental degradation, and food availability, reflecting concern for basic human needs and environmental health, though perhaps perceived as more context-specific or specialized areas of impact. Poverty and resource distribution and opportunities for women and minorities also received respectable rankings, pointing to awareness of social justice issues among students, though these were not at the very top of their priorities. Topics such as terrorism and war were ranked lowest, possibly due to students perceiving these as areas less directly influenced by engineering roles or as being beyond the scope of their expected career responsibilities. Overall, the data suggest that this group of engineering students is motivated by a desire to address large-scale global challenges, particularly those related to sustainability and intergenerational equity within their future careers. This reinforces the importance of integrating global issues and sustainability-focused content into engineering curricula to align education with students' career values and aspirations.

The analysis of average responses for Questions 58 to 67, which assess whether specific global and societal topics were covered in students' high school courses, reveals varying levels of exposure. Students were asked to respond with "Yes" (coded as 1) or "No" (coded as 0), allowing the average to reflect the proportion of students who reported exposure to each topic. Topics such as climate change, environmental degradation, and energy had relatively high proportions of "Yes" responses, suggesting that environmental issues were more commonly integrated into the high school curriculum. This indicates some alignment between secondary education and global sustainability priorities, potentially laying a foundation for continued

engagement in higher education. Conversely, topics like opportunities for women and minorities, terrorism and war, and poverty and distribution of wealth and resources showed notably lower proportions, indicating that these social and geopolitical issues were less frequently addressed in high school education. The limited exposure to these subjects may contribute to a narrower understanding of engineering's broader societal roles among students entering university. The results suggest that while environmental themes are reasonably well covered in high school education, there is room for improvement in integrating a broader range of social, ethical, and political topics especially those relevant to equity and global justice, into pre-university curricula to support more holistic educational development.

The average scores for Questions 68 to 74, which measure how frequently students engaged in extracurricular STEM-related activities during their high school years, reveal moderate to low levels of participation. These activities include involvement in science or engineering clubs, building projects, science-related hobbies, media consumption, and public communication of scientific ideas. The scale ranged from 1 (never) to 5 (more than 6 times), allowing for insights into how often these experiences occurred. The highest average scores were recorded for activities like reading or watching science/engineering programs or magazines, indicating that students were more likely to passively consume STEM content than engage in hands-on or social activities. Participation in engineering or science clubs/competitions and building things followed, suggesting some engagement in structured extracurricular activities, although still not at a highly frequent level. On the lower end were activities such as explaining science/engineering concepts to experts and giving poster presentations, which typically require a higher level of initiative, confidence, and institutional support. This may point to fewer opportunities in high school to engage in communication-based or formal science-sharing environments, which are important for developing scientific literacy and outreach skills. The findings indicate that while students had some exposure to STEM beyond the classroom, many lacked frequent and varied experiences, particularly in areas involving collaboration and public communication. Enhancing such opportunities at the pre-university level could better prepare students for the interdisciplinary, communicative, and applied nature of engineering education.



Figure 5: Average scores for Questions 48 to 57

Looking at Figure 6, the analysis of average scores for Questions 75 to 86, which measure students' agreement with various sustainability-related beliefs, reveals a generally positive orientation toward environmental responsibility. Most items received average ratings between 3.0 and 4.5 on a five-point Likert scale, indicating a moderate to strong level of agreement. Statements such as "I feel a responsibility to deal with environmental problems", "Climate change is caused by humans", and "We should be taking stronger actions to address climate change" received some of the highest average scores. This indicates that students not only recognize the human impact on the environment but also acknowledge the need for active intervention and personal accountability. Moderate scores were observed for items like "I have the knowledge to understand most sustainability issues" and "Sustainable options typically cost more", suggesting some uncertainty or perceived limitations in students' sustainability literacy.

and perceived feasibility of sustainable choices. The lowest scoring items included “Nothing I can do will make things better in other places on the planet” and “Pursuit of sustainability will threaten jobs for people like me,” which were appropriately framed in a disagreeable tone. The low agreement with these statements reinforces that students largely reject feelings of helplessness or threat when it comes to sustainability action. Overall, the responses demonstrate that students in this engineering cohort possess a foundational belief in sustainability and its relevance, along with a personal sense of responsibility. However, some responses indicate gaps in confidence or practical understanding, pointing to the need for deeper integration of sustainability education in a way that empowers and equips students with actionable knowledge.

The analysis of average scores for Questions 87 to 96 (Figure 7), which assess how likely students are to engage in sustainability-related behaviors, reveals a mixed but generally positive attitude toward personal environmental responsibility. Responses were scored on a five-point scale ranging from 1 (“Not at all likely”) to 5 (“Extremely likely”). Higher average scores were observed for relatively simple or habitual behaviors such as “Reuse bottles for water, coffee, or other drinks”, “Evaluate the necessity of things I buy”, and “Put on more clothes rather than turn up the heat when I’m cold.” These actions require minimal effort or lifestyle change, suggesting that students are more likely to engage in sustainable behaviors that are convenient and low-cost. Moderate scores appeared for actions like “Use less water when taking a shower or bath” and “Buy a product because it is environmentally friendly,” which may require more conscious decision-making but still fall within manageable personal habits. However, lower scores were found for behaviors such as “Contribute time or money to an environmental group”, “Choose public transportation, carpool, bicycle or walk as a means of transportation,” and “Educate others about the importance of these or similar actions.” These involve either a greater time commitment, financial cost, or social engagement, factors that may act as barriers despite favorable sustainability beliefs. These findings point to a common trend in sustainability research: while students express a willingness to adopt environmentally responsible behaviors, they are more likely to act on those that are low-effort and personally beneficial. To close the intention-action gap, educational strategies should not only emphasize knowledge but also remove barriers to action, promote agency, and normalize active participation in sustainability initiatives.

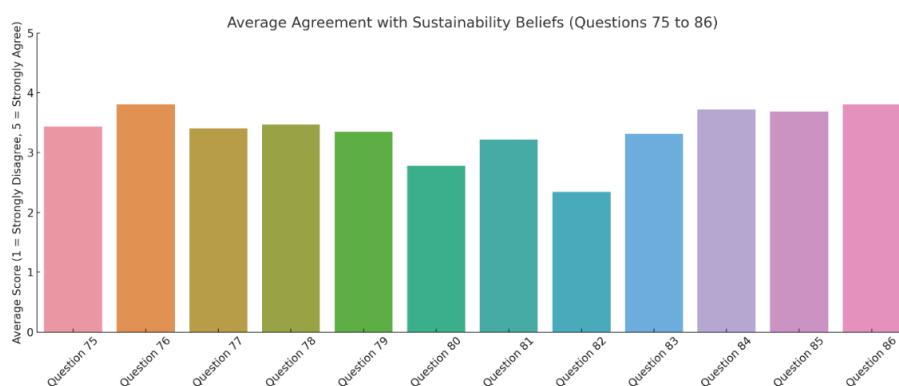


Figure 6: Average scores for Questions 75 to 86

This study set out to explore two interrelated dimensions of student development within engineering education: (1) how self-concept and intellectual curiosity shape engagement in reflective and interdisciplinary learning, and (2) the factors underpinning the gap between sustainability awareness and actual sustainable behaviors. The survey data collected from 32 second-year mechanical engineering students offered rich insights into these areas, directly addressing the stated research questions and objectives. Addressing Research Question 1 and Objective 1, the results from Questions 1 to 12 clearly demonstrate that students possess

a strong academic self-concept and intellectual curiosity. High agreement with statements such as *“I hope to gain general knowledge across multiple fields”* and *“I seek input from those with a different perspective from me”* suggest that students are open to interdisciplinary thinking and reflective learning. This aligns with the goals of modern engineering education, which increasingly values systems thinking, adaptability, and metacognitive skills. Furthermore, students’ recognition of engineering’s broader societal role (Questions 13 to 22), particularly in improving quality of life and fostering economic development, reinforces the idea that they see themselves as contributors to multidisciplinary problem-solving and socially relevant innovation. These insights suggest that engineering programs can and should integrate more reflective, interdisciplinary learning approaches such as collaborative projects, integrative design thinking, and personal learning portfolios that align with students’ existing orientations and learning preferences.

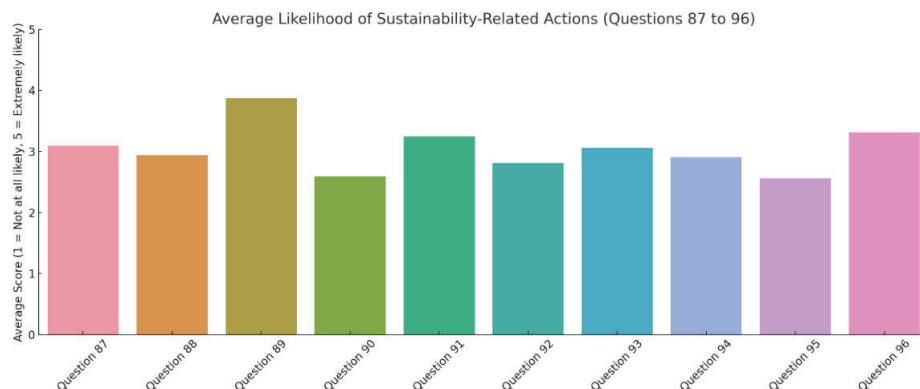


Figure 7: Average scores for Questions 87 to 96

In regard to Research Question 2, the findings reveal a nuanced but clear attitude-behavior gap in students’ engagement with sustainability. Questions 75 to 86 highlight that students demonstrate strong agreement with key sustainability beliefs, including recognition of climate change as human-driven, personal responsibility for environmental issues, and the need for urgent action. However, Questions 87 to 96 show that while students are willing to adopt convenient sustainability behaviors (e.g., reusing bottles, minimizing unnecessary purchases), they are far less likely to engage in effort-intensive behaviors such as using public transport, contributing to environmental groups, or educating others. This mirrors the well-documented “attitude-behavior gap” in environmental psychology (Kollmuss & Agyeman, 2002), where awareness does not translate into consistent action due to psychological and contextual barriers. Underlying this gap are several important factors. First, students report only moderate confidence in their sustainability knowledge, particularly in terms of applied practices suggesting that their conceptual understanding has not yet matured into actionable competence. Second, their high school education (Questions 58 to 67) tended to emphasize environmental topics over social dimensions of sustainability, indicating that their foundation in the broader sustainability discourse is uneven. Finally, limited hands-on engagement during high school (Questions 68 to 74) may contribute to their hesitance in adopting more participatory or community-oriented sustainability behaviors.

These findings highlight the critical need for educational interventions that move beyond awareness-building to action-enabling strategies. Incorporating sustainability into engineering design projects, offering courses in systems thinking, and fostering experiential learning through partnerships with environmental organizations can help close this gap. Furthermore, value-action reflection, where students explore and align their beliefs with their daily behaviors should be embedded in the curriculum to enhance behavioral consistency. This study provides clear evidence that engineering students are intellectually and motivationally prepared to engage in reflective, interdisciplinary learning and sustainability thinking. However, bridging

the gap between values and actions requires deliberate, structured pedagogical interventions that connect belief with behavior and theory with practice.

Conclusion

This study explored two critical dimensions of engineering education: the relationship between self-concept, intellectual curiosity, and reflective interdisciplinary learning; and the factors contributing to the gap between sustainability awareness and sustainable behavior. Findings reveal that students possess a strong academic identity and a pronounced interest in integrative and reflective learning, key attributes aligned with modern pedagogical strategies such as project-based learning and systems thinking. These strengths suggest that engineering curricula should be designed to cultivate and leverage these traits through interdisciplinary collaboration and reflective practice. Simultaneously, while students demonstrate high awareness and belief in sustainability principles, their actual behaviors tend to favor low-effort, convenience-based actions. This discrepancy underscores a well-documented attitude-behavior gap. The underlying causes include limited experiential learning, uneven exposure to social dimensions of sustainability, and moderate confidence in applying sustainability concepts. Addressing this gap requires moving beyond awareness-building to pedagogies that empower students to act, through real-world engagement, behavioral reflection, and value alignment. By highlighting both strengths and gaps in students' development, this study underscores the importance of intentional curriculum design that integrates identity formation with actionable sustainability competencies. These insights are crucial for engineering educators aiming to develop future-ready graduates equipped to address complex global challenges.

Appendix

Questions	To what extent do you disagree or agree with the following:	Questions	Which BEST describes what you wanted to be in while in high school?
Question 1	I prefer to focus on details and leave the big picture to others	Question 38	Medical professional (e.g. doctor, dentist, vet.)
Question 2	I hope to gain general knowledge across multiple fields	Question 39	Health professional (e.g. nursing, pharmacy)
Question 3	I often learn from my classmates	Question 40	Engineer
Question 4	I prefer to focus on the big picture and leave the details to others	Question 41	Environmental scientist
Question 5	I hope to develop my expertise in one specific field	Question 42	Chemist
Question 6	I identify relationships between topics from different courses	Question 43	Physicist
Question 7	I analyze projects broadly to find a solution that will have the greatest impact	Question 44	Biologist
Question 8	I seek input from those with a different perspective from me	Question 45	Computer scientist/information technologist
Question 9	I seek feedback and suggestions for personal improvement	Question 46	Business / Economics / Lawyer
Question 10	When problem solving, I focus on the relationships between issues	Question 47	Others: (please state)
Question 11	I plan ahead of time	Questions	Which of these topics, if any, do you hope to directly address in your career (when you start to work)?
Question 12	When problem solving, I optimize each part of a project to produce the best result	Question 48	Energy
Questions	In your opinion, to what extent are the following associated with the field of engineering?	Question 49	Water Supply
Question 13	Creating economic growth	Question 50	Disease
Question 14	Preserving national security	Question 51	Food availability
Question 15	Improving quality of life	Question 52	Poverty and distribution of wealth and resources
Question 16	Saving lives	Question 53	Climate change
Question 17	Caring for communities	Question 54	Terrorism and war
Question 18	Protecting the environment	Question 55	Environmental degradation
Question 19	Including women as participants in engineering	Question 56	Opportunities for future generation
Question 20	Including racial and ethnic minorities as participants in the engineering	Question 57	Opportunities for women and/or minorities
Question 21	Addressing societal concerns	Questions	Please indicate whether the following topics were covered in your last high school courses.
Question 22	Feeling a moral obligation to other people	Question 58	Energy
Questions	How important are the following factors for your future career satisfaction?	Question 59	Water Supply
Question 23	Making money	Question 60	Disease
Question 24	Becoming well known	Question 61	Food availability
Question 25	Helping others	Question 62	Poverty and distribution of wealth and resources
Question 26	Supervising others	Question 63	Climate change
Question 27	Having job security and opportunity	Question 64	Terrorism and war
Question 28	Working with people	Question 65	Environmental degradation
Question 29	Inventing / designing things	Question 66	Opportunities for future generation
Question 30	Developing new knowledge and skills	Question 67	Opportunities for women and/or minorities
Question 31	Having lots of personal and family time	Questions	How frequently have you done the following activities outside of formal courses in our high school (last 2-3 years)?
Question 32	Having an easy job	Question 68	Participated in engineering/science club/ competitions
Question 33	Being in an exciting environment	Question 69	Built things (e.g. structures, houses, mechanisms, etc.)
Question 34	Solving societal problems	Question 70	Participated in other science/engineering hobbies
Question 35	Making use of my talents and abilities	Question 71	Read/watched science/engineering programs or magazines
Question 36	Doing hands-on work	Question 72	Presented or gave a poster on science/engineering content
Question 37	Applying math and science	Question 73	Explained science/engineering topics to experts (example: professionals, teachers, etc.)
		Question 74	Explained science/engineering topics to non-experts (example: friends, relatives, etc.)

Questions	To what extent do you disagree or agree with the following
Question 75	We can pursue sustainability without lowering our standard of living
Question 76	Human creativity will ensure that we make the earth livable
Question 77	I feel a responsibility to deal with environmental problems
Question 78	Environmental problems make the future look hopeless
Question 79	I can personally contribute to a sustainable future
Question 80	Pursuit of sustainability will threaten jobs for people like me
Question 81	Sustainable options typically cost more
Question 82	Nothing I can do will make things better in other places on the planet
Question 83	I have the knowledge to understand most sustainability issues
Question 84	Climate change is caused by humans
Question 85	I think of myself as part of nature, not separate from it
Question 86	We should be taking stronger actions to address climate change
Questions	How likely are you to do the following:
Question 87	Put on more clothes rather than turn up the heat when I'm cold
Question 88	Use less water when taking a shower or bath
Question 89	Evaluate the necessity of things I buy
Question 90	Consider the energy/carbon/ecological impact of my food choices
Question 91	Reuse bottles for water, coffee, or other drinks
Question 92	Choose public transportation, carpool, bicycle or walk as a means of transportation
Question 93	Buy a product because it is environmentally friendly
Question 94	Take sustainability related courses in my area of academic interest
Question 95	Contribute time or money to an environmental group
Question 96	Educate others about the importance of these or similar actions

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