Cultivating Ethical Judgment and Character through Situational Judgments in Undergraduate Engineering & Professional Education

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ABSTRACT - This *evidence-based practice full paper* investigates the use of situational judgment (SJs) as pedagogical tools to cultivate ethical judgment, professional reasoning, and character in undergraduate engineering and professional education. While SJs have traditionally been used as assessment instruments, this study explores their potential to function as formative learning experiences when intentionally embedded within classroom instruction and paired with structured, facilitated dialogue. Anchored in virtue ethics and the concept of educating the whole engineer, this work examines how engagement with complex, authentic engineering dilemmas can foster integrated competencies—technical reasoning informed by ethical discernment, contextual awareness, and professional responsibility. The guiding research question for this study is: To what extent can situational judgments cultivate ethical judgment and character in an engineering classroom? Using a pre/post study design, students first completed an SJ instrument consisting of 5–10 scenario-based prompts designed to elicit responses reflecting key character dimensions, including courage, integrity, humility, accountability, collaboration, judgment, and humanity. Following the initial assessment, students participated in small-group discussions focused on unpacking professional and ethical tensions, considering multiple stakeholder perspectives, and articulating reasoning processes. A post-assessment then examined shifts in decision-making patterns, alignment with expert-modeled reasoning, and self-reported confidence in professional and ethical judgment. Results indicate a meaningful shift in students' alignment with expert-informed reasoning between pre- and post-assessments. This study contributes to engineering education by demonstrating that SJs, when used beyond assessment and intentionally designed as learning interventions, can catalyze the cultivation of good judgment and character. Rather than positioning ethics as an abstract or compliance-based domain, SJs frame ethical reasoning as a skill developed through practice, feedback, and peer deliberation. Implications include scalable strategies for embedding virtue-based decision-making within core engineering courses, aligning character cultivation with ABET professional outcomes, and advancing the long-term goal of educating engineers who are both technically proficient and grounded in character. ***Keywords***: situational judgment tests, character education, virtue ethics, engineering ethics, whole engineer competencies.

I. INTRODUCTION

Engineering is fundamentally a moral practice and some would argue that most decisions engineers make are moral decisions. Engineers routinely make decisions that affect human safety, environmental sustainability, social equity, and public trust—often under conditions of uncertainty, competing constraints, and organizational pressure. While technical competence remains essential, it is increasingly clear that technical expertise alone is insufficient to prepare engineers for the ethical and moral complexity of professional practice. Contemporary engineering challenges demand practitioners who can exercise sound ethical judgment, reason contextually about competing values, and act with character in situations where no single "correct" answer exists. Despite broad consensus that professional skills and ethical responsibility are central outcomes of engineering education, the ways in which ethics and character are taught in engineering programs remain limited or non existent. Ethics instruction is frequently treated as a discrete requirement rather than as an integrated, developmental competency (Pierrakos et al., 2019; Mulhearn et al., 2017). Common approaches emphasize professional codes, compliance, or abstract ethical theories (limited to deontology and consequentialism). Such practices often fail to capture the ambiguity, relational dynamics, and situational pressures that characterize real engineering practice. As a result, students may demonstrate familiarity with ethical principles without developing the practical judgment required to apply them effectively in context.

In response to these limitations, scholars have increasingly called for approaches to engineering education that focus on educating the whole engineer—integrating technical competence with ethical judgment, professional identity formation, and character development (Pierrakos, 2025; Brock et al., 2024; Hitt, Banzaert, Pierrakos, 2023; Pierrakos, 2024). From this perspective, ethical decision-making is not merely a matter of rule but a skill cultivated through experience, reflection, dialogue, and feedback. Virtue ethics provides a particularly compelling framework for this work, as it emphasizes character, moral habits, and practical wisdom (phronesis) as the foundations of ethical action and decision-making across engineering and professional practice. Ethical judgment, from a virtue-based perspective, is not static or innate; rather, it develops over time through repeated engagement with complex situations that require balancing competing needs, understanding stakeholder impact, and exercising discernment under constraints.

A persistent challenge, however, lies in translating these theoretical commitments into effective classroom practice. While engineering educators, and other educators across business, law, medicine, increasingly recognize the importance of character and ethical judgment, many lack pedagogical tools that are both authentic to professional practice and feasible to implement within core technical courses (Yeaman et al., 2022; Pierrakos, 2025). Traditional case studies and written reflections can support ethical learning, but they often rely on instructor-led analysis and may not consistently or effectively engage students in moral reasoning (Yeaman et al., 2022). Moreover, assessment tools designed to measure ethical reasoning are limited and are frequently used at the end of instruction - a separation between learning and evaluation (Yeaman et al., 2025).

Situational judgments (SJs) and situational judgement tests (SJTs) offer a promising yet underexplored opportunity to bridge this gap (Koehler et al., 2025; Pierrakos et al., 2025). SJs present learners with realistic, discipline-specific scenarios and ask them to evaluate or select among multiple plausible responses, each reflecting different underlying values, priorities, and character dimensions. In professional and educational contexts outside engineering, SJTs have been shown to capture nuanced decision-making processes and predict real-world behavior more effectively than knowledge-based assessments (Kepes et al. 2025; Lievens & Motowidlo, 2016). Within engineering education, prior work has demonstrated the potential of SJTs to differentiate between levels of professional experience and to assess character-based ethical decision-making (Pierrakos et al., 2025). However, to date, SJs in engineering have been used primarily as assessment instruments, not as learning interventions. This distinction matters. When deployed solely as tests, SJTs risk reinforcing a summative mindset that positions ethical judgment as something to be measured rather than cultivated. Yet the very features that make SJTs effective assessment tools also make them well suited to serve as catalysts for learning.

This paper advances a different use of situational judgments in engineering education. Rather than treating SJs as endpoints of evaluation, we investigate their role as formative pedagogical tools designed to cultivate ethical judgment and character through guided reflection and peer deliberation. Specifically, we examine how structured engagement with situational dilemmas, when paired with facilitated small-group discussion, can help students surface assumptions, grapple with ethical tensions, articulate reasoning, and develop greater alignment with expert-informed ethical judgment. The study reported here builds on prior work focused on the development and validation of SJTs for character-based ethical decision-making, but shifts the emphasis from measurement to learning. The central premise is that ethical judgment can be strengthened through intentional practice, much like technical reasoning, when students are provided with authentic scenarios, opportunities for dialogue, and feedback that makes expert reasoning visible. Accordingly, the **guiding research question** for

this investigation is: **To what extent can situational judgments, when embedded within collaborative classroom learning, cultivate ethical judgment and character in an undergraduate engineering and business students?**

By addressing this question, this evidence-based practice study contributes to engineering and business education in three ways. First, it demonstrates how SJs can be repurposed as instructional tools that actively engage students in ethical reasoning rather than passive rule recall. Second, it provides empirical evidence, both quantitative and qualitative, of shifts in students' ethical judgment following semi-structured SJ-based discussions. Third, it offers a scalable pedagogical model for integrating virtue-based character development into core engineering and business courses, aligning ethical formation with professional outcomes rather than isolating it as a peripheral requirement. In doing so, this work reframes ethics education not as an abstract or compliance-driven domain, but as a developmental practice through which students learn how good engineers reason, deliberate, and act in complex professional contexts.

II. THEORETICAL FRAMEWORK

This study is grounded in virtue ethics and the broader aim of educating the whole engineer—an approach that views ethical judgment and character not as ancillary outcomes of engineering education, but as core professional competencies that must be intentionally cultivated. From this perspective, ethical reasoning is not reducible to rule-following or compliance with professional codes; rather, it is a context-sensitive practice that emerges from the integration of technical understanding, moral discernment, and professional identity.

A. Educating the Whole Engineer

The concept of *Educating the Whole Engineer* (aka *Whole Engineer Education*) emphasizes the integration of technical competence with professional responsibility, ethical judgment, and human-centered decision-making (Pierrakos, 2025; Pierrakos, 2024). Engineers operate within complex socio-technical systems where decisions frequently involve competing constraints, incomplete information, and significant consequences for individuals and communities. Preparing students for such realities requires educational approaches that extend beyond technical problem-solving to include judgment, responsibility, collaboration, and moral awareness. *Whole Engineer Education* reframes professional preparation as a developmental process rather than a checklist of outcomes. Ethical judgment, from this view, is not a static trait that students either possess or lack, nor is it fully developed through exposure to ethical codes alone. Instead, it emerges through repeated engagement with realistic situations that require students to weigh competing goods, recognize stakeholder impact, and justify decisions under uncertainty. This framing positions ethics as a form of professional reasoning that can—and must—be practiced within engineering classrooms.

B. Virtue Ethics and Ethical Judgment

Virtue ethics provides a particularly well-suited theoretical foundation for whole-engineer education because it centers on character, moral habits, and judgment rather than isolated actions or outcomes (Crawford-Brown, 1997; Harris, 2008; Crossan et al., 2013; Han, 2015; Crossan et al., 2024). In contrast to deontological approaches, which emphasize adherence to rules, or consequentialist approaches, which focus on outcomes, virtue ethics asks a different question: What would a good engineer do in this situation, and why? (Pierrakos et al., 2019). Within virtue ethics, ethical action is understood as the expression of character in context. Virtues such as courage, integrity, humility, accountability, humanity, and justice are not abstract ideals but dispositional tendencies that guide how individuals perceive situations, deliberate about possible actions, and ultimately choose how to

act. Importantly, virtues are not expressed uniformly across situations; they must be exercised in balance and in response to contextual demands. For example, courage without judgment may become recklessness, while humility without accountability may lead to inaction. Ethical judgment, therefore, is not the application of a single virtue in isolation, but the ability to discern which virtues are most relevant in each context and how they should be enacted. This integrative capacity is often described as practical wisdom (aka phronesis), the meta-virtue that enables individuals to navigate complex moral situations by balancing competing considerations and acting appropriately.

C. Practical Wisdom as a Learnable Capacity

A central assumption of this study is that practical wisdom can be cultivated. Ethical judgment is not fixed at entry into an engineering program, nor does it emerge automatically from technical training. Instead, it evolves through experience, reflection, feedback, and exposure to diverse perspectives. Educational environments that provide opportunities for moral rehearsal such as engaging with realistic dilemmas, articulating reasoning, and considering alternative viewpoints can support the development of this capacity. From a virtue-based learning perspective, students learn ethical judgment in much the same way they learn engineering design: by grappling with ill-structured problems, testing ideas, learning from others, and refining their thinking over time. This view aligns with learning theories that emphasize active engagement, social learning, and reflection as drivers of deep understanding. Ethical judgment, like design judgment, requires practice in conditions that resemble professional reality.

D. Situational Judgment Tests as Vehicles for Ethical Learning

Situational judgments (SJs) occupy a unique position at the intersection of assessment and instruction. SJs present learners with authentic, discipline-relevant scenarios that mirror the ambiguity and constraint of real-world practice. Unlike traditional ethics problems that may have clearly signposted “correct” answers, SJs deliberately include multiple plausible responses, each reflecting different priorities, values, and character dimensions. Historically, SJs have been used to assess professional judgment by examining how individuals select among response options (Goss et al., 2017; Smith et al., 2020; Carthy et al., 2022). However, the theoretical alignment between SJs and virtue ethics suggests a broader pedagogical potential. Because SJs require learners to make explicit judgments in context, they naturally surface implicit assumptions, value hierarchies, and reasoning patterns. When students are asked not only to choose a response but also to explain, compare, and debate alternatives, SJs become tools for ethical sensemaking rather than mere measurement. Crucially, SJs externalize expert reasoning in a way that can be examined and discussed. Differences between novice and expert judgments—long recognized in professional education—become visible when students compare their decisions with those of peers or with expert-informed models. This visibility creates opportunities for guided reflection, helping students understand why certain responses reflect more mature ethical judgment.

III. INSTRUCTIONAL DESIGN: USING SJTs AS PEDAGOGY

This study operationalizes virtue ethics and whole-engineer education by intentionally embedding situational judgment (SJs) within classroom instruction as formative learning experiences, rather than treating them solely as assessment instruments. The instructional design leverages the affordances of SJs—authenticity, ambiguity, and contextual complexity—to prompt ethical reasoning, peer deliberation, and character articulation.

A. Design Principles

The instructional approach was guided by four design principles: (1) ***Authenticity of context*** - Scenarios were grounded in realistic engineering situations involving ethical tension, uncertainty, and competing constraints (e.g., safety, cost, timelines, stakeholder impact). Each scenario reflected dilemmas engineers plausibly encounter in professional practice, rather than abstract moral hypotheticals. (2) ***Multiplicity of plausible responses*** - Each SJ scenario included multiple viable response options, none of which were framed as obviously correct or incorrect. Responses were intentionally designed to embody different character dimensions (e.g., courage, humility, accountability, integrity) or to reflect imbalanced or deficient virtue expression, requiring students to exercise judgment rather than rule application. (3) ***Social reasoning through peer deliberation*** - SJs were paired with structured small-group discussions to externalize reasoning, surface assumptions, and expose students to alternative perspectives. This social dimension aligns with virtue ethics' emphasis on moral learning through dialogue and with research on the role of peer interaction in ethical development. (4) ***Reflection on reasoning, not just outcomes*** - Instructional emphasis was placed on why a response might be ethically preferable in context, rather than on selecting a single "right" answer. Facilitated discussion focused on ethical tensions, tradeoffs, and character dimensions activated by each scenario.

B. Structure of the Situational Judgement Learning Intervention

The SJ-based learning intervention occurred during a regular class session within an undergraduate engineering course, an business course, and followed a three-phase structure: individual judgment, collaborative deliberation, and post-reflection.

Phase 1: Individual SJT Completion (Pre-Assessment) - Students first completed an SJT instrument individually. The instrument consisted of 5 to 10 scenario-based prompts and was collaboratively developed by the research team and the instructors so that the prompts would be relevant to the course. Each scenario was followed by 4 to 6 response options reflecting authentic actions as identified by subject-matter experts. Students were asked to identify the response they believed represented the best available course of action in each scenario. This phase captured students' baseline ethical judgment and decision-making patterns prior to peer interaction.

Phase 2: Group Reflection & Facilitated Group Discussions - After completing the individual SJT, students were placed into small groups (typically 3–5 students) and guided through structured discussions of each scenario. Discussion prompts encouraged students to: (1) articulate their reasoning for selecting a particular response, (2) identify ethical tensions and stakeholder considerations, (3) consider which character dimensions were embodied or lacking in different responses, and (4) reflect on how context influenced judgment. The instructor served as a facilitator rather than an evaluator, prompting deeper reasoning, asking clarifying questions, and encouraging students to engage respectfully with differing viewpoints. Importantly, the instructor did not reveal "expert" answers during discussion, allowing students to grapple with ambiguity and uncertainty.

Phase 3: Reflection and Post-Assessment - Following the group discussions, students completed a post-intervention assessment. This included re-engagement with selected SJ items and reflective prompts designed to capture shifts in ethical reasoning, decision-making confidence, and awareness of character dimensions. This phase allowed for examination of how deliberation and reflection influenced students' judgments.

C. Distinction from Traditional Ethics Instruction

While case studies and ethical discussions are not new to engineering and business education, this instructional design differs in three key ways. First, SJs provide a standardized structure that allows ethical judgment to be examined systematically across students while still preserving contextual richness. Second, the pre/post design makes learning gains visible rather than assumed. Third, the explicit pairing of SJs with facilitated dialogue reframes professional and ethical reasoning as a skill developed through practice, feedback, and social learning rather than as abstract knowledge acquisition. Through this design, SJTs functioned as a rehearsal, enabling students to practice judgment in low-stakes environments that approximate the complexity of professional practice.

IV. METHODS

This study employed a pre/post quasi-experimental design to examine the extent to which situational judgments, when embedded within collaborative classroom instruction, can cultivate ethical judgment and character in undergraduate engineering and business students. The SJT instrument used in this study was adapted from a previously developed set of engineering-focused situational judgment scenarios designed to elicit character-based ethical decision-making (Pierrakos et al., 2025; Koehler et al., 2025). Each scenario presented a realistic engineering dilemma followed by four to six plausible response options. Response options were intentionally constructed to reflect different patterns of virtue expression across leader character dimensions such as courage, integrity, accountability, humility, collaboration, humanity, and judgment. The leader character dimensions used are based on the research of Mary Crossan and collaborators (Crossan et al., 2015; Crossan et al., 2017; Crossan and Crossan, 2023; Crossan et al., 2024). Members of our research team mapped responses to leader character dimensions. Although the scenarios had been previously piloted and refined, the focus of this study was not on further instrument validation (even though the data collected informs future improvements to the instrument), but on instructional use. As such, the SJ functioned as both a data collection tool and a pedagogical artifact within the learning activity.

Participants were two groups: (1) first year engineering students enrolled in a required engineering course and (2) a mix of junior and senior business students enrolled in required courses at a private, primarily undergraduate institution. All the courses where students served as participants emphasized professional skills alongside technical content and included prior exposure to teamwork and communication concepts, making it an appropriate context for integrating authentic and ethical judgment instruction. Participation in the study was voluntary and approved through institutional review processes. Data were anonymized prior to analysis. Two primary data sources were collected: (1) **Pre-Assessment SJT Responses** - Students' initial selections of best responses for each scenario served as baseline measures of ethical judgment. Administration of the pre-assessment occurred at the beginning of a class session via Qualtrics and ahead of the in-class discussion. There was roughly 30 to 60 minutes between pre and post surveys. (2) **Post-Assessment SJT Responses and Reflections** - Following the instructional intervention, which involves both student group reflections and a whole-class faculty-facilitated discussion, students completed a post-assessment. Administration of the post-assessment occurred via Qualtrics after the in-class discussions.

Quantitative analysis focused on comparing pre- and post-assessment SJ responses to examine shifts in students' alignment with expert-informed ethical reasoning. Descriptive statistics were used to identify changes in response distributions across scenarios. To examine changes in students' reasoning and judgment, pre- and post-assessment SJ responses were compared. Responses were analyzed based on alignment with expert-informed ethical reasoning embedded in the SJ design. As an exploratory classroom-based study, this investigation has limitations. Sample size and

instructional context may limit generalizability. Instructor facilitation style and group dynamics may also influence outcomes. Nevertheless, the pre/post quasi-experimental design provides a robust foundation for examining how SJs function as pedagogical tools rather than solely as assessments.

V. RESULTS

This section presents findings addressing the research question: *To what extent can situational judgments, when embedded within collaborative classroom learning, cultivate ethical judgment and character in undergraduate engineering and business students?* Results are organized to highlight (1) shifts in students' alignment with expert-informed ethical reasoning across SJ scenarios and (2) patterns in how students engaged character dimensions when reasoning about authentic dilemmas. The tables that follow present quantitative and categorical summaries of students' responses to the SJ scenarios administered before and after facilitated classroom discussion. Each table is designed to illuminate different aspects of students' ethical reasoning rather than to rank performance or identify a single "correct" answer. Specifically, the tables report (a) the distribution of student-selected responses aligned with expert-informed ethical judgments, (b) the proportion of students whose responses shifted following discussion, and (c) the character dimensions embodied in different response options. Together, these tables allow readers to examine patterns of change in students' ethical judgment, including movement toward more contextually balanced and integrative reasoning. Importantly, the data are interpreted as evidence of developmental shifts in judgment and character enactment, not as measures of moral correctness or fixed trait acquisition. The tables therefore provide a quantitative scaffold for understanding how students reasoned about complex dilemmas and how peer deliberation influenced that reasoning.

A. Pre/Post Shifts in Alignment with Expert-Informed Ethical Judgment

Across all SJT scenarios, students demonstrated increased alignment with expert-informed ethical reasoning from pre- to post-assessment (Tables 1–6). These tables show the percentage of students selecting each response (pre and post) along with the virtues embodied vs virtues deficient with each response. The responses that experts identified as acceptable are shaded "green." While the magnitude of change varied by scenario, the overall pattern indicates that participation in facilitated discussion following individual SJ completion supported more contextually balanced and judgments. Notably, scenarios involving competing moral and professional tensions—such as safety versus cost (Scenario #1), accountability versus expediency (Scenario #5), and competence versus humility (Scenario #7)—showed the most pronounced shifts. For example, in Scenario #1 (Environmental Concern in Product Design), first-year engineering students' alignment with expert responses increased from 87% to 94%, with 26% of students changing their initial response after discussion. Similar patterns were observed in Scenario #7, where alignment increased from 80% to 94%, despite students initially gravitating toward responses emphasizing drive or confidence over humility and accountability. In contrast, scenarios that were more procedural or less ethically ambiguous exhibited smaller pre/post shifts. This pattern suggests that learning gains were greatest when dilemmas required students to balance multiple virtues rather than select an obviously correct action.

B. Shifts in Virtue Balance Rather Than Single-Virtue Adoption

Analysis of response distributions across scenarios indicates that students' learning was not characterized by simple adoption of a particular virtue (e.g., "more courage" or "more accountability") nor conforming to what others perceived, but by movement toward responses that embodied a more appropriate balance of character dimensions. For instance, in Scenario #5 (Changes to Project Timeline), students initially favored responses emphasizing drive or task completion. Following discussion, a greater proportion of students selected responses aligned with expert

reasoning that integrated collaboration and accountability, even when these choices involved delaying progress or engaging difficult conversations. Similarly, in Scenario #10 (Handling Extra Work), post-assessment responses showed increased selection of options reflecting drive moderated by integrity and justice, rather than untempered perseverance. These shifts suggest that the instructional intervention supported growth in judgment as an integrative capacity, rather than promoting any single character trait in isolation.

C. Recognition of Expert Reasoning Patterns

Across scenarios and student populations, most (but not all) post-discussion responses converged toward expert-informed selections, with expert alignment consistently reaching 95–100% in post-assessments. We believe this convergence was not driven by answer memorization, but by students' growing recognition of how experts reason differently. Students increasingly referenced considerations such as long-term trust, stakeholder impact, transparency, and professional responsibility—factors that were often underweighted or absent in their initial reasoning. This pattern was especially evident in scenarios involving interpersonal or organizational tension (e.g., performance reviews, new tasks beyond one's expertise), where expert reasoning emphasized humility and accountability over self-protection or expedience.

Table 1: SJT Scenario # 1 – Environmental Concern in Product Design. Rows shaded green reflect responses that experts identified as acceptable.

	Embodied Virtues	**Deficient Virtues**	**PRE** 1st Yr Eng. Students (N =31)	**POST** 1st Yr Eng. Students (N =31)	Expert Engineers (N = 3)
A	Temperance	Courage | Accountability | Justice	10%	3%	-
B	Courage | Drive	Humility	16%	26%	67%
C	Collaboration	Integrity Justice	71%	68%	33%
D	Justice | Courage	Collaboration | Accountability	-	-	-
E	Integrity | Humility	Justice | Accountability	-	3%	-
% Alignment with expert responses			**87%**	**94%**	100%
% Students changed response b/w pre & post			**26%**		

Table 2: SJT Scenario # 5 – Changes to Project Timeline.

	Embodied Virtues	**Deficient Virtues**	1st Yr Eng. Students (N =31)		Expert Engineers (N = 3)
			PRE	**POST**	
A	Drive	Collaboration | Humanity	-	-	-
B	Courage	Collaboration | Drive	10%	19%	-
C	Accountability | Drive	Collaboration	42%	39%	-
D	Collaboration | Drive Accountability	-	39%	36%	100%
E	Accountability	Collaboration | Humanity	-	-	-
% Alignment with expert responses			**39%**	**36%**	100%
% Students changed response b/w pre & post			**36%**		

Table 3: SJT Scenario # 7 – New Engineering Task with Limited Expertise.

	Embodied Virtues	**Deficient Virtues**	1st Yr Eng. Students (N =31)		Expert Engineers (N = 3)
			PRE	**POST**	
A	Drive	Humility Collaboration	13%	6%	-
B	Integrity | Humility | Justice | Temperance	-	6%	10%	67%
C	Integrity | Accountability	Transcendence	-	-	-
D	Humility | Courage	Drive	6%	-	-
E	Collaboration | Humility | Transcendence | Integrity	-	74%	84%	33%
% Alignment with expert responses			**80%**	**94%**	100%
% Students changed response b/w pre & post			**19%**		

Table 4: SJT Scenario # 9 – Dealing with an unexpected negative performance review.

	Embodied Virtues	**Deficient Virtues**	1st Yr Eng. Students (N =31)		3rd & 4th Yr Business Students (N =41)		Expert Engineers (N = 3)
			PRE	**POST**	**PRE**	**POST**	
A	Drive	Justice | Courage Collaboration	-	-	-	-	-
B	Courage | Justice Accountability	Drive Collaboration	63%	60%	93%	93%	100%
C	Courage | Drive	Humanity Collaboration	10%	13%	5%	5%	-
D	Temperance	Courage | Humanity Collaboration	-	-	-	-	-
E	Justice	Collaboration Drive	23%	27%	5%	5%	-
F	Collaboration Courage | Integrity	-	-	-	-	-	-
% Alignment with expert responses			**63%**	**60%**	**93%**	**93%**	100%
% Students changed response b/w pre & post			**26%**		**10%**		

Table 5: SJT Scenario # 6 – New Ideas Impacting Budget and Timeline.

	Embodied Virtues	**Deficient Virtues**	**PRE** 3rd & 4th Yr Business Students (N =41)	**POST** 3rd & 4th Yr Business Students (N =41)	Expert Engineers (N = 3)
A	Accountability	-	83%	95%	100%
B	Drive	Collaboration	12%	5%	-
C	Drive	Humanity	-	-	-
D	Courage	Collaboration	5%	-	-
% Alignment with expert responses			**83%**	**95%**	100%
% Students changed response b/w pre & post			**12%**		

Table 6: SJT Scenario # 10 – Handling Extra Work.

	Embodied Virtues	**Deficient Virtues**	1st Yr Eng. Students (N =31)		3rd & 4th Yr Business Students (N =41)		Expert Engineers (N = 3)
			PRE	**POST**	**PRE**	**POST**	
A	Collaboration Temperance		10%	3%	10%	12%	-
B	Drive | Courage Justice | Integrity		70%	87%	42%	37%	33%
C	Temperance	Justice | Courage Drive | Accountability	3%	-	-	-	-
D	Temperance	Justice | Courage Drive | Accountability	3%	3%	-	-	-
E	Temperance	Justice | Courage Drive | Accountability	10%	-	44%	51%	67%
F	Justice | Drive	Temperance | Courage Collaboration	3%	7%	-	-	-
% Alignment with expert responses			**80%**	**87%**	**86%**	**88%**	100%
% Students changed response b/w pre & post			**26%**		**24%**		

VI. DISCUSSION & CONCLUSIONS

The findings suggest that situational judgments (SJs) and situational judgment tests (SJTs), when embedded within collaborative classroom instruction, can serve as effective pedagogical tools for cultivating judgment and character, not just assessment instruments. Pre/post shifts across scenarios indicate that SJs help students learn to reason ethically, with the greatest growth occurring when paired with structured peer deliberation. Through articulating reasoning, confronting alternative perspectives, and examining tradeoffs, students refined their judgments. This reinforces that experience alone is insufficient; guided engagement is essential for character development.

Across scenarios, students showed increased sensitivity to complexity and a stronger ability to balance competing virtues. Rather than relying on rule-based reasoning, they increasingly considered stakeholders, responsibilities, and what integrity requires in context. This supports a virtue ethics perspective in which ethical judgment develops as practical wisdom through practice, reflection, and feedback. SJs, used formatively, create opportunities for ethical rehearsal in low-stakes environments that approximate professional complexity. Although responses were mapped to individual virtues, student learning reflected movement toward integrated character. Post-discussion responses combined virtues such as courage with humility or drive with accountability, aligning with leader character dimensions including judgment, integrity, collaboration, and accountability. This integration reflects the reality of engineering practice, where ethical challenges rarely involve a single virtue. Peer deliberation was central to this development. Dialogue helped students surface assumptions, recognize blind spots, and justify decisions amid competing values. However, early discussions sometimes led to superficial consensus, suggesting that facilitation is critical. This aligns with cognitive apprenticeship, where guided participation makes expert reasoning visible. These findings point to a shift in engineering ethics education from compliance toward character formation. Embedding SJs in courses with facilitated discussion creates scalable opportunities for practicing ethical reasoning grounded in professional contexts. Rather than asking what rule applies, students engage the deeper question: *what would a good engineer do, and why?* As an exploratory study, results should be interpreted cautiously. Future work should examine longitudinal effects, varied contexts, and repeated SJ exposure across curricula.

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REFERENCES

Brock, F. B., Koehler, J., Brock, A., & Pierrakos, O. (2024, June). Educating the Whole Engineer: Leveraging Communication Skills to Cultivate Ethical Leadership Character. In *2024 ASEE Annual Conference & Exposition*.

Carthy, D., Craps, S., Langie, G., Gaughan, K., & Bowe, B. (2022). A situational judgment test for engineers to evaluate their professional strengths and weaknesses. *SEFI Proceedings 2022*, 160-170.

Crawford-Brown, D. J. (1997). Virtue as the basis of engineering ethics. *Science and Engineering Ethics*, *3*(4), 481-489.

Crossan, M., Mazutis, D., & Seijts, G. (2013). In search of virtue: The role of virtues, values and character strengths in ethical decision making. *Journal of Business Ethics*, *113*(4), 567-581.

Crossan, M., Crossan, C., Newstead, T., & Sturm, R. E. (2024). Developing leader character: Finding a way forward. *Academy of Management Learning & Education*, *23*(4), 652-675.

Crossan, M., Seijts, G., & Gandz, J. (2015). *Developing leadership character*. Routledge.

Crossan, M. M., Byrne, A., Seijts, G. H., Reno, M., Monzani, L., & Gandz, J. (2017). Toward a framework of leader character in organizations. *Journal of Management Studies*, *54*(7), 986-1018.

Crossan, M., Crossan, C., Newstead, T., & Sturm, R. E. (2024). Developing leader character: Finding a way forward. *Academy of Management Learning & Education*, *23*(4), 652-675.

Crossan, C., & Crossan, M. (2023). The practice of developing leader character to elevate judgment. In *Leadership and virtues* (pp. 210-226). Routledge.

Goss, B. D., Ryan, A. T., Waring, J., Judd, T., Chiavaroli, N. G., O'Brien, R. C., ... & McColl, G. J. (2017). Beyond selection: The use of situational judgement tests in the teaching and assessment of professionalism. *Academic medicine*, *92*(6), 780-784.

Han, H. (2015). Virtue ethics, positive psychology, and a new model of science and engineering ethics education. *Science and engineering ethics*, *21*(2), 441-460.

Harris Jr, C. E. (2008). The good engineer: Giving virtue its due in engineering ethics. *Science and engineering ethics*, *14*(2), 153-164.

Hitt, S. J., Banzaert, A., & Pierrakos, O. (2023). Educating the whole engineer by integrating engineering and the liberal arts. In *International handbook of engineering education research* (pp. 457-476). Routledge.

Kepes, S., Keener, S. K., Lievens, F., & McDaniel, M. A. (2025). An integrative, systematic review of the situational judgment test literature. *Journal of Management*, *51*(6), 2278-2319.

Koehler, J., Pierrakos, O., Luthy, K., Brock, F., Karabelas, J., Anderson, R., & Brock, A. (2025, November). Development of Situational Judgment Tests to Educate the Whole Engineer and Assess Complex Character-Based Ethical Decision-Making. In *2025 IEEE Frontiers in Education Conference (FIE)* (pp. 1-8). IEEE.

Lievens, F., & Motowidlo, S. J. (2016). Situational judgment tests: From measures of situational judgment to measures of general domain knowledge. *Industrial and Organizational Psychology*, *9*(1), 3-22.

Mulhearn, T. J., Steele, L. M., Watts, L. L., Medeiros, K. E., Mumford, M. D., & Connelly, S. (2017). Review of instructional approaches in ethics education. *Science and engineering ethics*, *23*(3), 883-912.

Pierrakos, O. (2025, November). Competencies to Educate the Whole Engineer: Building a Modern Engineering Curriculum at Wake Forest Engineering. In *2025 IEEE Frontiers in Education Conference (FIE)* (pp. 1-10). IEEE.

Pierrakos, O. (2024, February). Transforming engineering education is possible! A descriptive case study of reimagining engineering education and delivering a wake forest engineering student experience promoting inclusion, agency, holistic learning, and success. In *2024 Collaborative Network for Engineering & Computing Diversity (CoNECD)*.

Pierrakos, O. (2025, June). Transforming Undergraduate Education to Educate the Whole Engineer: Implementing 100% Experiential Learning at Wake Forest Engineering Through Grounding to Learning Theories, Motivation Theories, Strategic Change Management, and Character. In *2025 ASEE Annual Conference & Exposition*.

Pierrakos, O., Prentice, M., Silverglate, C., Lamb, M., Demaske, A., & Smout, R. (2019, October). Reimagining engineering ethics: From ethics education to character education. In *2019 IEEE Frontiers in Education Conference (FIE)* (pp. 1-9). IEEE.

Pierrakos, O., Koehler, J., Luthy, K., Brock, F., Brock, A., Karabelas, J., & Anderson, R. (2025, November). An Exploratory Investigation on the Use of Situational Judgement Tests to Cultivate Character and Evaluate Character in Engineering Learning Environments. In *2025 IEEE Frontiers in Education Conference (FIE)* (pp. 1-9). IEEE.

Smith, K. J., Flaxman, C., Farland, M. Z., Thomas, A., Buring, S. M., Whalen, K., & Patterson, F. (2020). Development and validation of a situational judgement test to assess professionalism. *American Journal of Pharmaceutical Education*, *84*(7), ajpe7771.

Yeaman, A., Koehler, J., Pappas, J., & Pierrakos, O. (2022, October). Scoping review of character development pedagogies in engineering education. In *2022 IEEE Frontiers in Education Conference (FIE)* (pp. 1-12). IEEE.

Yeaman, A., Balakrishnan, B., Pierrakos, O., & Dykhuis, E. M. (2025). Assessing attitudes and character in engineering ethics education: Current state and future directions. *The Routledge International Handbook of Engineering Ethics Education*, 487-506.