

Capstone Design as an Individual Writing Experience

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In a project-based engineering course whose only formal written deliverable is a team-authored report, providing students with a robust individual-writing experience is no easy feat. But this has been the challenge in the mechanical, industrial and manufacturing engineering (MIME) capstone design course at Oregon State University. MIME Capstone Design doubles as the designated writing-intensive (WI) course for MIME majors, and as such it must satisfy the associated university-wide WI requirements—including a specification that individual writing accounts for at least 25% of students' final course grade. Using an iteratively developed project report in which students are assigned specific authorial and editorial roles and that includes multiple feedback-and-revision cycles has helped in meeting this challenge. A self-assessment and goal-setting tool called the Capstone Communication Inventory is also part of the individual-writing solution. At the beginning of the course, students use this tool to identify personal communication goals, and then they work on those goals as part of their capstone experience. Incorporation of these complementary strategies requires careful orchestration and follow-through, and in the large MIME capstone class is facilitated by inclusion of a communication specialist in the instructional mix. Writing grade improvements and anecdotal evidence suggest the approach is working and may be of interest to other capstone instructors seeking to incorporate an individual writing experience in their courses.

Keywords: individual writing in capstone design, engineering communication skills, writing-intensive courses, writing self-assessment

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Introduction

In 2003, Brinkman and van der Geest described assessment of individual engineering students' writing competencies in team assignments as one of the most "urgent" needs in project-based curricula, while also noting the inherent challenges of meeting that need.¹ During the last decade, however, progress on this front appears to have been minimal, although the call for highly skilled communicators in the engineering profession is only growing stronger. (See for example the ASME Vision 2030 executive summary,² which notes that efforts to integrate professional skills, including communication, into the curriculum "must approach the priority given to technical topics" [p. 13].) Arguably, improvement in an individual's writing skills hinges almost entirely on individual practice, including practice in revision after feedback. But even when that connection is clearly understood, solutions to the problem of incorporating and managing a meaningful individual writing component in team-produced reports continues to prove elusive.

In the capstone design course for mechanical, industrial, and manufacturing engineering (MIME) students at Oregon State University, however, an external factor has forced our hand in finding a solution. This course doubles as the designated upper-

division writing-intensive (WI) course for MIME undergraduates, and as such it must adhere to the university-wide WI criteria—including that at least 25% of the course grade is based on assessment of individual writing that has undergone feedback and revision.³

This paper describes the way this challenge has been met through (1) iterative development of the project report, with specifically defined authorial and editorial roles, and (2) use of a metacognitive "frame" involving individual self-assessment and goal setting. While the approach used in MIME Capstone Design requires careful orchestration, and in our large class is facilitated by including a communication specialist in the instructional mix, the complementary individual writing strategies described in this paper could conceivably be adapted for use in other capstone design courses that include a communication component.

Individual writing strategies in MIME Capstone Design

MIME Capstone Design is a two-term (20-week) sequence in which students collaboratively develop and implement a project solution. The section with which this paper is concerned typically includes around 140 students organized into three-person teams that work on a wide range of industry, government, community, and

student organization-sponsored projects. The teaching team includes a communication instructor as well as a mechanical engineering instructor and an industrial and manufacturing engineering instructor; and in both terms, the lecture schedule includes several communication sessions that support the report-writing process. The communication instructor also reviews and grades all of the written assignments, and, during the second term, holds individual writing conferences with each of the project teams.

MIME Capstone Design was selected to serve as the school's writing-intensive course because with a major written deliverable whose content could be developed in stages (see Calvo-Amodio et al⁴), the basis for a WI experience was already in place. Incorporating the required individual writing focus into the course involved two primary strategies:

1. Careful orchestration of the formal project report writing and assessment process to ensure all team members' equal participation.
2. Use of a self-assessment and goal-setting tool to increase students' personal stake in their writing skills development during the course.

Orchestration of team report as an individual writing experience

To foster both individual and collaborative effort on project report development, the process is orchestrated as follows:

- The project report comprises a sequenced assignment with four iterations, each new document a revised and expanded version of the previous iteration. The first three documents—background report, preliminary proposal, and final proposal—are completed during the first term; the final report is due at the end of the second term.
- To ensure that all team members perform the requisite amount of individual writing and revision, the report content is divided into three author roles with specific chapters (or sections within chapters) associated with each role.
- To ensure that all team members also have the opportunity to practice combining the individual contributions into a single cohesive document, each must also serve as lead editor for at least one of the reports. The tasks associated with this function are clearly defined so as to avoid overlap with the authorial roles.
- For each report, the authors and lead editor submit individual scoring sheets that list the items on which each will be graded. (For an example, see Appendix A.) Signed statements at the top of these scoring sheets certify that the team members performed their respective assigned tasks.

- Report feedback and evaluation are provided by the team's project advisor and the communication instructor. Project advisors evaluate the individual report sections for technical content using a detailed grading rubric that is shared with students. The communication instructor uses an equally detailed rubric (shown in Appendix B) to evaluate and provide extensive feedback on the writing quality of each author's contributions. The writing rubric focuses on four global characteristics: clarity and conciseness, organization, technical writing conventions, and incorporation of sources.
- While the use of peer review and other collaborative strategies for report development is strongly encouraged, all team members are responsible for reviewing the technical and writing feedback within their own sections and revising these sections for the next report iteration. When they submit the next iteration, they attach the graded, marked-up copy of their previous report to facilitate evaluation of the quality of their revisions.

Capstone Communication Inventory: Writing engagement via self-assessment and individual goal setting

To forefront the individual writing component and help students make the most of this "last-chance" opportunity to polish their engineering communication skills prior to entering the workplace, a metacognitive element involving reflective self-assessment is also part of the MIME capstone design experience.

The first of these activities introduces and frames the writing component of MIME Capstone Design. At the start of the first term, students complete a Capstone Communication Inventory (CCI). This tool is an engineering-specific adaptation of a self-assessment and goal-setting tool called the Writer's Personal Profile, which was previously developed by one of the authors for use in upper-division WI courses across the curriculum.^{5,6}

A short (20–30-minute) exercise, the CCI moves engineering seniors through a series of reflections designed to help them identify personally meaningful communication goals for their capstone course. In its current form (it generally gets tweaked from year to year), the CCI comprises 25 multiple-choice and short-answer questions grouped into the four sections described below. The full version of the CCI is attached as Appendix C.

CCI Section 1: Undergraduate preparation as engineering communicators. The intent with this first set of questions is to prompt students' self-reflection on their undergraduate development as technical communicators by addressing the following:

- When and where did CCI respondents take their required lower-division communication courses (first-year writing, technical writing, and public speaking)?
- What additional college courses and extracurricular activities were also instrumental in honing their engineering communication skills?
- Based on these experiences, what do they see as their current strengths and weaknesses as engineering writers and presenters?
- How do respondents weigh in on the value of peer review and collaborative report writing, and to what extent have they received instruction and practice in these skills in previous engineering courses?

CCI Section 2: Career aspirations and expectations regarding workplace communication. Students next complete a series of questions about their career aspirations and their perspectives on communication in the engineering workplace. The opportunity to articulate their specific career plans is for many students a source of pride and—especially in large classes—helps differentiate them from their classmates; and this part of the CCI also helps focus their attention on the connections between their efforts in this capstone course and their future professional success.

CCI Section 3: Report-writing proficiencies. In the third CCI section, students identify any of the following report-writing proficiencies in which they think they need more practice:

- ✓ Identifying audience and purpose
- ✓ Discerning credibility of online sources
- ✓ Incorporating and citing borrowed information
- ✓ Assembling and incorporating visual information
- ✓ Assembling and incorporating appendixes
- ✓ Summarizing, introducing, concluding
- ✓ Keeping readers oriented to their report location
- ✓ Designing comprehensible paragraphs
- ✓ Transitioning effectively
- ✓ Crafting strong and succinct sentences
- ✓ Reviewing and revising effectively

Most of these skills categories correlate with the principles of engineering communication presented in Irish and Weiss (2012),⁷ a textbook already familiar to any MIME seniors who took the engineering-specific version of their required second-year technical writing course. The skills of assembling and incorporating both visual information and appendixes were identified as important in an MIME faculty survey.

CCI Section 4: Personal communication goals for the capstone design course

The conscious thought put into completing sections 1–3 better positions students for the culminating piece of the

CCI, which is to identify two personally relevant communication goals to be pursued as part of their course experience. The set-up narrative for this final section is reproduced below.

The first part of the CCI addressed your development thus far as an engineering communicator; the second part addressed your career aspirations and some communication-related aspects of your chosen profession; and the third part inquired about typical stumbling blocks for emerging engineering communicators. In the fourth and final part of the CCI, you'll pull all of this thinking together and identify two engineering communication-related goals that you want to work on during this course. Identify these goals as follows:

1. *Think for a few moments about the kinds of communicating you expect to do in your first engineering job after graduation. Think, too, about the kind of communicator you want to be in that job.*
2. *Next, think about the biggest gaps between your current repertoire of engineering communication skills and the skills that might be expected in your first job. To close these gaps, what needs to change?*
3. *With these thoughts in mind, identify two goals for communication skills improvement that you will commit to working on over the next two terms, with the following caveats:*
 - *The first goal must involve a report-writing skill that will be used in creating your capstone project report.*
 - *The second goal can involve either another report-writing skill or a skill related to oral presentation preparation and delivery.*
 - *Moreover, both of your goals must be sufficiently relevant, realistic and specific that (a) you'll be able to show evidence of following through on them in this class and (b) others will be able to provide feedback on your efforts.*

To follow up on the goals listing and move the students into “goal achievement” mindset, they must next list some viable strategies for pursuing their goals.

The CCI ends with a note of thanks to students for their participation in the exercise and an invitation for any additional input they might wish to share. Although this invitation typically garners few responses, input received has run the gamut from rants about the worthlessness of the writing focus, to confessions of anxiety about the respondent’s ability to succeed on the writing assignments, to acknowledgments of the importance of additional writing instruction and expressions of gratitude for this opportunity in capstone design. All such comments are welcome and, along with the rest of the collective CCI results, are helpful to the course instructors in developing a better sense of the unique combination of students in any given class.

CCI implementation in MIME Capstone Design

To ensure that students make the most of this metacognitive exercise and carry their individual

goals—and their commitment to achieving those goals—into and through the course, CCI use in MIME Capstone Design follows the best-practice recommendations for Writers Personal Profile implementation in WI courses.⁸ Specifically:

1. To forefront the integral role of the CCI (and the communication component more generally) in students' capstone design experience, the exercise is assigned during the first class meeting, and CCI completion is required for all students. (Note: The CCI is currently deployed using the Blackboard™ test function to allow tracking and crediting of the individual submissions, continued access to individual results by both students and instructors throughout the course, and easy downloading of the collective data set.)
2. Students are encouraged to include the writing goals identified in their CCI on all iterations of their project report, allowing the instructor to provide (ungraded) goal-specific feedback while also addressing the global writing elements on which all reports are formally evaluated. In the final iteration of the report, students are invited to identify passages that showcase their strongest performance on their writing goals.
3. At the beginning of the second term, students complete a mid-course CCI goals review in which they self-evaluate their progress on their existing goals and either recommit to those goals or set some new ones for the second half of the course. As well as helping students keep their personal goals on the radar screen as the course progresses, these reviews provide a conversational starting place at the teams' mid-course writing conferences.
4. The end-of-course “capstone experience memo” assignment (the third and last self-assessment exercise) includes a section in which students reflect on their development as engineering communicators, based partly on a review of their initial CCIs and their mid-course goals reviews. They also identify some “next-step” communication goals that they can carry forward with them into the workplace.

Student experience with the CCI

Due to the logistical complexities of obtaining publishable data from a tool intended primarily for students' personal use, no formal studies have thus far been conducted to quantify the effect of CCI use on student writing skills development in MIME Capstone Design. However, anecdotal student feedback provided at the mid-course writing conferences and in the end-of-term capstone experience memos suggests that the CCI does serve its purpose as an engagement and goal-setting tool, and is connected in students' minds with their writing progress in this course.

- At the team writing conferences, most students speak willingly and honestly about their efforts and progress on their personal goals during the first term; and most have also put thought into the decision of whether to renew or change their goals for the second term. Many students also attest to having made noticeable progress on other (non-goal-related) writing skills during the first term, often citing the instruction and feedback received on their report drafts and the revision cycles as instrumental factors. Increased awareness of their own writing processes, of the relationship between time-management skills and writing project success, and of their teammates as valued partners in communication skills development are also reflected in their comments.
- As noted earlier, students' end-of-course capstone experience memos include a final reflection on their development as engineering communicators over the past two terms. Here again, most students claim to have made specific and demonstrable progress in this area, and in many cases they cite the CCI and the work on their goals as part of this discussion.

Measurable student writing progress in MIME Capstone Design

Judging from the progression of writing grades for the four formal report iterations, most students do make noticeable progress on their writing skills in this course—most significantly during the first term where the writing focus is strongest. In the 2013–14 MIME Capstone class, for example, the progression of average class scores on three of the four graded writing categories across the four project report iterations is shown in Figure 1. (The fourth category, “incorporation of sources,” was not graded for all iterations and was therefore excluded from this analysis.)

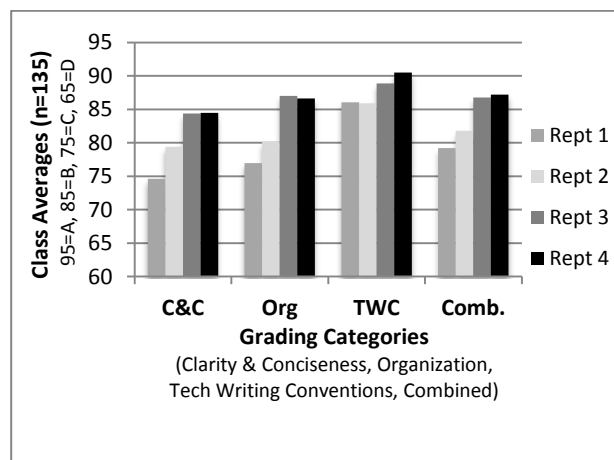


Figure 1. Progression of 2013–14 class grade averages for three writing skills over four capstone report iterations. Reports 1–3 were completed during the first term; Report 4 was submitted at the end of the second term.

Results and Conclusions

Engineering employers and the profession itself have issued call after call for stronger preparation of undergraduates as engineering communicators. Given that writing skills advancement is directly correlated with the actual practice of writing and with revision after feedback, our ability to be responsive to these calls hinges on our ability to provide more individual writing, feedback, and revision opportunities to our students. Incorporating more individual writing into our curricula also better positions engineering programs to satisfy ABET student outcome g (“an ability to communicate effectively”), which—as Brinkman and van der Geest remind us—applies to *all* program graduates and not just the best writers on student project teams.¹ For all of these reasons, the two-pronged strategy described here for including a robust individual writing experience in a project-based capstone design course will be of interest to engineering educators.

References

1. Brinkman, G.W., and van der Geest, T.M. “Assessment of communication competencies in engineering design projects.” *Technical Communication Quarterly*. Vol. 12, no. 1, pp. 67-81, 2003.
2. ASME Board on Education V2030 Project Group. “Creating the Future of Mechanical Engineering Education.” Executive Summary. Sept. 2012. [Online.] Available: <http://go.asme.org/v2030>
3. Oregon State University. “Baccalaureate core learning outcomes, criteria and rationale.” [Online.] Available: <http://oregonstate.biz/main/baccalaureate-core/learning-outcomes-criteria-rationale>
4. Calvo-Amodio, J., Robinson, T.A., and Parmigiani, J.P. “The use of project type tracks, scaffolding and websites in a large and multi-disciplinary capstone design course.” Proceedings of the 2014 Capstone Design Conference, Columbus, OH, 2014.
5. Robinson, T.A. “Charting their own course as writers: A study of writing-intensive students' self assessment and goal setting at start of term.” Master's thesis, Oregon State University, 2006. [Online.] Available: <http://hdl.handle.net/1957/1939>
6. Robinson, T.A. and Burton, V. T. “The writer's personal profile: Student self assessment and goal setting at start of term.” *Across the Disciplines*, Vol. 6. [Online.] Available: http://wac.colostate.edu/atd/assessment/robinson_burton.cfm
7. Irish, R., and Weiss, P. E. *Engineering Communication: From Principles to Practice* (2nd ed.). Don Mills, ONT: Oxford UP, 2012.
8. OSU Writing Intensive Curriculum Program. “Best practices for using the Writer's Personal Profile.” 2008. [Online.] Available: <http://wic.oregonstate.edu/sites/default/files/BestPractices.pdf>

Appendix A: Example of individual scoring sheets used for MIME Capstone Design reports
(Note: Grayed-out areas are report sections written by other authors)

GRADING SHEET FOR PRELIMINARY PROPOSAL: AUTHOR 1
ME/IE 497

Project # _____ **Author 1 Name:** _____

I certify that for the sections assigned to Author 1, I served as primary author. This includes:

- Generating the initial or revised draft of each assigned section
- Incorporating any feedback provided on these sections by other reviewers

Signature: _____ **Date:** _____

Category	Summary of Rubric Criteria	Grade Weight	Grade (A-F)
1 BACKGROUND	Technical and editorial revisions incorporated to create clear, succinct, and complete presentation of required chapter content	20%	
2 REQUIREMENTS 2.1-2.2 HOQ & CRs 2.3 ERs	Technical and editorial revisions incorporated in 2.1 and 2.2 to create clear, succinct, and complete presentation of specified section content. New Section 2.3 content satisfies rubric specifications.		
3 EXISTING DESIGNS 3.1 Methodology 3.2 Functional Decomp.	Technical and editorial revisions incorporated to create clear, succinct, and complete presentation of required section content		
3.3 System Level 3.4 Subsystem Level	Technical and editorial revisions incorporated to create clear, succinct, and complete presentation of required section content	20%	
4 DESIGNS CONSIDERED 4.1 Solutions Considered	Describes at least one complete design that addresses all subsystems identified in Section 3.2; clearly derives from the research reported in Sections 3.3 and 3.4; and is distinctly different from the other solutions presented in this section. Advantages and disadvantages of described solution(s) vis-à-vis project requirements are clearly and systematically summarized. 4.1 Subsection authored: _____	15%	
4.2 Solution Selected	Identifies solution selected for implementation and justifies selection based on best fit with project requirements. Discussion maps to the CR and ER design alternatives evaluations in HoQ.		
Clarity and Conciseness	Clear, concise, and focused; main ideas stand out; supporting details and references are effective and relevant. Writing is free of padding with no unnecessary repetition. Document is free of grammar, punctuation and spelling errors that could impede message clarity.	15%	
Organization	Clear visible structure, informative textual signposting (including chapter and section introductions), logical sequencing, and effective transitions between sentences, paragraphs, and ideas make writing easy to follow. Details fit where placed.	15%	
Conventions	Writing shows control of standard writing conventions noted on full report rubric and uses them effectively to enhance communication. Errors are few and minor.	10%	
Citing Sources	Writing demonstrates proficiency in locating, evaluating, incorporating, and citing borrowed information.	5%	

Individual report-related communication goal(s):

Appendix B: MIME Capstone Design Rubric – Writing Categories

Grading Category	A/A+ (Note: A+ is faculty level / journal quality)	B	C	D	F			
CLARITY and CONCISENESS	Writing is polished and controlled. Sentences are easy to follow, with meaning clear on first reading and length correlating with message complexity. Wordy and awkward sentence constructions are infrequent, and writing is free of padding (i.e., does not include extraneous, repetitive, or redundant verbiage). Supporting details and references are effective and relevant, and modifiers are used selectively to increase message precision. Adept use of tables, figures, and bulleted and numbered lists further enhances clear and succinct information delivery. Sentences are complete and grammatically correct, and spelling and punctuation errors are few and minor.	Approaching “A” quality, but room for improvement in most areas listed.	Reads like a rough draft. Sentences are relevant but often difficult to follow. Arguments may be weak, and details may be misplaced. Sentence constructions are sometimes awkward and/or wordy. Numerous opportunities exist to present information more clearly and concisely through effective use of tables, figures, and bulleted and/or numbered lists. Grammar, spelling and/or punctuation errors detract from message clarity.	Sentences are irrelevant and difficult to understand. Supporting evidence is incomplete, ineffective, and/or misplaced. Text contains a great deal of repetitive verbiage, information redundancy, unhelpful or confusing tables and figures, and/or other types of unnecessary verbal and visual “padding.” Grammar, spelling and/or punctuation errors abound.	Large sections of text are incomprehensible.			
ORGANIZATION	Clear visible structure and effective textual signposting make writing easy to follow. Chapters, sections and subsections begin with introductory set-up text. Information is presented in a logical sequence, and transitional language is used adeptly to direct and control idea flow. Within paragraphs, topic sentence defines content and focus, and all other sentences directly relate to the specified topic. Details fit where placed, and lengthy supplementary information is placed in appendixes when appropriate.	Approaching “A” quality, but room for improvement in many of the areas listed.	Report is difficult to follow in places. Some chapter, section, and/or subsection introductions are missing. Logic of information sequencing and detail placement is not always clear, and transitional language may be missing. Paragraph structure exists, but topic sentences are often missing. Appendix use could be improved.	Structure and logic of report flow is difficult to follow. Chapter and section introductions, if present, are weak. What may look at first glance like paragraphs are simply arbitrarily divided blocks of text that address multiple topics. Transitional verbiage is consistently absent, and details rarely fit where placed.	Large portions of the text are almost impossible to follow. Chapters and sections lack introductory text. No apparent logic to information sequencing and no effective paragraph structure.			
Grading Category				A/A+	B	C	D	F
CONVENTIONS Writing shows control of standard writing conventions, and text appears to have been proofread. <ul style="list-style-type: none"> • Passive constructions used appropriately but not overused. • Verb tense choices are appropriate. • Same-level headings and items within a given bulleted or numbered list have parallel structure. • Acronyms are spelled out at first mention (except when universally familiar). • Formatting of numeric data conforms to technical writing conventions. • Proper nouns are capitalized and all other nouns are lowercased. • Tables and figures and appendices are properly constructed, captioned, and cited in text. 				Always or almost always yes to all. A+ is faculty level / journal quality.	Usually yes, no obvious errors	Usually yes, but some obvious errors	Occasionally yes	Rarely or never yes
CITING SOURCES Writing demonstrates proficiency in locating, evaluating, incorporating, and citing borrowed information. <ul style="list-style-type: none"> • Supporting information from external sources is skillfully incorporated at the appropriate points. • Choice of supporting sources enhances report and author credibility. • Except in Section 1.2, information drawn from other sources is paraphrased, not directly quoted. • All borrowed information (including tables and figures borrowed or adapted from other sources) is properly cited. • In-text citations and Reference List items conform to ASME format. • Reference List includes all sources cited in report body and no additional sources. 								

Appendix C: MIME Capstone Communication Inventory

(Administered through Blackboard and to be completed during first week of the course)

DESCRIPTION

As its name implies, MIME Capstone Design is a place to synthesize and showcase everything you've learned so far as an engineering student. This includes not just technical knowledge, but also your skills in oral, written, and visual communication, team collaboration, and project management—all of which are key to success and professional advancement in the engineering workplace.

For many of you, MIME Capstone Design is also one of your final opportunities to fine-tune these engineering skills before entering the job market.

The following inventory is a 20–30 minute exercise that will help you take fullest advantage of this course for polishing your engineering *communication* skills. The questions prompt you to think about where you are now as an engineering communicator; where you want to be on your first job; the gaps between these two places; and strategies for bridging them. Based on this reflective thinking, you'll set some communication goals to work on during the next 3–6 months.

The information you and your classmates provide in this exercise will also assist the College of Engineering in developing an integrated engineering communication curriculum. Thank you in advance for your help with this effort.

Note: The Capstone Communication Inventory is being administered through the Blackboard Test function solely for tracking purposes (i.e., so we can give you credit for completing it). Despite what the Blackboard heading says, this inventory is NOT a test, and there are no right or wrong answers—just honest and considered ones

INSTRUCTIONS

1. Review the purpose of the Capstone Communication Inventory (CCI) in the assessment description. To get the most out of the CCI, you need to understand why you're doing it.
2. Complete the CCI by selecting or typing the applicable response(s) to each listed question. It's a good idea to save your work occasionally by clicking the "Save All Answers" at the bottom of the document (button (next to the "Save and Submit" button). **Note:** To receive credit for this assignment, you must answer all of the questions. You can submit the CCI only once, so be sure you have answered *all* of the questions before doing so. Also, if you need to navigate away from this page while you're still in the process of completing the CCI, be sure to save the questions you've answered thus far by clicking the "Save" button at the bottom of the document.
3. Submit your completed CCI by clicking the "Save and Submit" button at the end of the document.
4. Upon submitting the CCI, you will receive a "Test Submitted" confirmation message. Click the "OK" button in the confirmation message box.
5. Blackboard now displays your CCI responses. **Note:** Although this is NOT a test and there are no "right" or "wrong" answers to the inventory, various scoring notations (red Xs, green checks, yellow exclamation marks, etc.) will appear next to your responses. This is an unfortunate consequence of using the Blackboard Test function to deploy the CCI. Distracting as these notations may be, they have absolutely no bearing on the CCI, so please disregard them.
6. You will be asked to revisit your CCI responses at the beginning of MIME 498 when you do your mid-course communication goals review and at the end of ME/IE 498 when you prepare your capstone experience memo. Your completed CCI will continue to be available to you on Blackboard, but for easier retrieval and reference we recommend that you save and print your responses now (for example, by using your web browser's Save and Print functions or by copying and saving the responses in a Word document) and keep them with your course materials.

In the event of an Internet interruption, power fluctuation, or other anomaly that causes a premature time-out of your attempt to complete the CCI, you will need to ask your instructor to *reset* the self-assessment for you. For help with other technical aspects of using this questionnaire, contact either of the following:

- OSU Computer Help Desk at (541) 737-3474 or <http://oregonstate.edu/is/tss/och/>
- Technology Across the Curriculum (TAC) Office at TAC@oregonstate.edu

PART I UNDERGRADUATE PREPARATION

The Capstone Communication Inventory begins with a series of questions about your undergraduate preparation as an engineering communicator.

To start off, select from the statements below all that are true for you about the course you used to satisfy your first-year writing requirement (WR 121 or the equivalent).

- I took WR 121 at OSU.
- I fulfilled my first-year writing requirement through coursework at another 4-year college.
- I fulfilled my first-year writing requirement through coursework at a community college.
- I fulfilled my first-year writing requirement through a pre-college course.
- I have not yet fulfilled my first-year writing requirement.

Q2 From the following statements, select all that are true for you about the course you used to satisfy your technical writing requirement (WR 327, HC 199, or the equivalent).

- I took WR 327 ("Technical Writing") at OSU.
- I took HC 199 ("Honors Writing/Engineering") at OSU.
- I fulfilled my technical writing requirement through coursework at another 4-year college.
- I fulfilled my technical writing requirement through coursework at a community college.
- I fulfilled my technical writing requirement through a pre-college course.
- I have not yet fulfilled my technical writing requirement.

Q3 From the following statements, select all that are true for you about the course you used to satisfy your speech requirement (COMM 111 or 114 or the equivalent).

- I took COMM 111 ("Public Speaking") at OSU.
- I took COMM 114 ("Argument & Critical Discourse") at OSU.
- I fulfilled my speech requirement through coursework at another 4-year college.
- I fulfilled my speech requirement through coursework at a community college.
- I fulfilled my speech requirement through a pre-college course.
- I have not yet fulfilled my speech course requirement.

Q4 Please list any additional college courses, *both inside and outside your major*, that in your opinion have substantially furthered your engineering communication skills. If you had no such courses, write "None."

Q5 In your opinion, which of the college courses you've taken thus far did the most to advance your engineering communication skills?

Q6 In what ways did the course(s) cited in Question 5 advance your engineering communication skills?

Q7 Please list any extracurricular activities in which you've participated as an undergraduate (e.g. clubs, competitions, internships, international exchanges, etc.) that have strengthened/extended your engineering communication skill set. If there were no such activities, write "None."

Q8 In your opinion, what is your single-greatest current *strength* as an engineering writer?

Q9 In your opinion, what is your single-greatest current *weakness* as an engineering writer?

Q10 In your view, what is your single-greatest current *strength* as an engineering speaker/presenter?

Q11 In your view, what is your single-greatest current *weakness* as an engineering speaker/presenter?

Q12 From the following statements relating to peer review of writing assignments in your *engineering* courses, select the one that is true for you.

- I have no prior experience with either providing or receiving peer feedback on writing assignments in engineering courses.
- I have provided and/or received informal peer feedback on engineering writing assignments (for example, with friends or roommates), but none of my engineering courses has included formal instruction or guided practice in peer review.
- I have received formal instruction and guided practice in peer review in at least one engineering course.

Q13 From the following statements about writing feedback *offered* to other engineering students, select the one that corresponds most closely to your own experience.

- When reviewing other students' engineering writing, I can almost always provide constructive suggestions for improvement.
- When reviewing other students' engineering writing, I can sometimes provide constructive suggestions for improvement.
- When reviewing other students' engineering writing, I'm usually at a loss for suggestions on how to improve it.
- I have never had the opportunity to review other students' engineering writing for the purpose of providing feedback.

Q14 From the following statements about writing feedback *received* from other engineering students, select the one that corresponds most closely to your own experience.

- My engineering writing almost always improves as a result of feedback from other engineering students.
- My engineering writing sometimes improves as a result of feedback from other engineering students.
- Rarely, if ever, does my writing benefit from feedback from other engineering students.
- I have never received peer feedback on my engineering writing.

Q15 If you would like to make any additional comments or observations about your experience of giving or receiving peer feedback on engineering writing, please do so here. Otherwise, simply write "N/A".

Q16 From the following statements about collaborative (team) report writing, select the one that is true for you.

- I have received formal instruction and guided practice in the collaborative report writing process in at least one previous engineering course.
- I have never received formal instruction or guided practice in collaborative report writing in an engineering course.

Part II: CAREER ASPIRATIONS/EXPECTATIONS

The second part of this inventory asks about where you're headed after you complete your undergraduate program.

Q17 First, do you plan to pursue a master's degree prior to entering the job market?

- Yes
- No
- Not sure

Q18 Do you plan to pursue a doctoral degree prior to entering the job market?

- Yes
- No
- Not sure

Q19 Please list the career you intend to pursue after completing your degree(s).

- If you are targeting a specific job position and/or employer, feel free to include this information in your response.
- If you haven't yet settled on a career field, write "I don't know."

Q20 In the kind of job you expect to pursue after graduation, what percentage of your workday, on average, would you expect to spend on communication-related tasks?

- Very little (<10%) of an average workday
- Maybe 25%, give or take, of an average workday
- Closer to 50% of an actual workday
- Most (75% or more) of an average workday
- I have no idea

Q21 List three qualities that you'd expect most employers in your chosen field to place highest on their list of "good communication skills."

- 1.
- 2.
- 3.

Part III: REPORT-WRITING PROFICIENCIES

Q22 The engineering communication proficiencies listed below are elements of effective technical report writing, and most pertain to oral presentations as well. After reviewing this list, please select any you're unsure about or think you need more practice in.

- ✔ **Identifying audience and purpose.** *Careful analysis of the audience(s) for a report and your goals in writing it (i.e., what you want your audience to think or do after reading the report) will help you gauge how much background information to provide, how simple or complex your explanations should be, what tone and writing style to adopt, etc., in order to meet audience expectations and achieve the desired outcomes.*
- ✔ **Discerning the credibility of online sources.** *Not all online sources are created equal. Can you differentiate between those that will strengthen your report and those that could undermine its (and your) credibility?*
- ✔ **Incorporating and citing borrowed information.** *Information pulled from other sources must be seamlessly integrated and properly cited in your engineering reports, both at the point of inclusion in your text and in the reference listing. Direct quotations are virtually never used in engineering writing; so to avoid plagiarism, you must be proficient at paraphrasing. Borrowed visuals usually also require citation, whether in documents, on posters, or in presentation slides.*
- ✔ **Assembling and incorporating visual information.** *Visual information (tables, charts, photos, etc.) can certainly be worth the proverbial thousand words, but only if these "pictures" are clearly introduced and easily parsed and their function and relevance to surrounding text clearly explained.*
- ✔ **Assembling and incorporating supplementary information.** *The ability to differentiate between information that is integral to a technical report and that which can be moved to an appendix and to correctly format and reference appended information is another important technical writing skill.*
- ✔ **Composing effective executive summaries, introductions, and conclusions.** *An effective executive summary presents the key information and action items contained in the larger report. An effective introduction quickly and clearly describes the report's content and organization, allowing readers to quickly determine whether to read further and/or where to find specific information. An effective conclusion reviews key findings and other important document content, while also pointing readers toward any relevant "next steps."*
- ✔ **Keeping readers oriented as they move through your engineering report.** *You can help keep report readers on track both through visible structure (such as headings and bulleted lists) and through verbal "road-mapping" signals and cues.*
- ✔ **Designing comprehensible paragraphs.** *A paragraph is information that has been defined, limited, and arranged into a comprehensible unit. It systematically and seamlessly moves the reader from "known" to "new" information.*
- ✔ **Making effective transitions.** *The clarity and strength of an engineering report is enhanced by (and sometimes even hinges on) the use of effective transitions - "connecting" words or phrases that show the relationship between successive ideas or topics and provide logical flow from one sentence, paragraph, or section to the next.*
- ✔ **Crafting strong and succinct sentences.** *Sentence strength hinges on selecting strong verbs and positioning them for impact, clearly identifying the subject, using appropriate vocabulary, and matching sentence length to purpose.*
- ✔ **Reviewing and revising effectively.** *As with engineering design, creating an engineering report that meets all customer requirements involves multiple iterations as you systematically move toward your final version. The process tends to be most efficient when each iteration focuses on a different set of editorial concerns.*

Part IV: PERSONAL COMMUNICATION GOALS FOR THIS COURSE

Q23 The first part of this inventory addressed your development thus far as an engineering communicator. The second part addressed your career aspirations and some communication-related aspects of your chosen profession. The third part inquired about typical stumbling blocks for emerging engineering communicators; and your collective responses will help us determine the instructional foci for this class. In the fourth and final part of the CCI, you'll pull all of this thinking together and identify two engineering communication-related goals that you want to work on during this WI course. Identify these goals as follows:

1. Think for a few moments about the kinds of communicating you expect to do in your first engineering job after graduation. Think, too, about the kind of communicator you want to be in that job.
2. Next, think about the biggest gaps between your current repertoire of engineering communication skills and the skills that might be expected in your first job. To close these gaps, what needs to change?
3. With these thoughts in mind, identify two goals for communication skills improvement that you will commit to working on over the next two terms, with the following caveats:
 - The first goal must involve a **report-writing skill that will come into play in creating your capstone project report**. Any of the proficiencies listed in Question 22 would be appropriate, for example.
 - The second goal can involve either another **report-writing skill or a skill related to oral presentation preparation and delivery**.
 - Both of your goals must be sufficiently **relevant, realistic and specific** that (a) you'll be able to show evidence of following through on them in this class and (b) others will be able to provide feedback on your efforts. (See below for examples of goals that do and do not meet these criteria.)
4. Record your two goals in the space below. For quick reference, record them on your syllabus or in your engineering notebook as well.

PERSONAL COMMUNICATION GOALS:

- 1.
- 2.

Examples of relevant and specific goals that are achievable within the timeframe of this course:

- *Find credible sources of information and properly cite all references.*
- *I would like to strengthen my transitions from paragraph to paragraph and topic to topic.*
- *I would like to be able to craft stronger sentences in my reports.*
- *Develop a good mix between what is on a note card and what is memorized that mostly reduces my stuttering and struggling for what I am going to say for oral presentations.*
- *My reports would benefit from having multiple revisions. My goal is to finish written pieces with sufficient time that I can do at least one rough draft before pieces are due.*
- *I need to become better at drafting an executive summary. Specifically, I want to be better able to identify the important areas and aspects of a report/project that need to be included.*

Conversely, here are some examples of inappropriate (non-specific, irrelevant, and/or unrealistic) goals:

- *I want to ace this course.* (Not specifically communication-related)
- *I need to get better at writing.* (Too general)
- *I am going to do at least 5 full revisions of each report draft and get advisor feedback on each of them before generating the final version.* (Unrealistic)
- *I want to refine my five-paragraph essay-writing skills.* (Irrelevant to this course.)

Q24 Without follow-up, the goals we set quickly morph into wishful thinking. Therefore, the last step of this exercise is to consider exactly how you intend to follow up on the two goals you just specified. What strategies will you use for accomplishing them? What tools and resources can you harness for these efforts? Consider not only approaches that have worked well for you in the past, but also new ones you could experiment with.

In the space below, record several strategies to start out with. As the weeks progress, you may well identify additional or alternate paths to goals accomplishment. But in order to make real progress on their achievement, you need to assume full responsibility for their achievement.

Q25 Thank you for completing the CCI. If you would like to share any additional thoughts on MIME Capstone Design, the communication component of this course, and/or the CCI, please enter them in the box below. Otherwise, simply enter "N/A."

Reminder: After you complete this last question,

1. Look back through your CCI to make sure you haven't missed any other questions. To get credit for this assignment, all questions must be answered.
2. Then submit your CCI and click the "OK" button to display your responses. (Remember: The various Blackboard scoring notations next to your responses have absolutely no bearing on the CCI or whether you will be credited for this assignment, so please disregard them!)
3. Finally, for easy retrieval and reference later in the course, we recommend saving and printing your CCI results (for example by using your browser's Save and Print functions or by copying and saving the results in a Word document). **In any case be sure to keep a copy of your communication goals for reference throughout the course.**