

Undergraduate Writing Assignments in Engineering: Some Preliminary Findings

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Overview



- The importance of “communicative competence” in Engineering graduates – reflected in:
 - industry stakeholders’ complaint that engineering graduates have “weak” communication skills [Donnell, Aller, Alley and Kedrowicz, 2011; Rhoulac and Crenshaw, 2006] –
 - C.E.A.B. – engineering graduates must demonstrate “an ability to communicate complex engineering concepts within the profession and with society at large” [*Accreditation Criteria and Procedures,* 2008]

- The current study – part of a larger study on the assignments we are asking our students to write
 - Collected the course outlines from Electrical and Computer Engineering, Civil Engineering and Mechanical Engineering – from all available core and elective courses offered by each department
 - Documented the inclusion of “Attribute 7, Communication Skills”

Core & Elective Courses

[by department]

	Total	Attribute 7
Civil Eng	34	27
Computer Eng	33	21
Electrical Eng	33	21
Mechanical Eng	33	26

- Typically – undergraduates take only a subset of the elective courses
- Minimum number of courses with Attribute 7 that an undergraduate can take – while still fulfilling the requirements of the program =

	Attribute 7	Min. # of Courses Needed to Fulfill Program Requirements
Civil Eng	27	19
Computer Eng	21	13
Electrical Eng	21	11
Mechanical Eng	26	11

Challenges Faced in the Engineering Study

- Writing content of each assignment – difficult to extract from the course outlines
 - do not explicitly list each assignment
 - referred generally to “assignments” or lab reports or projects – e.g., “mini-projects” may be called “assignments,” not “projects”
 - consequently, we kept the terms used by the departments
- Each discipline - also emphasized writing differently
- These challenges led to several assumptions

Assumptions

- Assumed that outlines identifying Attribute 7 included writing components
- Assumed that, if a course had an outline that we could retrieve – it was offered each year – if an outline was not available, then it was not considered
- Assumed that the genres were the usual engineering ones – like lab reports and design projects [tests and exams excluded]

Undergraduate Writing Assignments: The Larger Study

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Roger Graves, Principal Investigator, University of Alberta

The Problem

- Even writing studies researchers are hard-pressed to describe or identify the kind and the frequency of writing assignments undergraduates are being asked to write
- Students are graduating in record numbers – but often without the ability to share or communicate the knowledge they have gained
 - May be unable to pursue a post-graduate degree
 - Inability of graduate programs to “fix” the problem
 - May derail their efforts to find – and keep – a job in their area of interest

Partner institutions

- University of Alberta
- University of Manitoba
- University of Calgary
- University of British Columbia
- Huron University College
- Wilfrid Laurier University
- University of Toronto
- Royal Military College
- University of Western Ontario

Objectives of the Study

- Provide systematic research about the demands placed on students in a wide variety of disciplines
- Map these writing demands by collecting the writing assignments
- Identify the goals of discipline-specific student writing
- Examine the writing practices and strategies of students in order to uncover how they approach the writing demands of their discipline

Some Findings

- Collected syllabi from 5 different curricular units
- Findings highlighted the variability of writing across the disciplines
 - The “nesting” of assignments, the genre required and the number of assignments required differed widely
 - Total of over 1000 assignments
 - 60+ genres in liberal arts; 13 genres in nursing
- This approach shows how writing assignments differ even within a specific program at one college or between disciplines as well

Genres vary across the disciplines

	Liberal Arts	Political Science	Service-Learning	Geography	Nursing
Papers	20	32	22	25	18
Reports	18			30	12
Essay	27	21		12	
Summary					
Self-evaluation					24
Handouts					11
Presentation		15	17	13	
Journal			10		

Note: numbers are reported in percent of all assignments.

Who isn't assigning writing?

	Number of writing assignments	Percent of courses with writing assignments
Liberal Arts	485	79%
Nursing	157	86%
Political Science	198	100%
Geography	186	77%
Service Learning	163	100%

Number of assignments by year in program

	Liberal Arts	Political Science	Service-Learning	Geography	Nursing
Year 1	34/1.5	7/1.4	42/10	15/3.8	17/3.4
Year 2	225/2.5	39/2.3	12/4	40/2.2	33/5.5
Year 3	189/4.1	40/2.4	35/6	24/1.85	50/4.2
Year 4	56/3.0	112/4.2	74/6.7	107/3.5	57/4.4

First number is total number of assignments.
Second number is average number of assignments per course.

Length of writing assignments



Length in pages	Liberal Arts	Political Science	Service-Learning	Geography	Nursing
under 2	31	5	16	18	0
2 - 4	26	27	39	34	74
5 - 6	12	15	14	19	2
7 - 10	17	23	14	18	18
11 - 12	8	11	6	5	0
13 +	6	19	11	6	6

Note: numbers are reported in percent of all assignments.

Audience of writing assignments

	Liberal Arts	Political Science	Service-Learning	Geography	Nursing
Instructor or peer	90	92	91	100	99

Note: numbers are reported in percent of all assignments.

Value of the Study

- Information gathered has proven to be a catalyst for curriculum review and change
- Optimize the way we structure our assignments
- Support our students as they write the kinds of texts that their discipline demands
- Create program profiles of departments [Anson and Dannels, 2009]
- Map these demands onto the curricula

C.E.A.B. Attribute 7 and Undergraduate Writing Assignments



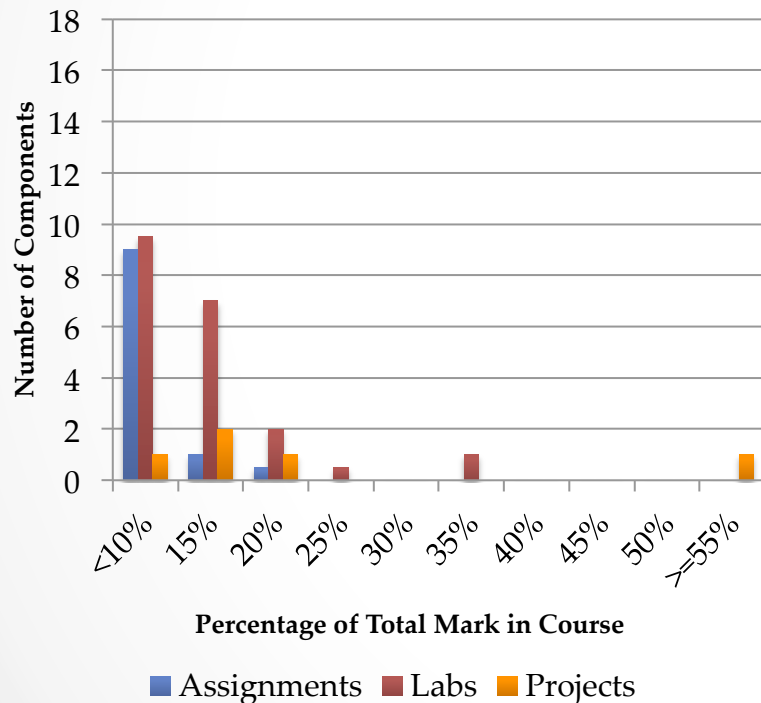
Kathryn Marcynuk, Research Assistant, University of Manitoba

Methodology

- Examined the relative distribution of writing components in the departments of Civil, Electrical & Computer, and Mechanical Engineering
- Assumed that all courses are offered every year, and only included courses that identify C.E.A.B. Attribute 7
- Course work that may include a written component was organized into the following categories:
 - Assignments
 - Lab Reports
 - Design Projects

Findings by Department

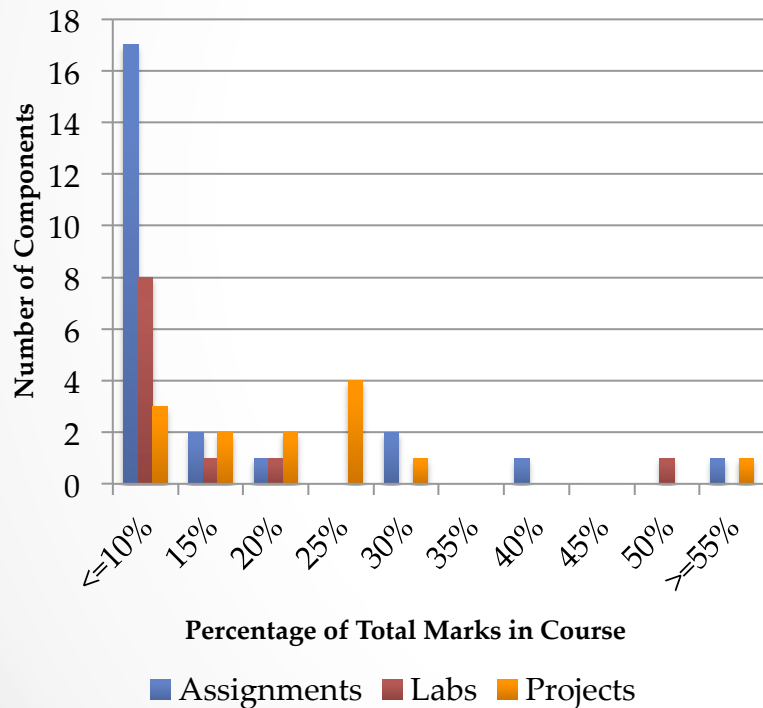
Electrical & Computer Engineering (Average)



- Emphasis on Labs
- Most potential writing components are worth <25% of the total grade
- Writing skills may be worth at least 50% of the total grade in 1 class

Findings by Department

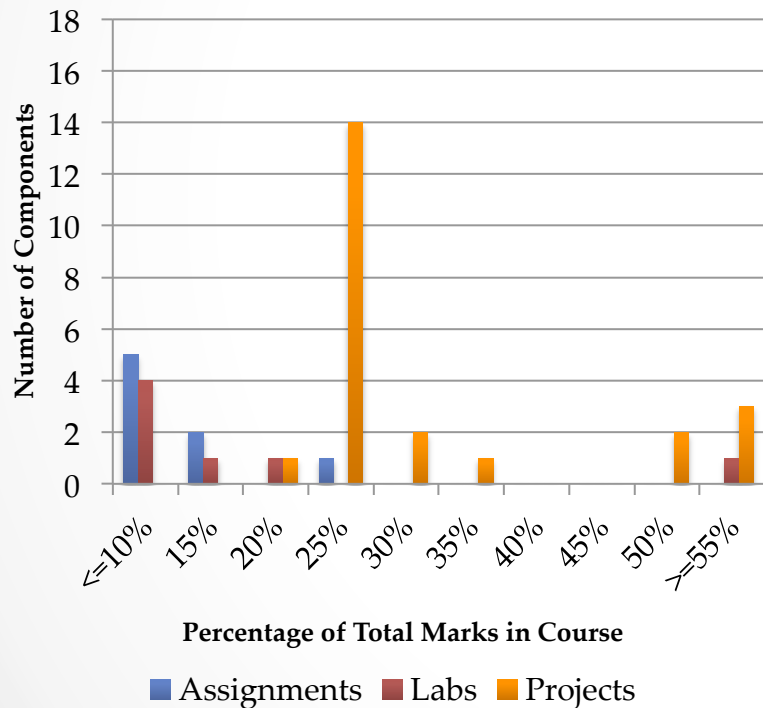
Civil Engineering



- Mix of assignments, labs, and projects
- Most assignments are worth <10%
- Writing skills may be worth at least 50% of the total grade in 3 classes

Findings by Department

Mechanical Engineering



- Emphasis on Projects
- Writing skills may be worth at least 25% of the total grade in 22 classes
- These skills may be worth at least 50% in 6 classes

Some Preliminary Conclusions



Anne Parker, Co-Investigator, University of Manitoba

Larger study – systematic research on

- The complexity of developing literacy in undergraduate students
- What kinds of demands our own programs put on students – and students will have to do more specialized kinds of writing as they progress in a program

- What instructors *intend* when they create these assignments – students may struggle to respond to a writing prompt and thus produce a lower quality document
- Learning what causes students to develop – or fail to develop – advanced literacy skills

Engineering Study: Preliminary Findings

1. reflect the emphasis placed on written assignments at the undergraduate level in Engineering –

- Each department includes some written work – but
- Different degree of emphasis between departments
- Reflected in the different evaluation weightings
- Most pronounced emphasis in Mechanical Engineering – 22 of 33 classes have projects where written component is worth at least 25% of the grade

but.....

2. Course outlines (distributed at the beginning of the course) – do not always include sufficient information on the following:

- What writing tasks students are being asked to do
- and in what genre? what are they being asked to create?
- Who is the audience for the document? Instructor? Peer? Client?
- What are the relative weightings of the technical and the written components?
- How will they be assessed?

..... And finally

3. Apparent differences in the amounts and the kinds of writing expected in different departments –
 - may impact how we respond to calls for improvement of student writing in Engineering
 - may need to focus on *specific disciplines*
4. Learning what causes students to develop these skills - may help us to meet C.E.A.B.'s requirements

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Thank You!

