WIP: Preparing Graduate Students to Engage in Multicultural Environments

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Overview
It is widely accepted that there is a need to improve research mentoring experiences among engineering graduate students and transform a perceived unwelcoming culture of engineering colleges (National Academies of Sciences, Engineering, and Medicine, 2018). In response to this need, the College of Engineering at Virginia Tech (VT) has started an initiative designed to address both of these needs, with foci on both graduate students as well as faculty and administrators in the College. This work-in-progress paper discusses one part of this initiative: the development and implementation of a required seminar for newly matriculating graduate students in engineering degree programs. This one-credit course (Graduate Student Success for Multicultural Environments, or GSSME) was designed to help first-year doctoral and master’s students: (1) integrate into the university environment, (2) navigate the interpersonal relationships associated with graduate school, (3) prepare for professional success as a student and scholar, (4) build awareness of diversity and inclusion values, and (5) understand their role in the research mentor/mentee partnership.

GSSME was developed based on the results of an assessment performed by the College of Engineering Dean's Office and the graduate school at VT. As a result, one key area found to be affecting student success in graduate school was the adviser/advisee relationship. More specifically, three primary issues were identified:
1. Misaligned goals and expectations between advisers and advisees;
2. Poor communication between graduate students and the faculty; and
3. The potential for race, gender, and culture to influence interactions between faculty and graduate students.

In response to these issues, the College of Engineering sought ways to help students and faculty avoid these potential points of conflict. Ultimately, interventions were put in place to set a standard for mentoring relationships so faculty and students could focus on their scholarship, progress towards degree, and maturation as independent researchers.

The course outlined in this paper is the student side of the aforementioned intervention, but training is also being introduced to faculty simultaneously. The initial intention was for the seminar to be offered in three different formats throughout an academic year: (1) five-week course with 2.5 hours sessions once per week; (2) two-day course with 6-hour sessions each day; and (3) an online version. The course was piloted during the 2019-2020 academic year, during which 11 engineering departments across the College opted to make this seminar mandatory for their incoming graduate students. In this paper, focusing on the 5-week version, we outline the initial format and structure of the course, discuss the curriculum and student engagement during the first-two implementations of the course, and highlight some of the early lessons learned and plans for improvement from this effort. We begin with an introduction to the framework we are using to guide the development of the GSSME course.

The Academic Plan Model
This paper is structured around Lattuca and Stark’s (2015) model of an Academic Plan in Sociocultural Context, which we used to guide our reflection on the initial implementation of the GSSME course and opportunities for improvement. The Academic Plan model was developed to
provide a framework through which to view curriculum as an academic plan or blueprint. This perspective highlights the various decisions that academic planners must make and the sociocultural context in which these decisions are situated. The model assumes an intentional planning process in the development of the curriculum and suggests that all of the components of the model are included in every academic plan, whether consciously or unconsciously (Lattuca & Stark, 2015). We have tried to address these components in our development of the GSSME course, as described in the remainder of the paper. Figure 1 shows the full Academic Plan model.

![Academic Plan Model](image)

**Figure 1: Academic Plan Model, adapted from Lattuca & Stark (2015)**

The central portion of the Academic Plan model is the plan itself, which is the focus of this paper. Part of the plan is defining the **Purpose** and **Content** for the academic program in question (in our case, the GSSME course). The purpose refers to the learning outcomes for the course, and the content is the subject matter included in the course used to achieve those outcomes. Although closely linked together, the purpose and content are considered separately because the same learning outcomes may be achieved through different subject matter. Additionally, the academic plan includes the consideration of the **Learners** and **Instructional Resources** when creating the **Sequence** for the course. Understanding the prior experiences and preparation of students (i.e., learners) coming into a course is essential in determining how to present the content to achieve the overall purpose. Similarly, the available instructional resources (e.g., instructors, labs, textbooks) influence the method by which the content is presented. The sequence describes the order in which the content is presented during a course, which can be influenced by learners, resources, or structure of the content itself. The **Instructional Processes** are the activities that take place in the classroom (or through online media) to present the content to the learners as well as assessments of student learning. Finally, **Evaluation** of the program (or course) is an essential part of the plan used to check whether the purpose was achieved, followed by making **Adjustments** (see the path inside the circle of Figure 1) for the next implementation of the course (Lattuca & Stark, 2015). As demonstrated in Figure 1, each component of an academic plan is
situated within an educational environment and sociocultural context. Although we focus primarily on the academic plan in this paper, aspects of the educational environment will be discussed where relevant.

Course Purpose
The GSSME course has a dual purpose, which is to: (1) improve the research mentoring experiences for engineering graduate students, and (2) meet a new requirement for graduate programs across the university to incorporate an inclusion and diversity component. The newly minted inclusion and diversity requirement “aligns with the Graduate School's goal of providing all students with an affirming, inclusive, and diverse education program that helps prepare students to face the complex challenges they will meet in their post-graduation careers” (Virginia Tech Graduate School, 2019). A depiction of the alignment of course topics and the inclusion and diversity requirements can be found in Appendix A.

Building on these two purposes, the following learning outcomes were developed for the GSSME course:
1. Developing effective interpersonal communication skills
2. Establishing and maintaining professional relationships
3. Dealing with personal differences in multicultural environments
4. Advancing equity and inclusion in professional environments
5. Developing responsible and ethical professional practices
6. Developing identity, confidence, and independence as a professional

In addition to meeting the Graduate School’s requirements, these learning outcomes were developed based on the evidence-based curricula developed by the Center for the Improvement of Mentored Experiences in Research (CIMER; Branchaw, Butz, & Smith, 2018). This curriculum is described in greater detail in subsequent sections.

Learners
One of the focuses of the institutions’ mission statement is student learning. Institutional leaders realize there are many factors that affect student learning and that students have preferred methods of learning that differ from student to student. Understanding how students learn helps faculty motivate and mentor different types of learners. Recently, departments, institutions, and national programs are attempting to provide entire cohorts of students with more sustained and sophisticated training through the development of more structured models of graduate student preparation (Wulff and Austin, 2004).
The breakdown of graduate students in the College of Engineering at VT is shown in Figure 2. Although there is a limited amount of domestic diversity, more than half of the graduate students are classified as international. This can be a large shift from undergraduate engineering programs, where this number is significantly lower (at VT, only 12% of undergraduate engineers are international students). Thus, graduate school may present a uniquely diverse environment for many engineering graduate students, supporting the need for a course such as GSSME.

In the course’s initial roll out, students opted into which offering of the course they would prefer. A total of 7 offerings were available throughout the 2019-2020 academic year. This paper focuses on the implementation of the first two offerings, in which a total of 117 students complete the course, Table 1. These students were in a variety of engineering departments, including: Aerospace Engineering, Biomedical Engineering, Biological Systems Engineering, Civil Engineering, Engineering Mechanics, Environmental Engineering, Electrical Engineering, Industrial & Systems Engineering, and Mechanical Engineering.

Table 1: Description of the topics covered in each weekly course session

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Format</th>
<th>Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5-week</td>
<td>66</td>
</tr>
<tr>
<td>B</td>
<td>5-week</td>
<td>51</td>
</tr>
</tbody>
</table>

Content and Sequence
The content covered in each session was informed by the previously identified learning outcomes and the newly instated inclusion and diversity requirements by the graduate school (Appendix A). The course development team sought to achieve alignment to provide the most effective learning opportunities in the short course time frames. In the 5-week course format, the seminar included a total of five sessions containing at least two topics of discussion every week.

Table 2: Description of the topics covered in each weekly course session.

<table>
<thead>
<tr>
<th>Session</th>
<th>Course Topics</th>
</tr>
</thead>
</table>
| Session 1. Building Your Professional Support | ● Mentors, Advisors, and Supervisors  
|         | ● Establishing Support Networks                    |
| Session 2. Managing Interpersonal Issues     | ● Effective Communication  
<p>|         | ● Group Dynamics                                   |</p>
<table>
<thead>
<tr>
<th>Session</th>
<th>Course Topics</th>
</tr>
</thead>
</table>
| Session 3: Navigating Personal Differences | ● Engineering by the Numbers  
● Vocabulary (Diversity, Equity, Inclusion, etc.)  
● Stereotypes and Bias  
● Vulnerable Populations |
| Session 4: Responding to Pressures | ● Conflict and Academic Bullying  
● Personal Wellness |
| Session 5: Exhibiting Professional Behaviors | ● Professionalism  
● Ethics |

**Instructional Resources**

A group of three engineering education faculty members are leading this effort, aided by financial and administrative support from the College of Engineering as well as an evidence-based curricula developed by the Center for the Improvement of Mentored Experiences in Research (CIMER) ([https://cimerproject.org/](https://cimerproject.org/)), which is housed at the University of Wisconsin-Madison. Additionally, two upper-level (i.e., more advanced) graduate student teaching assistants met weekly with the course instructors to plan the course curriculum, reflect on the previous class, and aid in classroom instruction.

**CIMER Curriculum**

CIMER is comprised of researchers and practitioners who focus on improving research mentoring relationships among post-secondary researchers. Prior to the implementation of our course, CIMER has developed, implemented, and published multiple works about their *Entering Research* curriculum. The curriculum was first developed, implemented, and tested for effectiveness in an interdisciplinary program for undergraduate research and mentoring (Branchaw, Pfund, and Rediske, 2010; Balster, Pfund, Rediske, and Branchaw, 2010). The curriculum was later adapted to be suitable for implementation in eight STEM (science, technology, engineering, and mathematics) disciplines and provided numerous presentations and training workshops across the United States (Branchaw, Butz, & Smith, 2018). CIMER has since compiled their expertise and understanding of research mentoring to also include graduate school applications in their curriculum. The professional development seminar discussed in this paper utilized this curriculum as a guide when developing the course content and accompanying in-class activities.

**Instructional Process**

In the 5-week course format, sessions were discussion- and case-based. Each session included short lectures to introduce the main ideas, one or two activities for students to engage with the content, and inclusion considerations for each topic, ending with a debriefing discussion. For example, during Session 1 we begin with a discussion around mentors, advisors, and supervisors, asking students to identify differences between the three roles, the many different ways these roles can be carried out, and the resulting implications. For example, one student’s advisor may also be their supervisor, which may make interacting with this person tricky as the student has to discern which role is being assumed at what times. We followed this introduction with an
activity from the CIMER curriculum asking students to review and discuss a generated list of expectations for both graduate students and their advisor. We prompt them to think about which items on the list are important to them personally and if they anticipate any misalignment between their expectations and their advisors’. We rounded out the discussion with our inclusion consideration. *Inclusion considerations* is a recurring segment where we discuss how the previous topic is influenced by individual differences. For example, when talking about misaligned expectations between mentors and mentees, we discuss how expectations can be influenced by different backgrounds and cultures. At this point we would take a break and return to the same format but with a different topic. Every class ends with “Tips of the Week” that drive home the key takeaways from the day’s discussion. An outline of the complete curriculum used during the first iteration can be found at the end of this work-in-progress paper (Appendix B).

*Assessment of Learning*

This seminar was offered on a pass/fail basis, and students were evaluated based on mandatory attendance and the completion of an end-of-course assignment. In addition to attendance, students were required to complete a Personal Development Plan (PDP) as their end-of-course assignment to be submitted no later than two weeks after the conclusion of the course.

The PDP was broken into four sections each with two parts. For example, there was Section 1: Research and Learning which focused on developing identity, confidence, and independence as a researcher (LO6). Part A asked students to explore their current career goals, competencies needed to reach these goals, identify activities to acquire these skills, and an assessment plan to track progress. Part B instructed students to graduate school timeline depicting coursework, milestones, and professional activities required for graduation, in addition to outside commitments students expect to have during graduate school and strategies for finding balance across. Each remaining section mapped to one or more of the remaining learning outcomes as seen in Table 3.

**Table 3: Alignment of Personal Development Plan (PDP) and student learning outcomes**

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>PDP Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1. Develop effective interpersonal communication skills</td>
<td>Section 3: Communication and Inclusion</td>
</tr>
<tr>
<td>LO2. Establish and maintain professional relationships</td>
<td>Section 2: Professional Relationships</td>
</tr>
<tr>
<td>LO3. Deal with personal differences in the research environment</td>
<td>Section 3: Communication and Inclusion</td>
</tr>
<tr>
<td>LO4. Advance equity and inclusion in the research environment</td>
<td>Section 3: Communication and Inclusion</td>
</tr>
<tr>
<td>LO5. Develop responsible and ethical research practices</td>
<td>Section 4: Ethical Professional Practice</td>
</tr>
</tbody>
</table>
Learning Outcomes | PDP Section
---|---
LO6. Develop identity, confidence, and independence as a researcher | Section 1: Research and Learning

**Course Evaluation**

For our first implementation, we used several methods of assessment to inform ways to improve the course. Each week a member of the research team would take notes during class and capture ideas for improvement in real time. Additionally, the research team constantly reflected on the course, meeting weekly to discuss how students were responding to the material. At the end of the five weeks, we also administered a short questionnaire for students to provide any feedback based on their time in the class, focusing on two main areas: 1) top things to remain the same and 2) top things to change. We also reflected as we graded the students’ PDPs to identify areas for improvement regarding the assignment and the content. Synthesizing all of these assessments leaves us with lessons learned as they relate to various elements of our academic plan: 1) Purpose, 2) Content, 3) Sequence, 4) Learners, 5) Instructional Processes, and 6) Instructional resources.

**Course Evaluation Results & Adjustments**

In this section, we review both our own observations on what went well and what could be improved in the GSSME course as well as feedback from students in the first iteration of the course. We also include ideas about what adjustments we would make in the course during the next implementation. This section is organized into the same categories as the previous section.

*Purpose - “knowledge, skills, and attitudes to be learned”*

Because the course’s purpose was largely driven by two university mandates (i.e., focus on strong graduate student mentoring in the College and focus on diversity and inclusion from the Graduate School), the knowledge, skills, and attitudes to be learned do not require much adjustment. However, the learning objectives themselves were largely informed by the College’s interest in improving mentoring as opposed to the Graduate School’s interest in advancing diversity and inclusion. As we refine the syllabus and learning objectives moving forward, we will seek to make the dual focus (see Table 4) more obvious in the learning outcomes. This dual focus on the learning outcomes will continue to highlight the current course outcomes while also making the diversity and inclusion outcomes more explicit.

**Table 4: Proposed dual-focused student learning outcomes**

<table>
<thead>
<tr>
<th>Current Outcome</th>
<th>D&amp;I Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing effective interpersonal communication skills</td>
<td>Considering the impact of personal actions and words related to difference, bias, and microaggressions</td>
</tr>
<tr>
<td>Establishing and maintaining professional relationships</td>
<td>Applying effective strategies of inter- or intra-personal conflict resolution</td>
</tr>
<tr>
<td>Current Outcome</td>
<td>D&amp;I Outcomes</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dealing with personal differences in multicultural environments</td>
<td>Acquiring an awareness of words and language, especially micro-aggressions</td>
</tr>
<tr>
<td>Advancing equity and inclusion in professional environments</td>
<td>Applying shared responsibility as active bystanders to recognize and disrupt academic bullying and other discrimination</td>
</tr>
<tr>
<td>Developing responsible and ethical professional practices</td>
<td>Demonstrating the University's Principles of Community</td>
</tr>
<tr>
<td>Developing identity, confidence, and independence as a professional</td>
<td>Identifying instances where stereotype threat and imposter syndrome may manifest</td>
</tr>
</tbody>
</table>

**Content** - “subject matter selected to convey specific knowledge, skills, and attitudes”

A surprising and reoccurring critique of the course was the overlap in topics with students’ departmental seminar. As a result, students found the course a bit repetitive. Students mentioned aspects such as the course planning document in the PDP, the visit from the Ombudsperson, and discussions regarding ethics as a few that overlapped. On a positive note, students responded positively and in favor of the use of research related to the course topics.

As we refine the course content going forward, we will seek to communicate with program coordinators to prevent as much repetitive content as possible in addition to incorporate more relevant research studies and findings that can help support our overall message. We will also weave more examples that extend beyond graduate research assistantships to be more inclusive to students who may be teaching or pursuing the coursework-only option.

**Sequence** - “an arrangement of the subject matter and experiences intended to lead to specific outcomes for learners”

After running through the course content in the first iteration of the course, we had several ideas about how the order of content and activities might be adjusted. In the initial version, we discussed communication and group dynamics in Week 2 and diversity, inclusion, and equity in Week 3. We realized that a lot of the nuance we wanted to address in the communication and group dynamics conversations was harder to convey without the diversity, inclusion, and equity content.

In the future, we plan to move the communication and group dynamics topics from Week 2 to Week 4 to improve the flow of the course and ensure that students have appropriate background to have meaningful conversations about the challenges of communication and group dynamics in multicultural environments.
Learners - “how the plan will address a specific group of learners”
Other students mentioned that if they have already had professional experience (e.g., industry or military work) the course is all a review and should not be a mandatory course. Additionally, if students are not first time graduate students, they did not find the mentoring discussion very helpful and asked if it could be possible to have a separate section. Lastly students asked that the course give more consideration to students who may not be funded, have not identified a project yet, and are coursework only Master’s students.

As we move forward, we are discussing whether it makes sense to require this seminar for students in all of these situations, or perhaps only certain modules. In particular, students who are completing a one-year coursework Master’s program who have limited time and different needs than, for example, full-time doctoral students, may not need to participate in the seminar. In addition, most of these students do not have a research mentor, so they often felt that the content in this course did not apply to them.

Instructional Processes - “the instructional activities by which learning may be achieved”
Students commented on the discussion format of the course and how they enjoyed learning about other students’ experiences. They appreciated the balance between lecture and engagement with others in the course. Students also mentioned an appreciation for the use of data to support points being made during the discussion. For example, we used the ASEE Engineering by the Numbers (Yoder, 2017) report when talking about diversity, inclusion, and equity in engineering. Students also liked the use of case studies during the activities as a way to apply concepts and strategies previously discussed. Lastly, students also mentioned an appreciation for the instructors sharing personal experiences throughout the course.

Students requested more case studies to be incorporated into the curriculum with situations that were a little less obvious in terms of how an individual should or should not react. They also requested that gender-inclusive language be used in the case studies as a way for their peers to become more familiar with this practice. Online participation tools were suggested as an addition to the course to provide the opportunity for anonymous and less anxiety-driven participation. Students also requested that we increase small group discussion as opposed to discussions with the whole class. Logistically, students recommended breaking up the final assignment into smaller segments throughout the semester.

Moving forward we plan to continue the use of research and data during course instruction as well as more intentional use of case studies and small groups. One idea is to increase the number of opportunities for students to discuss scenarios in their small groups as opposed to large group discussions.

Instructional resources - “the materials and settings to be used in the learning process”
The most frequently mentioned aspects of the course that students enjoyed were the instructors and the ways in which they presented topics. They appreciated the encouragement to sit with new people and even requested that we take extra means to ensure this happens weekly. The “oops and ouch” system was also frequently mentioned by students. Oops and ouch refer to ways in which a person can respond when engaging in conversation around difficult topics (Aguilar, 2006). If someone were to say something they realize may come off as offensive, they can say...
oops and attempt to rephrase or simply detract their statement. Otherwise, if someone felt
offended by something someone else said, they can say ouch. Many students pointed toward this
system as one to keep in the course, but none of the students in the first offering used the system.
Students unsurprisingly and overwhelmingly mentioned wanting the course meeting day and
time to change. It is currently offered on Fridays from 1:20-3:50. They also requested that the
length of the course be changed even if that resulted in having to meet more often during the
week. While the course meeting day and time will likely not change, moving forward two other
formats of the course will be offered to students.

Conclusion
This work-in-progress paper explores the course material and the first semester’s implementation
of a new graduate professional development seminar for incoming engineering graduate students.
We provide a description of pedagogical practices in the classroom, lessons learned, and any
planned changes for future offerings.

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### Appendix A - Alignment between graduate school requirement and course session

<table>
<thead>
<tr>
<th>Graduate School Requirements</th>
<th>Course Topics</th>
</tr>
</thead>
</table>
| The University's Principles of Community: Valuing human diversity and inclusion and creating a climate of civility, sensitivity, and mutual respect | Session 1. Building Your Professional Supports  
Session 3. Navigating Personal Differences |
| Impact of personal actions and words: Understanding difference, bias, and microaggressions    | Session 2. Managing Interpersonal Issues  
Session 3. Navigating Personal Differences |
| Avenues of redress and shared responsibility as active bystanders: Recognizing and disrupting academic bullying | Session 2. Managing Interpersonal Issues  
Session 4. Responding to Pressures |
| Process of individual introspection to create inclusive environments: Awareness of words and language, especially micro-aggressions | Session 2. Managing Interpersonal Issues  
Session 3. Navigating Personal Differences |
| Historical perspectives on diversity and its impact on traditions                            | Session 3. Navigating Personal Differences |
| Effective strategies of inter- or intra-personal conflict resolution                         | Session 2. Managing Interpersonal Issues |
| Inclusion and diversity in a global context                                                  | Sessions 1-5                                                                  |
Appendix B - Fall 2019 GSSME Course Outline

Session 1: Building Your Professional Supports

Part 1: Mentors, Advisors, and Supervisors
- Presentation: Course introduction and syllabus overview
- Warm-up: Meet each other, who is in the class? (departments, PhD/masters)
- Presentation: Define the difference between mentors, advisors, and supervisors
- Activity: “Aligning Mentor and Trainee Expectations” (CIMER)
- Presentation: Faculty expectations of graduate students
- Inclusion Consideration: How might this topic be influenced by individual differences?

Part 2: Who is going to help?
- Presentation: Building your support network
- Activity: “Mentoring Needs” (rank roles you would like your mentors to play)
- Inclusion Consideration: How might this topic be influenced by individual differences?

Session 2: Managing Interpersonal Issues

Part 1: Effective Communication
- Intro: What types of communication are required in grad school?
- Warm-up: “Which do you prefer” activity with communication types/styles
- Presentation: Effective vs. ineffective communication
- Activity: “Barriers to Communication” (CIMER)
- Inclusion Consideration: Diversity can complicate communication

Part 2: Group Dynamics
- Warm-up: What positive and negative experiences have you had with groups?
- Activity: “Constructive and Destructive Group Behaviors” (CIMER)
- Inclusion Consideration: Intergroup contact
- Activity: “Bystander Intervention” (what would you do in different group scenarios)

Session 3: Advancing Diversity Awareness

Part 1: Us
- Presentation: What is diversity?
- Warm-up: What do you know about diversity in the US/in engineering/at VT?
- Inclusion Consideration: What do these demographics say about engineering?
- Presentation: What are equity and inclusion?
- Activity: Privilege sit, adapted from “Privilege and White Fragility” (CIMER)
- Inclusion Consideration: Different approaches to promoting diversity/inclusion/equity

Part 2: You and Them
- Presentation: Stereotypes, Bias, and Stereotype Threat
- Activity: Case study, adapted from “Stereotype Threat” (CIMER)
• Presentation: Vulnerable populations
• Activity: Brainstorm and discuss how your discipline might impact vulnerable populations

Session 4: Responding to Stressors

Part 1: Addressing External Pressure
• Presentation: Sources of Pressure
• Warm-up: “Which is it?” activity -- Conflict vs. Bullying
• Activity: “Addressing Conflict” case study (CIMER)
• Presentation: Strategies for addressing conflict
• Inclusion Consideration: How might this topic be influenced by individual differences?
• Presentation: The role of the Ombudsperson (Bryan Hanson)

Part 2: Managing Internal Pressure
• Presentation: Sources of Internal Pressure
• Activity: “Addressing Conflict” case study (CIMER)
• Inclusion Consideration: Extra pressures for marginalized and international students
• Presentation: Strategies for managing internal pressures

Session 5: Exhibiting Professional Behaviors

Part 1: Responsible Behaviors
• Presentation: What does it mean to be professional?
• Warm-up: “What would you do?” based on Sticky Situations activity (CIMER p. 80)
• Activity: “Responding to Feedback” case study (CIMER)
• Inclusion Consideration: Assumptions made based on social characteristics

Part 2: Ethical Behaviors
• Presentation: What does it mean to be ethical?
• Activity: “Credit where Credit is Due” case study (CIMER)
• Inclusion Consideration: Ethics are based on rules which vary by environment