Choreographing Virtue: The Role of Situatedness and Layering in Building Moral Muscle Memory in Engineering Ethics Education

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Abstract

This paper explores the contribution that a situated and competency-layering pedagogy can offer to enhance the effectiveness of Giving Voice to Values (GVV), a growing model for teaching ethical leadership in engineering, business, law, and other professional fields. The uptake of GVV as a framework for ethical leadership practice and education has had a growing influence in business school curricula, and more recently, in engineering ethics education. GVV is an innovative model that bridges ethical decision-making and ethical action by preparing learners to develop scripts and action plans for acting consistently with their values in ethically challenging scenarios. The approach moves away from discussing what the right action would be according to different ethical normative frameworks, and instead starts from the premise that most people are able to recognize the right course of action that is consistent with their values, and want to pursue it; however, they have difficulties acting accordingly. Central to this learning model is the application of a thought experiment framed as: "Assuming I know what I want to do to act on my values, how can I get it done?" The capacity to bridge the space between decision and action is strengthened by reflection about past experiences and each person's specific style and personality. The Department of Engineering & Society at the University of Virginia is currently applying the GVV model in its undergraduate engineering ethics courses.

The developer of the GVV framework has stated that the model's use of the notion of "moral muscle memory" draws in part from the pedagogical approach to layering the physical, emotional, and cognitive abilities to respond to situations of violence that were developed within the Impact or Empowered Self Defense method of gender violence prevention. The authors, faculty members of the Department of Engineering & Society at the University of Virginia are proposing a Situated Ethical Action Framework (SEAF) described in this paper to enhance the development of engineering students' competencies for responding to ethical predicaments. SEAF draws on both conflict resolution process design methods and on elements of layering derived from the Empowered Self Defense pedagogy. It introduces additional scenario-building and response-planning strategies that can enhance the stepwise rehearsal experience of the learner, and therefore their sense of self-efficacy in applying the GVV framework. The proposed innovation incorporates two additional elements: concentric circles of engagement and stepwise rehearsal of interactions. Concentric circles of engagement involve different centers of focus and degrees of involvement of others in the learner's process of ethical decision-making and action, which expand from an internal cognitive space where the dilemma is acknowledged and analyzed, to preliminary interactions with trusted others to better understand the issue, to

assessing organizational cultures and stakes, to ultimately engaging with others to raise concerns and seek alternatives. Stepwise rehearsal of interactions includes a breakdown of the steps necessary to engage with others at each of these circles, from preparing to frame concerns to scripting difficult conversations. This paper presents the pedagogical foundations for this revised approach and preliminary insights from its early application in an undergraduate course.

Keywords

GVV
Giving Voice to Values
Situated Ethical Action Framework
Professional Skills
Engineering Ethics
Undergraduate Education
STS

Introduction

The mission of the University of Virginia's School of Engineering and Applied Sciences (SEAS) is "to make the world a better place by creating and disseminating knowledge and by preparing engineering leaders to solve global challenges" [1]. While parts of this mission are fulfilled in learning and demonstrating technical skills, the greater challenge is to cultivate professional skills and curate opportunities to strengthen these skills embedded within undergraduate engineering curricula. Downey explains,

> "But the big news and challenge of globalization for engineering education is the importance of questioning and studying one's own identity as an engineer, including the knowledge one values and the broader social commitments one takes for granted in doing engineering work. The work of building such questions into engineering education is the responsibility of all engineering educators and the entire curriculum, including the most technical of technical courses and instructors. The big hurdle to overcome is to move these questions from the periphery of engineering curricula to their core." [2]

As Seabrook et al. examine in their comparative study, embedded courses within engineering schools that draw from the field of Science and Technology Studies (STS) are a potentially powerful model for integrating knowledge and understanding of professional engineering skills [3]. The purpose of this paper is to propose a further innovation on a burgeoning pedagogical model that other engineering educators can explore and adopt as a resource in their classrooms to help strengthen and integrate these foundational skills to help mold global engineering leaders.

A common observation within the American Society for Engineering Education (ASEE) is that there is no standardization in teaching professional skills. Some scholars, such as Neeley, have tried to map conceptual efforts of integrating professional skills into undergraduate engineering curricula [4]. There are several different models for how these courses appear in undergraduate programs. Some schools use a powerful embedded model where there are programs and departments that specifically address and teach professional engineering courses, while other schools rely on outsourcing these courses to liberal arts colleges to fulfill humanities and social science electives [3]. The main issue with relying on liberal arts colleges is that the course offerings are generally not related to engineering as a professional practice. By utilizing an embedded model, engineering programs can curate courses that directly prepare students for engineering professional skills. As Downey explains, "The bottom line: the contemporary challenge to produce global engineers is not about how to cram more skills into the minds and bodies of engineers in the same amount of time. It is to make engineers better problem definers and problem solvers by integrating into engineering routines questions about what engineers are for and what engineering is for in the first place" [2]. Implementing a Problem Definition and Solution model helps to negotiate fundamental engineering professional skills, namely collaborating with experts and non-experts, as well as accounting for alternative outcomes for varying stakeholders [5]. This model is integrated in varying formats through the instruction of the engineering design process, but there is a theoretical and practical model that puts these principles into actionable skills and steps: Giving Voice to Values (GVV) as introduced by Gentile [6]. A search of the American Society for Engineering Education document repository reveals that there are only five papers that have directly cited GVV. The oldest was published in 2014, and the newest in 2023.

The following sections of this work in progress paper set the stage for the introduction by the Department of Engineering & Society faculty at the University of Virginia of an innovative framework for developing engineering students' competencies for acting on their values in ethical predicaments. The next section of this paper outlines the approach and curriculum of a new required engineering ethics course at the University of Virginia that attends to the development and practice of professional skills, and the implementation of a new Minor in Tech Ethics. The following section discusses the incorporation of the Giving Voice to Values model as a component of the course for strengthening practical abilities for ethical action. The paper subsequently discusses the reliance of the GVV pedagogy on the process of rehearsal and the development of procedural memory to support ethical action and examines some of the most salient GVV educational exercises. Considering the key role of rehearsal in the development of competencies for ethical action, this paper introduces the Situated Ethical Action Framework (SEAF) that is in the early stages of development by the authors as part of an effort to enhance the GVV curriculum through structured reflection on the interpersonal context for action and layered practice of the basic competencies for ethical action. The paper concludes by outlining the next steps in researching, validating and disseminating the application of the SEAF.

A Course About Engineering Ethics

The first year Foundations of Engineering course at the University of Virginia introduces students to concepts of Science and Technology Studies (STS) as well as care ethics. To build on these skills, the University of Virginia has recently adopted a new required undergraduate course aptly named "Engineering Ethics." This course is meant primarily for second and third-year students in the engineering school as the second course in a sequence of four courses taught by the Department of Engineering & Society. Rather than focusing on macro-ethics, this course emphasizes micro-ethics to empower engineering students to understand how to deepen their communication and decision-making skills.
The learning goals of the course are:

1. Identify theories and principles of ethics
2. Find relevant engineering codes of ethics
3. Use the Giving Voice to Values (GVV) method of scripting and rehearsing
4. Apply "Pillars of GVV" in addressing ethical dilemmas
5. Recognize key elements of classic engineering ethics cases
6. Use self-awareness and conscientious thinking in contributing to a high-functioning team
7. Conceive what is possible in terms of values-driven leadership in engineering

The course is divided into three distinct modules. The first module introduces ethics theory and contextualizes norms and debates about engineering (learning goals 1, 2 and 5) as identified in Deborah Johnson's 2020 publication [7]. The second module utilizes the Giving Voice to Values (GVV) framework, originally created by Mary C. Gentile [6] for use in business education, to emphasize self-awareness and individual ethical decision making (learning goals 3, 4, 5, and 7). The third, and final, component to the course incorporates student interest in exploring current topics in engineering ethics (learning goals 5, 6, and 7). While the topics included in the third module depend on the interests of the instructor and the students, a small sample of these topics includes: genetic engineering, IVF, surrogacy, weapons of mass destruction, nuclear power, data ethics, ethical algorithms, self-driving vehicles, autonomous weapons, lying and deception in engineering, and techno-ableism. Each module builds knowledge, understanding, confidence, and practice for professional skills. The following section outlines the theoretical framing of GVV and how it is incorporated into the engineering ethics course.

About the Giving Voice to Values model

Giving Voice to Values (GVV) is an innovative pedagogy for ethical leadership that bridges ethical decision-making and ethical action by preparing learners to develop scripts and action plans for acting consistently with their values in ethically challenging scenarios. The approach moves away from discussing what the right action would be according to different ethical normative frameworks, and instead starts from the premise that most people are able to recognize

the right course of action that is consistent with their values, and want to pursue it; however, they have difficulties acting accordingly. Central to this learning model is the application of a thought experiment framed as: “Assuming I know what I want to do to act on my values, how can I get it done?” The capacity to bridge the space between decision and action is strengthened by reflection about past experiences and each person’s specific style and personality.

The Origins of the Transformative Outlook in GVV Pedagogy

The creator of the GVV model, Dr. Mary C. Gentile, has declared that her motivation for exploring new approaches to teaching ethical leadership came from her own “crisis of faith,” derived from her perception of a disconnect between the prevailing rational approach to teaching business ethics and the experiential sense of overwhelm and skepticism that learners often expressed when delving more deeply in the complexity of real-world business ethics cases [8]. GVV pedagogy expands on the two modes of activity that have been traditionally emphasized in ethical and valued education—awareness and analysis—by incorporating a third fundamental mode: action [9]. While GVV regards awareness and analysis as essential to address ethical challenges, it emphasizes building the skills necessary for ethical action to overcome the previously mentioned disconnect between rational thinking and experiential overwhelm.

Competencies for ethical action are stimulated through repeated rehearsal and “pre-scripting,” primarily by performing a type of practical exercise known as the “GVV thought experiment” [6]. The thought experiment presents learners with scenarios of ethical predicaments in which the protagonist has already identified a course of action that is consistent with his or her values, but is aware that, under the present circumstances, this course of action may entail tensions with the perceptions or interest of others within the organization or with existing organizational practices. These organizational or circumstantial barriers are dubbed “disablers” in the context of the thought experiment. Learners are encouraged to also identify “enablers” related both to intrapersonal resources, such as their own values and skills, and to inter-personal and organizational resources, such as potential allies, norms, and solutions [6]. The process of rehearsing to respond to these scenarios involves assessing the perspectives and reactions of those who may be impacted and devising both concrete action plans and “scripts” for framing the situation and addressing the objections and concerns of others.

Gentile drew inspiration for the emphasis that GVV places on rehearsal and pre-scripting partly from the findings of researchers who examined the behavior and motivation of “rescuers,” people who helped and sheltered those who were persecuted by the Nazi regime at high risk to their own safety and well-being [6]. She was struck by the fact that a common element recounted by those rescuers was “the experience, early in their lives, of anticipating situations where their values would be challenged and sharing out loud with a respected listener what would they do” [10, p. xxxii]. Reviewing the accounts of those researchers cited by Gentile, this feature of ethical anticipation by rescuers seems to range from the recollection of repeated guidance and prompting from a parent with very strong moral convictions to a series of life habits of

anticipation and preparation for facing moral challenges ingrained by the influence of this parent or respected other [10][11]. This cultivated mindset of rehearsal for addressing challenging ethical situations is most clearly reflected in several teachable enabling traits for ethical action compiled by Douglas Huneke, which he illustrates through examples from the life of German "rescuer" Fritz Graebe [11, pp. 326-326]. The first trait is an "*empathic imagination*" prompted by explicit discussions with his mother about dire situations faced by others, followed by the question "…and Fritz, what would you do?" The second trait is an "*ability to present himself or herself and control a critical situation*" which involves careful preparation for setting the scene and performing specific roles for the purpose of carrying out a rescue. The third trait is "*previewing a purposeful life*," which involves "(1) careful planning to act in a cooperative and responsible way; (2) anticipating opportunities for having positive and beneficial impact in the lives and the circumstances of others; and (3) actively promoting the well-being of self and others." These findings from research on the character of WWII rescuers highlighted for Gentile the paramount importance of habits of reflection and rehearsal for people's ability to respond to ethical quandaries.

Another realm of practice that inspired Gentile in the development of GVV was the Impact Empowerment Self-Defense pedagogy (also known as Model Mugging). In one of her introductory videos, Gentile shares an anecdote from her experience taking a padded assailant self-defense course in the "Model Mugging" system [12]. In the words of transformative learning researcher Christina Schlattner, the program uses "scenarios which verbally and physically simulate an actual attack—with many added guard rails to protect against physical or psychological harm. The class is typically led by one female instructor/coach and one male instructor/mugger and is assisted by graduates of the program who provide logistical support for the instructors and emotional support for participants" [13, p. 837]. Many training centers in the system have switched their name from "Model Mugging" to "Impact" or "Impact Safety" training, and the roles of the instructors are no longer defined along gender lines, but rather as "lead instructor" and "padded instructor" with instances of people from either gender playing the different instructor roles. An element of the Impact self-defense training system that Gentile acknowledges as inspiration for her development of the GVV pedagogy is the emphasis placed on progressively rehearsing kinesthetic responses, initially through simpler drills building to gradually more complex and high-adrenaline scenarios that may even include surprise attacks in the latter stages of the course, as a way of creating "specific state muscle memory" that helps learners overcome the "freeze response" in scenarios that induce fear or emotional shock. Gentile recounts her insight as follows:

> "So one day I am lying on my back, and you know, having failed to protect myself in the class, and I thought to myself: Gee, I wonder if you could create a kind of 'moral muscle memory.' I wonder if you could create a default behavior to voice. But not just to speaking up, but to informed voice. Because one of the things that we were learning from the research in GVV is that the ways these ethical conflicts present themselves to us in the workplace are kind of predictable, some of the same pressures, some of the same arguments, some

> of the same circumstances, come up again and again. And so, I started thinking, could we create some sort of program or approach that would allow us to rehearse and create that moral muscle memory? So the question then became, 'how do we do that? how do we build that moral muscle memory?'" [12]

One of the main developers of the Impact training methodology, Lisa Gaeta, describes that system's approach to "layering" in order to create "muscle memory" in a book she coauthored with Ellen Snortland:

> "…it is not really information stored in your muscles; rather, it is stored in your 'procedural memory.' Procedural memory is where we store information on how to do things. The memory is stored through a gradual process and is readily available for access…The idea is that you learn one segment extremely well before adding the next. For example, when we teach the confrontation sequence—a scenario in which you face the padded assailant while he confronts you verbally—we do it in steps or 'layers.' We start by talking about distance and dynamics…and do exercises to practice those concepts. Then we add the heel palm technique; you learn it, drill it and fight it. Next we add the knee strike; you learn it, drill it, and fight *that*. Finally, we add all the layers together and bada-bing! You have a confrontation fight with all the physical elements in place. Once you've practiced the physical, we then add the verbal component. Again, you learn the concepts, then you drill them, and finally we add the verbal and physical together into a complete confrontation sequence in which you begin to walk your way out of the situation" [14, pp. 100-101].

Gaeta's description showcases the emphasis that her model places on progressive rehearsal to stimulate the development of procedural memory as a means of overcoming the freeze response that individuals may experience under stressful situations. Gentile's own recollection of her own training experience, and the insight that this sparked for her, reveals an interesting connection between the two pedagogies. Considering that Impact training has evolved over more than four decades, and has been an object of study for social, psychological, gender, and kinesthetic researchers, it is valuable to explore more deeply how the concepts and practices that it has integrated and adapted could further enrich GVV pedagogy. In the next section, we will explore three exercises that are frequently used in the GVV training toolkit that are representative of its approach to integrating awareness, analysis, and action.

The Main Conceptual Shifts of the GVV Framework

A central element of GVV pedagogy is its aim to "reframe" the prevailing approaches to business ethical education. Gentile illustrates her reframing approach through "Three Flips" regarding the focus of ethical education and an expansion in the modes of activity from "Two A's" to "Three

A's." The "three flips" serve to delineate the scope of ethical scenarios and outlooks that are most useful to focus on when learning the GVV approach and practicing its application. This does not imply that only those scenarios and outlooks are relevant, but that those are the most useful ones for becoming familiar with and rehearsing the application of
GVV. The three flips concern (i) directing attention toward discernible "black/white" ethical scenarios rather than "gray-area" issues, (ii) centering on pragmatic moral outlook rather than on an idealistic or an opportunistic moral outlook, and (iii) reformulating the question at hand from "what is the right thing to do" to "once I have determined the course of action that aligns with my values, how can I get it done effectively" [15].

The introduction of these flips is not meant to neglect the relevance of other questions that fall outside them, but to delimit a space for learning and rehearsal where people can develop their practical competencies and their sense of self-efficacy for acting on their values. In this sense, a second reframe of GVV pedagogy is to move beyond the primacy of two A's: awareness (recognition of ethical challenges and their consequences) and analysis (models of ethical reasoning). The GVV model recognizes that the two A's are necessary, but not sufficient for ethical action, and argues for a third A, "action," as central to the development of ethical leadership skills [16]. In the next section, we will illustrate how GVV integrates the learner's application and skill development in the three A's through three key exercises that together offer a good representation of the GVV educational approach.

An Illustration of the GVV Approach

There are three prominent exercises included in the engineering ethics course: the GVV survey, A Tale of Two Stories, and the GVV Implementation Plan. None of these activities are assigned a grade or point value in the course. However, these activities highlight awareness, analysis, and action, all of which are key components of GVV. While these assignments represent a small sample of the reflexive practice of the course, these activities highlight the strengths and limitations of approaches for building moral muscle memory. Likewise, these activities introduce additional elements to enhance the GVV model, layer building blocks, and visualize shifting situational context. A brief explanation of each exercise follows below.

The GVV Survey

Prior to the introduction of the GVV module, students are asked to complete a survey on GVV values. The GVV survey is a 34-item questionnaire with a 5-point Likert agreement scale that measures student's identification with some of the key assumptions of the GVV model [17]. The questions are organized around the seven central concepts or "Pillars" of the GVV model: (i) *Values*, (ii) *Normalization*, (iii) *Choice*, (iv) *Purpose*, (v) *Self Knowledge and Alignment*, (vi) *Voice*, and (vii) *Reasons and Rationalizations*. As the course advances in its discussions of these concepts, students are asked to return to their initially filled surveys and reflect on how their views have evolved. While there is a fair amount of group work in this course, the GVV survey

is an individual opportunity to reflect on the complexities of making difficult ethical decisions. What these surveys reveal is a sign of strong moral imagination. Giving students the opportunity to reflect on their values gives them space to establish a greater understanding of the values that others carry. This exercise connects most strongly with the learning goals: applying the pillars of GVV to ethical dilemmas (#4), using self-awareness and conscientious thinking in contributing to a high functioning team (#6), conceiving what is possible in terms of value-driven leadership in engineering (#7), and finding identifying theories and principles of ethics (#1).

A Tale of Two Stories

A Tale of Two Stories is a freeform response assessment that advances students from the initial reflection of the GVV survey towards a process of reviewing and analyzing their own behavior in the context of two contrasting ethical scenarios in their past [6]. Part 1 asks students to identify a time when their values conflicted with what they were expected to do in a particular, non-trivial situation, when they spoke up and acted to resolve the conflict. The prompts walk students through their motivations for speaking up and acting, their satisfaction with the outcome, and recognizing the enablers and disablers of the scenario. Part 2 asks students to recall an experience where they did not speak up to resolve a conflict. The two stories walk students through the same prompts; in one case they were able to act on and speak to resolve the scenario, and in the other they were not, highlighting the complexities and nuances of awareness, analysis, and action. According to Gentile, the Tale of Two Stories is one of the most emblematic exercises of the GVV pedagogy and has been used in multiple settings worldwide. The juxtaposition of these two scenarios highlights for students the relevance of acknowledging those times when they have not acted according to their highest aspirations, and learning from those situations, but also to recognize that they have many other times acted consistently their values, and they can also learn from what helped them to proceed in those successful situations. A central notion that is emphasized in this exercise is that people have a choice about how they respond to ethical dilemmas, even when it feels like circumstances restrain them. This activity is most closely tied with the learning goals “applying the pillars of GVV in addressing ethical dilemmas (#4), recognizing key elements of classic engineering ethical dilemmas (#5), and conceiving what is possible in terms of values-driven leadership in engineering (#7)

The GVV Implementation Plan

The GVV Implementation Plan is a guide for reflection that students can call upon to formulate a strategy and a script to respond to a particular ethical scenario. The standard form of the exercise provides a general structure for reflection and action that the student can use to formulate a response to a GVV scenario in which a protagonist faces tensions with the interests of others and the sensitive circumstances of an organizational setting that make it challenging to act according to his or her values. The GVV Implementation Plan guidance directs the student to consider (i) the values-based action that he or she wishes to pursue, (ii) the stakes or risks that will impact other actors involved, (iii) specific reasons or rationalizations that others may raise to counter the

protagonist's desired course of action, (iv) the scripts that the protagonists can prepare to respond to those generalizations, and (v) the most effective strategies and lines of action that the protagonist may pursue to successfully act on his and her values [18]. These general questions provide a structure for the student to visualize the process of defining a response to the present ethical predicament. This activity connects most strongly with the learning goals: using the GVV method of scripting and rehearsing (#3), applying the pillars of GVV in addressing ethical dilemmas (#4), finding relevant engineering codes of ethics (#2), and conceiving what is possible in terms of values-driven leadership in engineering (#7).

This activity is used with a variety of case study scenarios that touch on different engineering applications, a few examples are: toxic waste disposal, safety in nuclear powerplant management, algorithmic bias in artificial intelligence and the environmental impact of disposable product design. , among others. For the purpose of illustrating the range of ethical dilemmas, three scenarios that students and instructors have highlighted as especially useful are outlined in Table 1.

Table 1: Three examples of cases used to practice GVV Implementation Plan development

Case Title & Citation	**Case synopsis**
Finding the Mother Tree [19]	The protagonist recounts an experience of a summer job with a logging company that is clear-cutting a section of biodiversity-rich natural forest. It was her job to mark the area that would be clear cut. Her supervisor pressured her to reroute the markings so that more elder trees were (illegally) included in the area to be cut. She attempted to object, but given the supervisor's pushback, she ultimately went along. Her narrative tone makes it clear that she regrets doing so. Students are asked to situate themselves in the story, as the protagonist, and to develop a script and plan that they can enact to revise the ending of the story. What would have supported the protagonist in acting more in line with her values? What could she say or do? What actions could she take?
Soft Issues in the Software Industry [20]	The protagonist is the project team lead of an IT support services company. Due to excessive workloads, an inexperienced employee makes a mistake while working unsupervised on a client's system. The situation generated substantial losses for the client. The protagonist is pressured by superiors to lie to the client about the cause. The protagonist does not want to be dishonest, but he is told that telling the truth could result in substantial financial liability for his company, and potentially to the loss of his and his inexperienced subordinate's jobs.

Corporate Social Responsibility in India [21]	The protagonist is a short-term intern carrying out an evaluation of a major company's corporate social responsibility project in a remote rural community in India. She does not speak the local language, and her point of contact, who is responsible for managing the project locally, does not seem to be fulfilling all his coordination and management responsibilities, and is often unavailable to act as interpreter when she needs to gather data. The point of contact pressures the protagonist to refrain from including the problems she has identified in her report, claiming that she does not understand the local culture and that reporting the problems to the funders will only result in harming the local beneficiaries of the project. The protagonist wants to submit an honest report but is concerned about potential negative consequences for the beneficiaries.

The progression through these three exercises highlights the way in which the GVV model integrates awareness, analysis, and action, with the primary emphasis on the process of rehearsal and scripting to support learners' in preparing to take action. However, they also showcase that the guidance provided to learners is very flexible and abstract. In the next section we describe our proposal for a framework that can be more supportive of the students' process of stepwise repetition in order to build their moral muscle memory and their confidence in their own competencies for ethical action

A Layering Pedagogy for GVV Skill Building Blocks

As we have illustrated, GVV pedagogy takes a sequential approach to developing the learner's skills for ethical awareness, analysis, and action by introducing exercises in reflection and discussion before progressing rapidly to applied scenarios for rehearsing and pre-scripting ethical action. In the the University of Virginia Engineering Ethics course, the GVV component is introduced after several weeks of discussion and application of other elements of engineering ethics, including ethical codes, practical cases, concepts from moral psychology, normative ethical theories, and ongoing debates about engineering professional ethics. Within the self-contained module of GVV training, the process of awareness-raising and analysis continues through self-assessment tools (like the GVV survey) and discussion of cases using the framework of the GVV thought experiment. However, the central focus during GVV training sessions tends to be on the process of moving toward ethical action. In this section, we break down the steps of ethical action as they are laid out through the exercise of the GVV Implementation Plan. We also make two additional specific contributions: (a) We introduce a more detailed stepwise framework for ethical action under GVV thought experiment scenarios, and (b) we situate the different action steps within ranges of interpersonal and organizational interaction.

Our framework for action highlights potential steps for learners to consider when moving through the GVV implementation plan, expanding the level of guidance provided by the model. While the GVV implementation plan outlines a clear logic for reflection to analysis to rehearsal and pre-scripting for action, the appropriate steps can differ greatly from one circumstance to another. The existing GVV educational resources mostly illustrate this through a diversity of cases. For example, in one of the initial cases presented in the training module, "The Client Who Fell Through the Cracks," the protagonist, who is asked by her supervisor to prepare a deceitful presentation for a client, after checking with a co-worker whether that is a standard practice, gives her supervisor an excuse of "not having time to find an effective way" to do what the supervisor asked, and instead presents her supervisor with an alternative presentation that explains to the client what went wrong and how it can be mitigated going forward [22]. In another case, a diversity consultant, who is faced with a discriminatory attitude from a hiring manager rooted in a prior experience with the hiring manager, decides to show curiosity and empathy toward the manager and ask him about the impact of this past experience, which leads the hiring manager to reinterpret that past experience in a way that allows him to overcome his prejudice [18]. Thus, GVV methodology provides a wealth of diverse examples, but the availability of templates for guiding the processes of dialogue and strategic action are limited, save for the very well-developed case of responses to rationalizations. While this open-endedness can help stimulate the learner's flexibility to tackle a diverse range of situations, it can also constrain the range of pathways for action that learners can envision and rehearse.

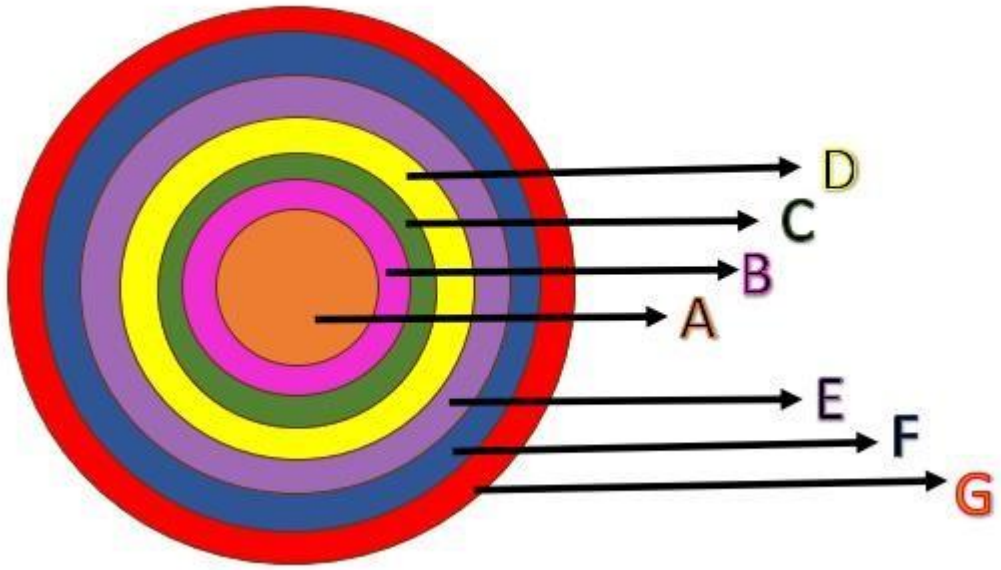
Our proposed framework is strongly aligned with the guidance provided by Gentile in the GVV educational exercises and videos. However, it provides a more explicit repertoire of possible actions for the GVV learner to consider. Not every action may be appropriate in every case, but they are available for the learner to contemplate during the process of rehearsal. The following six steps, strongly grounded on Gentile's model, but expanding it at specific places, are contemplated in our framework for GVV ethical action:

1. Examine the situation deeply in the context of your own values.
2. Map the main stakeholders and the way they are impacted.
3. Anticipate how their stakes may influence others' responses to your desired course of action.
4. Plan for how to implement your desired course of action (including how to stage, script, and perform your actions, and how you can respond to pushback and contingencies you encounter).
5. Rehearse your Implementation Plan.
6. Move to action and iterate if necessary.

In addition to outlining a repertoire of steps, our framework also shows how the performance of ethical action flows across different domains of personal and organizational interaction. We have expressed these spatial domains as seven nested circles of interaction around the protagonist of the GVV scenario.

A. Introspection/Internal Deliberation
B. Immediate Circle of Trust
C. Intermediate Advice Circle
D. Situational Predicament Circle
E. Troubleshooting Resources
F. Intra-Organizational Governance
G. External Environment

Figure 1: Spatial Domains of the Situated Ethical Action Framework



The circle of internal deliberation refers to all activities of reflection, fact-finding, and preparation that the protagonist can do on his or her own, without reaching out to others. The immediate circle of trust involves those trusted persons in his or her sphere of everyday interaction that the protagonist can reach out to in confidence to express his or her own concerns, ask for their perspective and advice, and sound-off possible statements and solutions. Bringing something up to a friend or an office mate in the protagonist's immediate circle allows the protagonist to "get out of his or her own head," get some validation about the validity and severity of the concern and explore the best way to approach others about it. However, it does not bring the issue out into the open before the protagonist is entirely clear in his or her own mind about how he or she wants to proceed. The third circle of interaction is "intermediate" because it may not involve people with whom the protagonist has immediate familiarity or trust, but it also does not involve the people who are directly deciding or taking the action that the protagonist is concerned about. They could be colleagues who can provide additional background information or give an opinion as to whether a particular scenario represents "the

normal way of doing business" in the organization. The fourth circle is the setting where the current predicament is being resolved now; this may be within a workforce or committee where a decision is being made, or just the direct line of communication between the protagonist and the superior who issued the instruction that raised the ethical predicament. Communication within this central circle of action involves careful attention about how to express the challenging situation, its consequences, and how they impact the organization's values. Specific disciplinary fields, such as crisis communication [23] address the process of planning and scripting for these situations in greater depth. Since learners in engineering education are not likely to have many opportunities for exposure to these tools and concepts (comparatively to students of business or communication studies) it is important for the framework to provide some basic guidance about how to approach these conversations. The fifth circle involves the resources (generally internal to the organization) that the protagonist can draw on in order to propose a solution. This is different from the third circle, because it would involve a formal organizational decision to take alternative action that would draw on other resources from the organization. The sixth circle pertains to the formal norms, policies, and hierarchical structures of the organization that the protagonist may decide to appeal to if he or she is not able to persuade others to abandon the unethical course of action; reaching out to this circle would generally entail that the protagonist has needed to take a more contentious attitude. Finally, the seventh circle involves going beyond the organization to leverage resources from the external environment. This could involve reaching out to donors, to public opinion, to affected stakeholders, or even whistleblowing to authorities. Hence, the proposed framework offers a concrete repertoire of potential actions, illustrated in Table 2. These actions are framed with clear awareness of the web of relations, and therefore the interpersonal and organizational stakes, in which these actions are embedded.

Table 2: The Situated Ethical Action Framework: Spatial Domains, Action Repertoire, and Learning Exercises for Layering Key Competencies

Spatial Domains (Circles of Interaction)	**Key Competencies**	**Repertoire of Possible Actions**	**Learning Exercises**
A and B	Contextualizing Values	• Exploring own values • Analyzing case and consequences	Values Surveys Reflective Journaling Case/Scenario Review and Discussion
A, B, and C	Stakeholder Mapping	• Identifying Stakeholders • Identifying Impacts	Examining Scenarios Peer Discussion and Review

A, B, and C	Anticipating Tensions	• Recognizing how others' concerns may influence their response to proposed action • Envisioning possible responses and alternatives	Reviewing Cases Catalog Rationalizations Pre-Scripting
A, B, and C	Planning	• Staging • Scripting • Preferred mode of communication • Appropriate framing of the issue • Delivery of message • Responding to contingencies	Reviewing Cases Preparing Scenario Scripts and Implementation Plans Peer Feedback
A, B, and C	Rehearsing	• Rehearsing from a personal value perspective • Rehearsing from an organizational effectiveness perspective	Preparing Scenario Scripts and Implementation Plans Role-Playing Peer Feedback
D	Moving to Action	• Communicating concern to Situational Predicament Circle (SPC) • Explaining negative consequences • Acknowledging concerns, efforts, and limitations of counterparts in the SPC • Proposing alternate course of action • Reframing or mitigating impacts of alternate course of action • Responding persuasively to rationalizations	Preparing Scenario Scripts and Implementation Plans Role-Playing Peer Feedback Practicing in Low-Stakes Real Life Conflicts Journaling
A, B, C, and D	Iterating Above Steps for Effectiveness	• Returning to prior circles to seek additional arguments and solutions to make a persuasive argument	More Complex Scenarios, Scripts, and Role-Plays

A, B, C, D, and E	Troubleshooting Negative Impacts with Additional Organizational Support	• Incorporating the contribution of other units within the organization to obtain more accurate information and/or mitigate the negative impacts of action	More Complex Scenarios, Scripts, and Role-Plays
A, B, C, D, E, and F	Appealing to Organizational Authorities and Norms	• Appealing to higher-level organizational norms and authorities	More Complex Scenarios, Scripts, and Role-Plays
A, B, C, D, E, F, and G	Appealing to External Authorities, Norms, and Stakeholders	• Appealing to other norms and principles beyond the organization • Seeking support and/or pressure from external actors (public opinion, donors, regulators)	More Complex Scenarios, Scripts, and Role-Plays

Researching the SEAF: Next Steps

The development of the Situated Ethical Action Framework is still in its early stages, with this paper being its first presentation to a scholarly peer community. The authors are continuing to develop this framework collaboratively with fellow faculty from the Department of Engineering & Society at the University of Virginia, and some of these concepts are being applied in the Engineering Ethics course. Multiple faculty members involved in teaching the course are participating in discussion and reflection sessions about testing and revising the curriculum as the course is being taught in the Spring semester. Several undergraduate teaching assistants for the course, who have taken the course recently, are also involved in providing valuable feedback for reviewing and updating the curriculum.

Research question and hypotheses

While this is a work-in-progress paper, and the research plan is under development and may evolve over the coming months, this section outlines a preliminary plan for undertaking research on the effects of shifting to the more detailed framework provided by the SEAF. The following is the research question for the initial exploratory project:

Can an adapted teaching approach that modifies the standard GVV training materials by introducing the enhanced SEAF situated and layered action framework generate higher levels of student self-efficacy in acting according to their values in response to professional ethical predicaments?

The research will test the following hypotheses:

H1. All students will gain greater confidence in dealing with professional and academic ethical predicaments related to their engineering education as a result of completing either (a) the standard GVV module or (b) the adapted SEAF-GVV module of the STS 2600 course.

H1.a The increase in confidence will be higher for students completing (b) the adapted SEAF-GVV module over those completing (a) the standard GVV module.

H2. All students will be more likely to act on their values in the face of professional ethical dilemmas as a result of completing either (a) the standard GVV module or (b) the adapted SEAF-GVV module of the STS 2600 course.

H2.a. The increase in the likelihood of acting on their values will be higher for students completing (b) the adapted SEAF-GVV module over those completing (a) the standard GVV module.

H3. The level agreement with each of the twelve GVV underlying assumptions will increase for all students as a result of taking either a) the standard GVV module or (b) the adapted SEAF-GVV module of the STS 2600 course.

H3.a. The overall increase in their agreement with the twelve GVV assumptions will be higher for students completing (b) the adapted SEAF-GVV module over those completing (a) the standard GVV module.

Development of exercises for comparing the impact of standard GVV versus SEAF approaches

The research plan will involve the development of an adapted version of standard GVV teaching exercises that incorporate the situated and layering elements of the SEAF framework, while maintaining other aspects of the exercises equivalent. These methods and exercises will be validated during the 2024 fall term. The research study will be undertaken in the 2025 Spring and Fall Terms, with participants recruited from the population of STS 2600 students and assigned randomly to the testing and control groups. For participating students, the GVV material and exercises relevant to the differentiated educational content will be taught in external sessions outside of their normally scheduled classes, to enable them to be mixed according to the random sampling instead of their registered course sections. The treatment and control groups will participate in alternate sessions where the material introducing GVV will be differentiated: (a) the standard methods and exercises normally used in the course (for the control group), and (b) the adapted training methods and exercises (for the treatment group).

Data collection and analysis

The project will use pre-treatment and post-treatment surveys that will be adapted from instruments previously used by accounting ethics researchers Miller, Shawver & Mintz [24] to assess student's self-reported sense of competency and alignment with the GVV core assumptions. The pre-treatment survey will be applied at the beginning of the semester, and the post-treatment survey will be applied at the end of the GVV module. Students will be awarded extra-credit less than 1% of the total course points for competing each of the surveys.

The survey will collect demographic information and will record student's agreement with 14 statements using a 7-point Likert scale. These statements are shown in Table 3. The first 12 statements will directly address H3 by testing the level of agreement with each of the 12

underlying assumptions of the GVV framework [6]. The remaining two statements will each test H1 (students' confidence in dealing with engineering professional ethical predicaments) and H2 (students' likelihood of acting according to their values).

Table 3: -Statements for the assessment questionnaire

Statement	Hypotheses Tested
1. I want to voice and act upon my values.	H3, H3a
2. I have voiced my values at some points in the past.	H3, H3a
3. I can voice my values more often and more effectively.	H3, H3a
4. It is easier for me to voice my values in some contexts than others.	H3, H3a
5. I am more likely to voice my values if I have practiced how to respond to frequently encountered conflicts.	H3, H3a
6. My example is powerful.	H3, H3a
7. Although mastering and delivering responses to frequently heard rationalizations can empower others who share my views to act, I cannot assume I know who those folks will be.	H3, H3a
8. The better I know myself, the more I can prepare to play to my strengths and, when necessary, protect myself from my weaknesses.	H3, H3a
9. I am not alone.	H3, H3a
10. Although I may not always succeed, voicing and acting on my values is worth doing.	H3, H3a
11. Voicing my values leads to better decisions.	H3, H3a
12. The more I believe it's possible to voice and act on my values, the more likely I will be to do so.	H3, H3a
13. I am confident that I can deal with professional and academic ethical predicaments related to my engineering education	H1, H1a
14. I am likely to act according to my values in the face of professional ethical dilemmas	H2, H2a

Dissemination plan

The results of the research will be disseminated through future ASEE regional and national conferences and through the Online Ethics Center's website (https://onlineethics.org/). Future research can also trace how this course prepares students for the fourth-year ethics courses included in the undergraduate engineering curriculum at the University of Virginia.

Closing Considerations

This enhanced pedagogical model offers additional opportunities to use elements of the GVV framework for more integrated reflexive role play, specifically in the Engineering Ethics course. The GVV model does not dictate which ethical values must be emphasized to be successful engineers, but rather encourages students to discover how to learn from and identify multiple perspectives in response to scenarios they may encounter in their professional practice. The opportunity to learn, rehearse, and refine this moral muscle memory ingrains the interconnectedness between technical and professional engineering skills. The more detailed experience guidance of the SEAF framework, and its added space for reflection about particular situational and interpersonal contexts, can strengthens the course's capacity to meet the learning objectives: using the GVV method of scripting and rehearsing (#3), applying the pillars of GVV in addressing ethical dilemmas (#4), using self-awareness and conscientious thinking in contributing to a high functioning team (#6), and conceiving what is possible in terms of value-driven leadership in engineering (#7).

The research plan for the implementation of this novel framework will contribute new empirical data on the impact of both the standard GVV training activities and the revised SEAF activities in enhancing students' sense of self-efficacy for responding to ethical dilemmas not only at the time of taking the course, but over the long-term span of their engineering careers. Since the STS 2600 course is taken by second-year students, this provides opportunities for following up with subsequent surveys during the latter years of the student's degree program. In the future, a Community of Practice could be established within the Online Ethics Center to promote long-term peer support and mentoring among students who have studied the standard GVV and SEAF approaches. In addition to peer support and mentoring, this Community of Practice could provide the possibility to continue surveying former students' responses to the questions through the development of their professional careers.

The introduction of the SEAF as a spatially contextualized and stepwise framework as an added aide for addressing ethical dilemma scenarios can be especially valuable for engineering students since there are few opportunities in the engineering curriculum to rehearse assertive communication and respond to tense interpersonal scenarios. In contrast, students of business and law programs take many more courses that center on interpersonal communication and organizational behavior.

Engineering programs that lay claim to building global engineering leaders can use and adopt GVV modules so that their students are given the opportunity to learn effective communication through their values. The GVV modules used in the Engineering Ethics course at the University of Virginia are available for use through the Online Ethics Center.

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