Work In Progress: First-Year Student Signature Project - Design an Infographic on ”What is Technical Communication?”

Dr. Jessica A. Kuczenski, Santa Clara University

Dr. Jes Kuczenski joined the engineering faculty at Santa Clara University in 2014. She obtained her M.S. and Ph.D. from the University of Notre Dame and her B.S. from Iowa State University all in Chemical Engineering. Dr. Kuczenski has been teaching since 2007 and focuses on courses which are commonly found in first years of an engineering education (e.g. introduction to engineering, engineering graphics, statics, and dynamics) or are heavily based in engineering design.

Tricia Serviss, Santa Clara University

Tricia is an assistant professor in the Department of English at Santa Clara University, specializing in writing studies, composition, and writing educational practices.
Abstract:

There are a number of concepts and skills that are common to all our university students. Technical writing is one of the most relevant and utilized concepts, thus we have developed a project-based ‘writing to learn’ infographic design mini-project assignment to engage first-year students in two different disciplines. Overall, the project aims to demonstrate student competence in four areas of particular interest including audience, ethics, summary and design. We will assess student knowledge using survey questions in each of our targeted areas along with quality assessment of the assignment using a shared rubric. Additionally, we hope that we can capture more longitudinal student information in comparison with first-year and senior students over time. Preliminary results presented in this work in progress report will include examples of student created infographics analyzed in our four assessment areas from both courses and survey data from our initial student cohorts.

Introduction:

There are a number of concepts and skills that are common to all university students. Technical communication is one of the most relevant and utilized across disciplines. Technical and professional communication genres and strategies are defined by their context and purpose in the workplace (Hart-Davidson, 2001). Engineering students who understand how technical communication works and deploy its strategies typically add three kinds of value to a technical project by effectively 1) designing documents that convey information in usable forms, 2) working with and refining collaborative practices to maximize collaborative output, and 3) recognizing patterns and structures across specific problems or projects as well as providing strategic thinking that can productively impact large systems and data sets (Reich, 1992; Johnson, 1995). Technical communication tasks require attention to the competencies our intervention is designed to study and promote, namely audience, ethics, summary and design. Ideally, engineering students learn about technical communication approaches by producing typical engineering deliverables while analyzing crucial attributes of successful technical communication itself (Winsor, 1996; Kain and Wardle, 2005; Slattery, 2005; Simpson et al, 2011).

Thus, we propose to introduce technical communication to our first-year students in two courses in separate disciplines to capitalize on common themes and reinforce ideas to form a stronger foundation for discipline-specific concepts and skills. The purpose of our study is to create and implement a signature assignment across both a core curriculum Critical Thinking and Writing
course sequence and an Introduction to Engineering course to help students connect writing concepts across disciplines and toward different purposes. In particular, we have noted that students tend to view writing assignments in writing courses as ‘creative writing’ and writing for other (often technical) courses as ‘technical writing’ when in fact, the writing principles are the same across contexts. By focusing on common core ideas in communication including attention to audience, ethics, analytic summary, and design, we can help students visualize and understand the communication concepts and skills they will use to complete future coursework and ultimately become more adept thinkers and communicators. Thus, this report discusses the creation of a project-based ‘writing to learn’ signature assignment in different courses, gives examples of student infographics, and assesses student work in our four target areas.

Signature Assignment:

We considered many potential media platforms for a common mini-project assignment, from essay writing in Google Docs through electronic portfolios. Because our students are largely in their first-year, we wanted the assignment deliverable to be visual, easy to use, and concise. The visual nature of the assignment aims for students to more creatively communicate what they’ve learned and to learn more deeply through that act of communication. We also have evidence that our engineering students in particular tend to be highly visual, as represented by learning style scores from the Introduction to Engineering course (see Appendix A for explanation of survey and figure illustrating results). Ultimately, we decided to have students create visual infographic posters. An infographic, or information graphic, is defined as “a chart, diagram, or illustration that uses graphic elements to present information in a visually striking way” (Infographic 2014). There are many free online software tools which could be utilized, e.g. Piktochart, Venngage, along with common software such as PowerPoint, Google Apps, or even web-based portfolio platforms like Digication. Our students are considered to be “digital natives” (Prensky 2001), so an online web-based software was considered to be relatively easy for students to learn.

The infographic platform allows us to easily target our four areas of interest: audience, ethics, summary, and design. The nature of the infographic ensures that students will summarize what they have learned. Students would be responsible for researching their topic using library resources, then communicating what they’ve learned in a concise, visual manner which has been formally cited, thus investigating ethics in visual media. Finally, students will need to design their infographic to effectively communicate with their intended audience.

As part of the project-based signature assignment, the two instructors for the different courses are carefully aligning our technical communication teaching to use a common vocabulary. Students share and provide feedback to each other’s infographic drafts during facilitated
workshops in class to learn more about the genre of the infographic, the content represented in the infographic, and editorial strategies useful in applying that feedback to their own work.

The assignment itself is in multiple parts over several weeks:
1. Students are tasked to independently research 2 academic skills from Table 1 (one skill from each column) using a minimum of 4 sources properly cited. **Note: the subject of the research may change, especially by discipline, but topic is not important to overall project goals**;
2. Students are placed on a team with other students who have researched the same academic skill and are tasked to summarize and develop steps to implement the skill into their learning practice, using a Plan-Do-Check-Act (PDCA) cycle model (more information in Appendix B). At this time, student teams also review and choose an infographic platform;
3. Student teams develop a draft infographic using their chosen platform. Draft is to be scaled to a 8.5”x11” paper size and printed in color for in-class peer review;
4. Feedback is generated from in-class facilitated workshop and returned to student team in order to finalize infographic and formally submit. A quality effort is incentivized by giving some extra points for the student favorite (top vote earning) infographic in each section;
5. After submission, students are asked to review all the infographics in their course section and vote on their favorites. Students are also given an ‘Infographic Survey’ (described in the ‘Assessment’ section) to assess their own understanding in our target areas.

**Table 1: Academic skills for student research**

<table>
<thead>
<tr>
<th>Making the most of how you are taught</th>
<th>Making the learning process work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep for class</td>
<td>Reading</td>
</tr>
<tr>
<td>Note taking</td>
<td>Problem-solving methodology</td>
</tr>
<tr>
<td>Listening</td>
<td>Time/priority management (procrastination)</td>
</tr>
<tr>
<td>Questioning</td>
<td>Study groups (peer learning)</td>
</tr>
<tr>
<td>Use academic services*</td>
<td>Prep for and taking exams</td>
</tr>
</tbody>
</table>

*Tutoring, professors office hours, library, advising, career center, etc.

Assessment:

We propose two types of assessment for this assignment. First, an assessment rubric for the infographics evaluates the quality of the infographic (see Table 2). The rubric is given when the first draft is assigned and students peer review the draft infographics using the rubric during the facilitated in-class workshop(s). The rubric areas inform the authors of areas for improvement including creativity, graphics, fonts, and colors, but is also meant to inform instructors toward
our target areas including ethics ('citations' criteria) and summary ('topic' criteria). Ultimately, as this is used during the peer review process, it also informs the author on how their target audience, their peers, have received their infographic. When the infographics are formally submitted, this same rubric is used by the instructors and graders to assess the final quality of the infographic. A simple code of 3 -“exceeds expectations”, 2 - “meets expectations”, and 1 - “needs more work” is used.

Table 2: Rubric used to assess quality of student-submitted infographics

<table>
<thead>
<tr>
<th>Components</th>
<th>Exceeds expectations (3)</th>
<th>Meets expectations (2)</th>
<th>Needs more work (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>The topic of the infographic is specific in nature and is intended to inform or convince the viewer.</td>
<td>The topic of the infographic may be a bit too broad or narrow to allow the viewer to understand the main points.</td>
<td>The topic of the infographic is hard to ascertain and needs to be made more specific.</td>
</tr>
<tr>
<td>Creativity</td>
<td>Highly creative and attractive presentation of information. All required elements are present and additional elements included enhance the infographic.</td>
<td>Creative and attractive presentation of information. All required elements are present. Any additional elements used do not enhance the infographic.</td>
<td>Presentation is not very creative nor attractive. Some required elements are included, though may be unclear. No additional elements used.</td>
</tr>
<tr>
<td>Graphics</td>
<td>All graphics are related to the topic and make it easier to understand. The data visualization formats chosen make the data presented easy for the viewer to understand the information.</td>
<td>All graphics are related to the topic and most make it easier to understand. The data visualization formats chosen showcase the data, but some may make it difficult for the viewer to understand the points.</td>
<td>Graphics do not relate to the topic or do not help reader understand. Other data visualization formats should be chosen to best showcase the data presentation for the viewer.</td>
</tr>
<tr>
<td>Fonts</td>
<td>The infographic includes an appropriate font to both complement the content and make the text readable</td>
<td>The infographic includes multiple fonts and/or the fonts do not seem related to the infographics topic.</td>
<td>The font(s) used in the infographic make the text almost unreadable.</td>
</tr>
<tr>
<td>Colors</td>
<td>The color choices enhance the visibility of the infographic. Different saturations of the same color are used wisely.</td>
<td>The color choices are fine, but too many colors may have been used or used more effectively.</td>
<td>The color choices for the infographic are not visually pleasing and detract from the infographic.</td>
</tr>
<tr>
<td>Mechanics</td>
<td>Capitalization, punctuation, spelling and grammar are correct throughout the infographic.</td>
<td>There is 1-2 errors in capitalization, punctuation, spelling or grammar.</td>
<td>There are more than 2 errors in capitalization, punctuation, spelling or grammar.</td>
</tr>
<tr>
<td>Citations</td>
<td>Full bibliographic citations in APA format for all sources used are included.</td>
<td>The URL of sources used are included.</td>
<td>No citations to sources used are included.</td>
</tr>
</tbody>
</table>

Our second assessment is the creation of a survey which asks questions based on our four specific assessment areas of audience, ethics, summary and design. The survey asks multiple questions per category to ensure accurate capture of data. In particular, 2 questions per category are related to existing survey questions asked of graduating senior students including, but not limited to, the senior exit survey given to engineering students after their senior design capstone experience. Thus, we hope that we can capture more longitudinal student information in comparison with first-year and senior students over time. The survey will be given at the conclusion of the assignment, though some questions may also be incorporated toward the beginning of the quarter to try to track progress. The survey questions are available in Appendix C.
Preliminary Results:

Our signature infographic assignment was first piloted to the Introduction to Engineering class fall quarter 2016. A total of 130 students in the course completed the assignment in 3 course sections. Student teams of 2-3 persons were made randomly (total of 44 teams), organized by academic skill topic researched; topics which were researched less frequently were filled first. The infographic platform chosen by student teams was largely Piktochart (73%) with other platforms chosen including Venngage, Google Slides, MS Word, and various Adobe software. Students brought in one color copy of their infographic to exchange with another student during an in-class peer review. The draft of the infographic was reviewed using the rubric assessment (Table 2) and reviewer comments were written directly on the document. Student reviewers immediately discussed the comments and scores with the author. Authors combined the feedback from multiple reviews (usually 3 per team), and drafted a final infographic for submission along with a response explaining changes made. All infographics were compiled into a slideshow and favorite infographics were voted on by each class section. The 3 favorites (top vote earners, 1 from each section) from fall quarter 2016 are shown in Appendix D. Unfortunately, the rubric scores from the draft phase were not recorded in a meaningful way, however final infographic rubric scores are available in Appendix E. A summary of rubric scores are shown in Table 3.

Table 3: Scores from infographic rubric assessment on final student infographics from fall quarter 2016 and from draft and final student infographics from winter quarter 2017 presented as percent of team scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Topic</th>
<th>Creativity</th>
<th>Graphics</th>
<th>Fonts</th>
<th>Colors</th>
<th>Mechanics</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall 2016 Final Infographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Exceeds expectations</td>
<td>72.7</td>
<td>54.6</td>
<td>13.6</td>
<td>13.6</td>
<td>34.1</td>
<td>29.6</td>
<td>59.1</td>
</tr>
<tr>
<td>% Meets expectations</td>
<td>25.0</td>
<td>38.6</td>
<td>15.9</td>
<td>25.0</td>
<td>50.0</td>
<td>68.2</td>
<td>38.6</td>
</tr>
<tr>
<td>% More work needed</td>
<td>2.3</td>
<td>6.8</td>
<td>70.5</td>
<td>61.4</td>
<td>15.9</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Winter 2017 Draft Infographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Exceeds expectations</td>
<td>95.4</td>
<td>70.1</td>
<td>58.6</td>
<td>67.8</td>
<td>67.8</td>
<td>77.0</td>
<td>78.2</td>
</tr>
<tr>
<td>% Meets expectations</td>
<td>4.6</td>
<td>29.9</td>
<td>39.1</td>
<td>29.9</td>
<td>20.7</td>
<td>20.7</td>
<td>1.2</td>
</tr>
<tr>
<td>% More work needed</td>
<td>0.0</td>
<td>0.0</td>
<td>2.3</td>
<td>2.3</td>
<td>11.5</td>
<td>2.3</td>
<td>20.7</td>
</tr>
<tr>
<td><strong>Winter 2017 Final Infographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Exceeds expectations</td>
<td>30.0</td>
<td>46.7</td>
<td>53.3</td>
<td>23.3</td>
<td>60.0</td>
<td>20.0</td>
<td>10.0</td>
</tr>
<tr>
<td>% Meets expectations</td>
<td>66.7</td>
<td>53.3</td>
<td>43.3</td>
<td>63.3</td>
<td>30.0</td>
<td>66.7</td>
<td>76.7</td>
</tr>
<tr>
<td>% More work needed</td>
<td>3.33</td>
<td>0.0</td>
<td>3.33</td>
<td>13.3</td>
<td>10.0</td>
<td>13.3</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Overall, rubric scores (which met or exceeded expectations) suggest that the student teams were able to successfully convey the topic of the infographic (98%) and infographics were mechanically correct (98%) hitting our target area of summary. The poster results were rated as creative (93%) with effective color choices (84%), though reviewers felt that improvements
could be made in both the use and type of graphics (only 29.5% met or exceeded expectations) and font choices selected (39% met or exceeded expectations). Thus, toward the target area of design, there are mixed results with creative and effective color design choices made, but better execution was needed for some of the individual design elements including graphics and fonts. Finally, infographics were cited appropriately on nearly all posters (98%) illustrating an understanding of the ethical use of information in visual media. Overall, an average of all infographic poster scores using our 3 point scale yields an average score of 2.17 out of 3 (72%) and illustrates effective targeting toward their peer audience.

The infographic assignment has been implemented winter quarter 2017 in two sections of the Introduction to Engineering course (total of 90 students placed in 30 teams) and also in one section of a Critical Thinking and Writing course (~20 students). The Introduction to Engineering course repeated the assignment and both draft and final rubric assessments were recorded. The full rubric results are available in Appendix E with summarized results available in Table 3. The infographic platform chosen by student teams again favored Piktochart (57%) with other platforms chosen including Venngage, Google Slides, MS Word, and various Adobe software. The top vote earning infographic posters from each section in winter quarter 2017 are shown in Appendix D, Figures D4-D5.

Rubric scores from winter quarter infographics (which met or exceeded expectations) for both draft and final rubric scores suggest that the student teams were able to successfully convey the topic of the infographic (draft-99%; final-97%) and infographics were mechanically correct (draft-98%; final-87%) hitting our target area of summary. The poster results were rated as creative (draft-98%; final-100%) with effective color choices (draft-89%; final-90%), graphics (draft-98%; final-97%), and font choices (draft-98%; final-87%). Thus, toward the target area of design, there were creative and effective color design choices made, and good execution of some of the individual design elements including graphics and fonts. Infographics were cited appropriately on most posters (draft-79%; final-87%) illustrating an understanding of the ethical use of information in visual media. Overall, an average of all infographic poster scores using our 3 point scale yields an average score of 2.68 out of 3 (89%) for the draft infographics and 2.27 out of 3 (76%) for the final infographic submissions. Both of these high scores indicate effective targeting toward their peer audience.

In comparing the draft submission to the final submission rubric scores for winter quarter, it can be seen that scores are similar for many categories reviewed including topic, creativity, color, and graphics. The approximately 10% difference in scores in font choice and mechanics (e.g. grammar, punctuation, capitalization) is likely simply due to having student peers vs. a graduate student grader assessing the work. The 10% increase in the citation category was due to draft
phase scores being polarized to either 1 ‘missing’ or 3 ‘complete; the higher scores in the final simply means that more teams remembered to include their citations!

In comparing the final winter quarter data to the final fall quarter data (Figure 1), we can highlight a few areas where rubric scores from the infographics are markedly different, most notably in the Graphics and Fonts categories. The largest change in assigning the project for the winter quarter was that students reviewed more example infographics both on their own (before class) and in class prior to the creation of their own infographic, which may account for the differences shown.

![Percent vs. Quarter](image)

Figure 1: Comparison of fall quarter final infographic results with winter quarter final infographic results

The infographic survey assessment is also piloted in the winter quarter and initial results are discussed below (survey questions are found in Appendix C). The Critical Thinking and Writing course is a 2 quarter sequence (winter and spring quarters), so preliminary results from these students was not available as of the date of submission. Survey results from the Introduction to Engineering students were received from 54 students for a 60% return rate. Results from all survey questions were reported on a ‘confidence’ scale from 1 (not at all) to 7 (extremely) and analyzed en masse. The scores were surprisingly high in all categories with an average score of 5.93 for audience, 5.78 for design, 5.79 for ethics, and 5.68 for summary. This highlights that students felt confident about their ability and understanding in these areas. A summary of the results from each category of audience, design, ethics, and summary is shown in Table 4 as a percent of responses with each score value. The full set of data is available in Appendix F.
Analysis of the responses show that approximately one-third of respondents had neutral to slightly confident scores of 4-5, while another one-third felt confident with a score of 6, and the final one-third felt extremely confident in these areas with a score of 7. Fewer than 5% of all responses in audience, design, and ethics were less confident (scores of 1-3), except in summary, for which a score of 3 was reported for 5% of respondents.

Table 4: Results from the infographic survey data, winter quarter 2017

<table>
<thead>
<tr>
<th>Score</th>
<th>%Audience</th>
<th>%Design</th>
<th>%Ethics</th>
<th>%Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0%</td>
<td>0.3%</td>
<td>1.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>2</td>
<td>0.8%</td>
<td>0.3%</td>
<td>1.4%</td>
<td>1.9%</td>
</tr>
<tr>
<td>3</td>
<td>1.3%</td>
<td>1.3%</td>
<td>2.1%</td>
<td>4.9%</td>
</tr>
<tr>
<td>4</td>
<td>8.2%</td>
<td>10.1%</td>
<td>6.7%</td>
<td>10.2%</td>
</tr>
<tr>
<td>5</td>
<td>18.0%</td>
<td>23.5%</td>
<td>22.0%</td>
<td>18.8%</td>
</tr>
<tr>
<td>6</td>
<td>37.3%</td>
<td>36.2%</td>
<td>35.0%</td>
<td>33.6%</td>
</tr>
<tr>
<td>7</td>
<td>34.4%</td>
<td>28.3%</td>
<td>31.7%</td>
<td>30.6%</td>
</tr>
</tbody>
</table>

Overall, the results from both the infographic rubric assessing quality of the submitted infographics and the infographic survey directly assessing our target areas indicate that students are able to successfully communicate their summarized topic to their intended audience, with proper citation and creative design.

Conclusions and Future Work:

We are most interested in asking if technical writing skills can be effectively taught across disciplines to first-year students. In particular, we are interested in using a visual media (infographic poster) to engage students and hope to prove that students are demonstrating competence in four areas of particular interest including audience, ethics, summary, and design.

To date, student teams have successfully generated infographics which were researched, peer-reviewed, and formally submitted. An infographic rubric to assess quality of the posters was used for the final student team submissions in the fall quarter and in the draft and final submissions for the winter quarter. In both quarters, student teams scored well on the infographic rubric assessment indicating that they effectively targeted and understood their audience, could effectively summarize and design on a particular topic, and supplied appropriate formal citations for their media. Additionally, we now have preliminary results from assessment with the infographic survey where questions directly assess student confidence in the areas of audience, summary, design, and ethics. Students were highly confident of their abilities with over two-thirds of student responses indicating ‘high confidence’ or ‘extreme confidence’ in each survey category.
For future work, we hope to gather feedback from the ASEE annual conference to inform our assignment and assessment methods. Eventually, we also hope to longitudinally study these students to see if their rhetorical skills in these areas have grown or persisted due to this project-based introduction to ‘What is technical communication?’.

References:


Appendices

Appendix A: Learning style survey results for engineering students from previous academic years
Appendix B: PDCA cycle
Appendix C: Survey questions targeting audience, ethics, summary, and design
Appendix D: Student infographic examples
Appendix E: Peer and instructor assessment of infographic examples
Appendix F: Survey results for student responses on audience, ethics, summary and design
Appendix A: Learning style survey results for engineering students from previous academic years

The Introduction to Engineering students take a 44 question learning style survey created by Solomon and Felder. The learning style survey is a simple multiple choice survey where students select between 2 options for each question as to which most frequently applies to them. Their website (given in the footnote citation) computes the results and gives the student a printout, see example in Figure A1. Students then take their results and enter them into a Google Form where they are counted en masse and results are presented graphically below in Figure A2.

Figure A1: Example printout of learning styles results from questionnaire

Figure A2: Results of learning style survey for Introduction to Engineering students from fall 2014 through fall 2016 quarters. Total students polled is 629 to date.

---

The primary results important for this report is the Visual vs. Verbal categories. Note the much larger numbers of students for whom their learning preference is for visual information rather than verbal. The full results are given in Table A1, which shows that more students have a ‘strong’ (strength of 9 or 11) or ‘moderate’ (strength of 5 or 7) preference for visual information (total of 397 students) rather than ‘strong’ or ‘moderate’ preference for verbal information (total of 27 students).

Table A1: Learning style questionnaire results to date of Introduction to Engineering students. Numbers given are total number of students reporting a strength value in each (paired) category.

<table>
<thead>
<tr>
<th>Strength</th>
<th>Active</th>
<th>Reflective</th>
<th>Sensing</th>
<th>Intuitive</th>
<th>Visual</th>
<th>Verbal</th>
<th>Sequential</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>13</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>72</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>36</td>
<td>10</td>
<td>33</td>
<td>25</td>
<td>106</td>
<td>5</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>60</td>
<td>32</td>
<td>60</td>
<td>27</td>
<td>129</td>
<td>10</td>
<td>66</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>76</td>
<td>42</td>
<td>92</td>
<td>46</td>
<td>90</td>
<td>11</td>
<td>90</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>93</td>
<td>85</td>
<td>107</td>
<td>67</td>
<td>81</td>
<td>19</td>
<td>138</td>
<td>71</td>
</tr>
<tr>
<td>1</td>
<td>89</td>
<td>85</td>
<td>87</td>
<td>70</td>
<td>65</td>
<td>37</td>
<td>89</td>
<td>71</td>
</tr>
</tbody>
</table>
Appendix B: PDCA cycle

The PDCA cycle (Plan-Do-Check-Act/Adjust) mentioned in step 2 above is a four-step iterative cycle which was originally developed under the ‘Total Quality Management’ umbrella in business (see Figure B1). This cycle is commonly used as a personal development or learning tool, and in our case changed to a PDSA cycle, where the ‘check’ step is changed to ‘study’ in order to make more relevant for student development. For more information on the PDCA cycle, Pietrzak (2015) offers an interesting review of the opinions of the origins and variations of the PDCA cycle. In our case, we found the fundamental principle of iteration for the PDCA cycle to be a great model for the continuous student development toward learning we are hoping to have students adopt.

Figure B1: PDCA cycle in Pietrzak (2015)
Appendix C: Survey questions targeting audience, ethics, summary, and design

**Infographic Survey**

Questions to assess 'audience', 'design', 'ethics' and 'summary'.

Your email address (jkuczenski@scu.edu) will be recorded when you submit this form. Not jkuczenski?

* Required

## Audience

1. **To what degree are you confident that you can:** *

   *Mark only one oval per row.*

   | | Not at all | 1 | 2 | 3 | 4 | 5 | 6 | Extremely 7 |
---|---|---|---|---|---|---|---|---|
Identify the makeup of my intended audience |
Identify the needs of my intended audience |
Identify the purpose of the communication |
Communicate effectively with those in my chosen profession/major (engr) |
Communicate effectively with those outside my profession/major (non- engr) |
Identify needs of team members |
Respect people different from me |

## Design

2. **To what degree are you confident that you can:** *

   *Mark only one oval per row.*

   | | Not at all | 1 | 2 | 3 | 4 | 5 | 6 | Extremely 7 |
---|---|---|---|---|---|---|---|---|
Identify and use appropriate technical literature |
Understand the impact of your solution in a societal and global context |
Function on multidisciplinary teams? |
Find a solution to an open-ended question/problem |
Finding relevant sources independently |
Use relevant sources to solve a problem/find a solution |
Design a document to communicate for a specific purpose |
## Ethics

3. To what degree: *  
*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Extremely 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you concerned with codes of ethical conduct for your intended profession (engr)?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Will you consider ethics when making professional choices?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of professional ethics?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of corporate ethics?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of legal ethics?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of social ethics?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of academic ethics?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are you confident that you can engage ethically with ideas of others?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

## Summary

4. To what degree are you comfortable condensing project information into the summary formats listed below? *  
*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Format</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Extremely 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Figures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Abstract</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Summary report</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Outline</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lab report</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Notetaking</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

5. To what degree are you comfortable researching a question/project and determining an appropriate response/argument? *  
*Mark only one oval.*

<table>
<thead>
<tr>
<th>Degree</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
6. Which communication skills are relevant for each type of writing:
   *Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Academic writer</th>
<th>Technical writer</th>
<th>Creative writer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Inquiry</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Summary</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Evaluate</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Synthesize</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Collaborate</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Claim making</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Argumentation</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

☐ Send me a copy of my responses.
Appendix D: Student infographic examples - Example infographic posters from fall and winter quarters. The infographic with the most votes among their peers in each section for the fall quarter is reflected below in Figures D1-D3. The winter quarter top vote earners are shown in Figures D4-D5.

Figure D1: Infographic on Peer Learning from Monday section (Team D), F2016
How to Read Effectively and Successfully

Seamus Hudnut, Annika Tiña, and Tehmi den Braven

What's the Problem?
As technology advances, our generation's READING SKILLS have greatly DECLINED. We need to start practicing ACTIVE READING techniques and simply READ MORE!

What to Do?

PLAN
(1) Pick a book to read outside of class
(2) Take notes while reading
(3) Make connections between readings to gain better understanding

DO
(1) Test your reading comprehension (ex: quiz yourself)
(2) What note taking style works best for you?
(3) Figure out where and when you retain the most information: In bed? In the library? At night? In the morning?
(4) See how you perform in your classes

STUDY
(1) Change where and when you read to produce best results
(2) Take the kind of notes that work best for you
(3) Use the best resources suited for your maximum reading comprehension

ACT

References

Figure D2: Infographic on Reading from Wednesday section (Team Q), F2016
Figure D3: Infographic on Questioning from Friday section (Team II), F2016
Figure D4: Infographic on Questioning from Tuesday section (Team 9), W2017
Figure D5: Infographic on Questioning from Thursday section (Team 18), W2017
Appendix E: Peer and instructor assessment of infographic examples

The infographic rubric was used during peer review of draft infographics and also to score final submissions. Tables E1-E3 gives the results from infographic draft or final submissions. A score of 3 = “Exceeds expectations”; 2 = “Meets expectations”; and 1 = “Needs more work”.

<table>
<thead>
<tr>
<th>Team</th>
<th>Topic</th>
<th>Creativity</th>
<th>Graphics</th>
<th>Fonts</th>
<th>Colors</th>
<th>Mechanics</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>27</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>28</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>31</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
Table E2: Average infographic rubric scores from winter quarter draft submissions.

<table>
<thead>
<tr>
<th>Team</th>
<th>Topic</th>
<th>Creativity</th>
<th>Graphics</th>
<th>Fonts</th>
<th>Colors</th>
<th>Mechanics</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>2.50</td>
<td>3.00</td>
<td>2.50</td>
<td>2.00</td>
</tr>
<tr>
<td>2</td>
<td>3.00</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
<td>2.33</td>
<td>3.00</td>
<td>2.67</td>
</tr>
<tr>
<td>3</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>3.00</td>
<td>2.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>4</td>
<td>3.00</td>
<td>2.67</td>
<td>2.67</td>
<td>2.67</td>
<td>3.00</td>
<td>2.67</td>
<td>1.00</td>
</tr>
<tr>
<td>5</td>
<td>2.67</td>
<td>2.67</td>
<td>2.00</td>
<td>2.67</td>
<td>2.67</td>
<td>2.33</td>
<td>3.00</td>
</tr>
<tr>
<td>6</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
<td>2.33</td>
<td>2.33</td>
<td>2.67</td>
<td>1.67</td>
</tr>
<tr>
<td>7</td>
<td>3.00</td>
<td>3.00</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>8</td>
<td>3.00</td>
<td>3.00</td>
<td>2.75</td>
<td>3.00</td>
<td>3.00</td>
<td>2.50</td>
<td>3.00</td>
</tr>
<tr>
<td>9</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>1.00</td>
</tr>
<tr>
<td>10</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
<td>2.33</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>11</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>2.33</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>12</td>
<td>3.00</td>
<td>2.50</td>
<td>2.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>13</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>14</td>
<td>3.00</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>2.33</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>15</td>
<td>2.67</td>
<td>2.33</td>
<td>2.33</td>
<td>3.00</td>
<td>1.67</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>16</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
<td>2.67</td>
<td>2.67</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>17</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>18</td>
<td>2.67</td>
<td>2.67</td>
<td>2.67</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>2.33</td>
</tr>
<tr>
<td>19</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>20</td>
<td>3.00</td>
<td>3.00</td>
<td>2.67</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>21</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>22</td>
<td>3.00</td>
<td>3.00</td>
<td>2.67</td>
<td>2.67</td>
<td>3.00</td>
<td>2.67</td>
<td>2.33</td>
</tr>
<tr>
<td>23</td>
<td>2.50</td>
<td>2.50</td>
<td>3.00</td>
<td>2.50</td>
<td>2.50</td>
<td>3.00</td>
<td>2.00</td>
</tr>
<tr>
<td>24</td>
<td>3.00</td>
<td>2.67</td>
<td>1.67</td>
<td>2.00</td>
<td>1.67</td>
<td>2.33</td>
<td>3.00</td>
</tr>
<tr>
<td>25</td>
<td>3.00</td>
<td>2.67</td>
<td>2.67</td>
<td>2.33</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>
Table E3: Infographic rubric scores from winter quarter final submissions.

<table>
<thead>
<tr>
<th>Team</th>
<th>Topic</th>
<th>Creativity</th>
<th>Graphics</th>
<th>Fonts</th>
<th>Colors</th>
<th>Mechanics</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix F: Survey results for student responses on audience, ethics, summary and design

Table F1: Number of student responses from infographic survey questions for each scale value from winter quarter 2017

<table>
<thead>
<tr>
<th>Survey Question</th>
<th># responses for each scale value:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audience - To what degree are you confident that you can:</strong></td>
<td></td>
</tr>
<tr>
<td>Identify the makeup of my intended audience</td>
<td>0 0 0 8 14 19 13</td>
</tr>
<tr>
<td>Identify the needs of my intended audience</td>
<td>0 0 0 6 17 17 14</td>
</tr>
<tr>
<td>Identify the purpose of the communication</td>
<td>0 0 1 3 7 22 21</td>
</tr>
<tr>
<td>Communicate effectively with those in my chosen profession/major (engr)</td>
<td>0 1 1 2 6 19 25</td>
</tr>
<tr>
<td>Communicate effectively with those outside my profession/major (non-engr)</td>
<td>0 1 1 8 7 22 15</td>
</tr>
<tr>
<td>Identify the needs of team members</td>
<td>0 0 2 3 14 22 14</td>
</tr>
<tr>
<td>Respect people different from me</td>
<td>0 1 0 1 3 20 29</td>
</tr>
<tr>
<td><strong>Design - To what degree are you confident that you can:</strong></td>
<td></td>
</tr>
<tr>
<td>Identify and use appropriate technical literature</td>
<td>0 0 1 10 16 17 10</td>
</tr>
<tr>
<td>Understand the impact of your solution in a societal and global context</td>
<td>0 1 3 1 16 23 10</td>
</tr>
<tr>
<td>Function on multidisciplinary teams</td>
<td>0 0 0 4 10 20 20</td>
</tr>
<tr>
<td>Find a solution to an open-ended question/problem</td>
<td>0 0 0 2 14 24 14</td>
</tr>
<tr>
<td>Find relevant sources independently</td>
<td>0 0 0 7 12 14 21</td>
</tr>
<tr>
<td>Use relevant sources to solve a problem/find a solution</td>
<td>1 0 0 9 9 16 19</td>
</tr>
<tr>
<td>Design a document to communicate for a specific purpose</td>
<td>0 0 1 5 12 23 13</td>
</tr>
<tr>
<td><strong>Ethics - To what degree:</strong></td>
<td></td>
</tr>
<tr>
<td>Are you concerned with codes of ethical conduct for your intended profession?</td>
<td>4 4 1 9 9 10 17</td>
</tr>
<tr>
<td>Will you consider ethics when making professional choices?</td>
<td>0 0 0 3 9 16 26</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of professional ethics?</td>
<td>0 1 1 3 11 23 15</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of corporate ethics?</td>
<td>0 0 4 5 14 18 13</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of legal ethics?</td>
<td>0 0 2 5 16 21 10</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of social ethics?</td>
<td>0 1 0 2 14 20 17</td>
</tr>
<tr>
<td>Are you confident that you can understand the issue and responsibilities of academic ethics?</td>
<td>1 0 0 1 10 21 21</td>
</tr>
<tr>
<td>Are you confident that you can engage ethically with the ideas of others?</td>
<td>0 0 1 1 12 22 18</td>
</tr>
</tbody>
</table>

Table F1 continued on next page
To what degree are you comfortable condensing project information into the summary formats listed below?

<table>
<thead>
<tr>
<th>Summary</th>
<th>0</th>
<th>0</th>
<th>1</th>
<th>4</th>
<th>8</th>
<th>17</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Abstract</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>9</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Summary report</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Outline</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>Lab report</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>17</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Notetaking</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>9</td>
<td>20</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

To what degree are you comfortable researching a question/project and determining an appropriate response/argument?

|                                         | 0 | 0 | 0 | 1 | 13| 26 | 14 |
|------------------------------------------|---|---|---|---|----|----|

Table F1 (cont.)