



Work in Progress: Student Perceptions of Professional Integrity Modules Incorporated in a First-Year Engineering Program

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Abstract

This Work in Progress paper will describe first-year engineering students' perceptions of a series of modules on professional integrity implemented for the first time by the First-Year Engineering Program at the University of Pittsburgh in the 2018-2019 academic year. As part of the First-Year Engineering Program, students take two engineering courses: one in the fall semester and one in the spring. Three modules were implemented each semester, so that students were exposed to the topic periodically throughout their first year in engineering. The modules discussed the importance of integrity in the engineering profession and in the workplace, and connected professional integrity expectations to academic integrity expectations.

After each module, students (541 in the fall semester and 527 in the spring semester) were asked to complete anonymous, voluntary feedback surveys to learn about their perceptions of each module. Response rates varied by semester, with the lowest response rate being 15% and the highest response rate being 32%. The survey consisted of Likert-scale items asking about the module and their understanding of the topics that were discussed, as well as an open-ended question asking what was particularly useful about the module and what suggestions they had for improvement.

The six surveys were used to answer the following research questions: (a) What were first-year engineering students' perceptions of the first implementation of these six modules?, and (b) In what ways can these modules be improved in future implementations? Medians for the Likert-scale items are provided in this paper. The open-ended responses were analyzed using open coding, to see which themes emerged from the students' responses, and the results are provided in this paper.

Overall, survey results indicate that the students' perceptions were that the modules helped them better understand the topics and that they did learn from the modules.

Introduction

This Work in Progress paper will describe first-year engineering students' perceptions of a series of modules on professional integrity implemented for the first time in the two required first-year engineering courses at the University of Pittsburgh, in the 2018-2019 academic year.

Previous research has shown that academic integrity violations are frequent in higher education, especially in engineering [1], [2]. Engineering is a profession guided by a code of ethics, yet the incidences of academic dishonesty in engineering students indicate that students are not practicing the values that, per the code of ethics, practicing engineers ought to uphold. Previous research, such as [3], has also shown that there are differences in how cheating is defined, both

within a group of students, and when comparing faculty definitions to student definitions. Additionally, ongoing (though yet unpublished) research by the author and a colleague has shown that student perceptions of and experiences with academic integrity change their first year of engineering, with more lax definitions of what behaviors constitute cheating at the end of their first year of engineering than at the beginning [4]. These findings highlight the importance of teaching engineering students about ethics and integrity from the beginning of their college careers.

Context of the Study and Research Questions

The Swanson School of Engineering at the University of Pittsburgh has for several years been proactive about promoting academic integrity within the school, including providing training to faculty on how to incorporate academic integrity in their courses. In the 2018-2019 academic year, the First-Year Engineering Program at the University implemented a series of six modules on professional integrity. To provide the context in which these modules were implemented, more information about the First-Year Engineering Program is below.

As part of the First-Year Engineering Program, students are required to take two engineering courses: ENGR 0011 in the fall semester and ENGR 0012 in the spring semester. In the 2018 fall semester, ENGR 0011 focused on Excel and programming using HTML and JavaScript. 541 first-year engineering students were enrolled in the fall 2018 semester, distributed among seven sections taught by six different faculty. The spring semester course (ENGR 0012) focused on programming using MATLAB and C. There were 527 first-year engineering students enrolled in ENGR 0012 in the spring 2019 semester, distributed among seven sections taught by five different faculty. The fall semester course is a prerequisite for the spring semester course, so the lower number in ENGR 0012 is due to students failing ENGR 0011 or deciding to switch majors and/or leave the University. Although there are multiple sections of each course, the course material and assessments are the same for all sections; the faculty team coordinates to ensure that the different sections are taught the same information.

Three professional integrity modules were implemented each semester, so that students were exposed to the topic periodically throughout their first year in engineering. The modules discussed the importance of integrity in the engineering profession and in the workplace, and connected professional integrity expectations to academic integrity expectations. Rather than simply condemn integrity violations, the modules sought to promote and encourage acting with integrity. The same content and activities were implemented by multiple faculty in all the different sections of the first-year engineering courses. Each module took about 30 minutes of one 110-minute class (the course meets twice a week, for 110 minutes each time).

It was hoped that by incorporating these modules within the first-year engineering courses, rather than as a separate course, the importance of integrity in engineering would be communicated to students. It was also hoped that by having the same engineering faculty who taught the first-year engineering courses, rather than other (non-engineering) faculty teach these modules, the value

engineers place on integrity would be communicated to students. More information about each of the modules is briefly provided below, with more detailed information about each module appearing in a subsequent publication.

Because the professional integrity modules were administered for the first time during this academic year, the author was interested in getting feedback from the students, not only to learn about their perceptions of the modules, but also to see how these modules could be improved when implemented the following academic year. The research questions guiding this study were therefore: (a) What were first-year engineering students' perceptions of the first implementation of these six modules?, and (b) In what ways can these modules be improved in future implementations?

Description of the Modules

Each of the modules implemented in the 2018-2019 academic year is briefly described below. More detailed information will be provided in a subsequent paper, or readers are encouraged to directly contact the author.

Module 1: What is Integrity?

The first module was implemented on the first day of class in all sections, with the goal of setting the stage for the course and the semester regarding integrity expectations.

The module consisted of the following:

- Information on why professional integrity is a topic that will be discussed all year as part of the ENGR 0011 and ENGR 0012 courses
- Discussions on definitions of integrity
- Introduction to the six fundamental values of academic integrity provided by the International Center for Academic Integrity [5]: honesty, trust/trustworthiness, respect, responsibility, fairness, and courage
- Time to read and discuss an article on the importance of integrity
- Student teams (consisting of typically 3 students) submit answers to short reflection questions about the text

Module 2: Connecting Professional Integrity to Academic Integrity

The second module was implemented on week 6 of the fall semester (there are 15 weeks in the semester), and consisted of the following:

- Introduction to the engineering code of ethics – the code of ethics provided by the National Society of Professional Engineers [6] was used
- Connecting integrity in the engineering field to integrity in the school setting – student teams identify the six fundamental values of academic integrity in the NSPE code of ethics

- Discussion of the implications of academic integrity violations at our University and beyond

Module 3: Demonstrating Integrity as New Hires

The third module was implemented on week 14 of the fall semester, and consisted of the following:

- Discussion of case studies describing students in situations where they have to make a decision to act with integrity – these were based on true situations shared by the school's cooperative education program
- Time to read and discuss an article on the reasons new hires get fired
- Student teams submit answers to short reflection questions about the text
- Discussion on the place of integrity in engineering work

Module 4: Case Study

The fourth module was implemented on week 2 of the spring semester, and consisted of the following:

- Student teams read an engineering case study in which engineers did not act with integrity, then discuss what occurred, the consequences, and possible alternative actions the engineers could have taken
- Student teams submit answers to short reflection questions about the case study

Module 5: Integrity in Teamwork

The fifth module was implemented on week 9 of the spring semester, and consisted of the following:

- Prior to class, students review some materials in preparation for class
- In class, student teams read and discuss some case studies involving integrity and teamwork in the first-year engineering courses

Module 6: Professionalism

The sixth module was implemented on week 14 of the spring semester, and consisted of the following:

- Discussions on definitions of professionalism
- Discussion of professionalism in the context of engineering
- Time to read and discuss an article on professionalism in the workplace
- Student teams submit answers to short reflection questions about the text

Methods

After each module, students (541 in the fall semester and 527 in the spring semester) were sent a feedback survey to learn about their perceptions of each module. The students completed the anonymous survey on a voluntary basis, and response rates varied by semester (response rates for each survey are included below). The survey consisted of Likert-scale items asking about the module and their understanding of the topics that were discussed. There was also an open-ended question asking what was particularly useful about the module and what suggestions they had for improvement.

In this paper, medians for the Likert-scale items are provided. The open-ended responses were analyzed using open coding, to see which themes emerged from the students' responses. These results are summarized below.

Results and Discussion

The table below summarizes student responses to the Likert-scale questions included in the online, anonymous, voluntary survey sent out that day requesting feedback on the modules. For the first survey, the possible responses were: 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, and 5-Strongly agree (scale noted as 1-5 in the table). Starting with the second survey, in order to encourage students to respond with positives or negatives, rather than neutral, the possible Likert responses were modified to be: 1-Strongly disagree, 2-Disagree, 3-Somewhat disagree, 4-Somewhat agree, 5-Agree, and 6-Strongly agree (scale noted as 1-6 in the table). As these were categorical data, medians are provided. In order to match the corresponding module, the statement wording was sometimes slightly changed. These changes are noted in the table.

Table 1. Student perceptions of the modules – Quantitative responses (Medians)

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Response rate	171 (32%)	138 (26%)	116 (22%)	88 (17%)	77 (15%)	126 (24%)
Scale	1-5	1-6	1-6	1-6	1-6	1-6
The information provided as part of this session was new to me.	3.00	4.00	5.00	5.00	4.00	4.00
The information provided as part of this session was easy to understand.	4.00	5.00	5.00	5.00	5.00	5.00
The information provided as part of this session helped me better understand what integrity* is. *For Module 5, “integrity” is replaced with “social loafing” *For Module 6, “integrity” is replaced with “professionalism”	4.00	5.00	5.00	5.00	5.00	5.00
The information provided as part of this session helped me better understand why integrity* is important**. *For Module 6, “integrity” is replaced with “professionalism” **For Module 5, “how integrity is important” is replaced with “how social loafing is connected to teamwork and integrity”	4.00	5.00	5.00	5.00	5.00	5.00
The information provided as part of this session will motivate me to act with integrity*. *For Module 5, “integrity” is replaced with “integrity in my teams” *For Module 6, “act with integrity” is replaced with “demonstrate professional behavior”	4.00	5.00	5.00	5.00	5.00	5.00

In the first survey, the Likert-scale items were followed by the open-ended question “If you have any additional comments about the first professional integrity session, you may include them below.” Starting in the second survey, in order to get more specific feedback, the open-ended question following the Likert-scale items was changed to “What was particularly useful to you? What are ideas for modification?”. Responses were coded using open coding, to see which themes emerged from the data. The responses are summarized below. The table indicates how many students provided an answer to the open-ended questions, and provides the percent of students (of those who provided open-ended responses) whose response was assigned a particular code. Note that one participant’s response could have included comments that were assigned multiple codes, so the percentages do not add up to 100%.

Table 2. Percent of students (of those who provided open-ended responses) whose response was assigned a particular code

Code	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Number who provided open-ended comments	8	29	30	45	37	45
Comments about integrity being something easy, obvious, and/or something they already knew (and therefore didn't learn anything new)	25%	14%	13%	7%	8%	13%
Comments about integrity being something personal that cannot be taught	13%	3%	3%	0%	0%	0%
Negative comment about the module, the topic, and/or how it was taught	13%	3%	13%	0%	11%	16%
Positive comment about the module, the topic, something they learned, and/or how it was taught	38%	62%	63%	84%	65%	73%
Provided ideas for modifications	0%	17%	23%	29%	24%	24%
Specifically indicated that there were no ideas for modification and/or that no changes were needed	0%	14%	7%	2%	5%	2%
Unrelated comments or "No comments"	13%	10%	3%	7%	11%	9%

Sample comments which demonstrate positive perceptions of the modules include:

- "I found it useful that we were able to examine a document produced and approved by a body of real-world engineers. Amidst college coursework, it is often easy to lose sight of real-world applications of material, so having the document tie to real-world scenarios was appreciated."
- "I thought it was useful to see a real-life example of a breach in integrity in the workplace and the consequences of those actions. Professional integrity has become even more important to me."
- "Hearing what specific behaviors of recent college graduates that employers found unsatisfactory made me more aware of my own behavior and how to avoid acting the same way."
- "I find it particularly helpful when the aspects of professional integrity are related to the responsibilities of a student. In this way, the content of our discussions becomes more personal. By applying the ethical expectations of an engineering professional to student life, I can better understand my missteps as a university student and more effectively pinpoint how I can improve as an individual of integrity in preparation for the workforce."

Sample comments which demonstrate negative perceptions about the modules include:

- "Integrity comes from within and those who choose to be dishonest will not be persuaded by a lecture."

- "...it was a waste of time and ultimately lead to nothing new and no new information...Most of us already understand what to do and what not to do when it comes to the workplace and a job when we get out of college. For those who don't know will not change their ways or their way of thinking just by completing the [module]."
- "It was not particularly useful. I think the article was a blanket statement on being a professional but did not really help me with challenges in the workplace that lead me to be unprofessional."

Sample suggestions for modifications include having students work with their disciplinary code of ethics, rather than the NSPE code; requiring that students read the articles and/or case studies prior to coming to class so that they have more time to read them; including more real-life examples; asking students to act out scenarios or write out the steps that ought to be followed in a particular scenario; and having a case study in which engineers acted with integrity (so, seeing the positive examples in addition to the negative examples). Many of these suggestions are already being included in the next implementation of the modules.

Regarding the first research question, overall, the Likert-scale item responses indicated that the students found that the modules helped them better understand the topics and that they did learn from the modules. Open-ended responses showed that while some students did push back when discussing integrity, overall they did find the modules and topics interesting. This latter finding can serve as motivation for institutions to find ways to continue the discussions of integrity in the engineering profession and to incorporate these discussions throughout the engineering curriculum.

The module with the most positive comments was Module 4, in which a real-life engineering case study was discussed. Similarly, one of the suggestions provided by students was to include more case studies. This finding can encourage instructors to find real and current examples and resources to make professional integrity relevant and real to students. This can include using case studies of engineering in the workplace and/or of engineering students in internships and co-ops. This can also include providing students with resources such as codes of ethics and engineering documents or handbooks, that will expose them to what it means to work and act as an engineer ought to.

Finally, as one of the student comments included above indicates, discussions on professional integrity should be guided such that students can connect the expectations in the workplace setting to the expectations in the classroom setting, and can learn to see that one starts to become an engineer that acts with integrity by being a student that acts with integrity.

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