New Orleans JAZZED about Engineering Education

Paper ID #15065

A Preliminary Study on Supporting Writing Transfer in an Introductory Engineering Laboratory Course

Dr. Dave Kim, Washington State University, Vancouver

Dr. Dave (Dae-Wook) Kim is an Associate Professor and Coordinator of Mechanical Engineering in the School of Engineering and Computer Science at Washington State University Vancouver. He has 18 years of experience in engineering materials and manufacturing. His research area includes materials processing, structural integrity improvement, and hybrid composite manufacturing. He has been very active in pedagogical research and undergraduate research projects, and his research interests include manufacturing laboratory pedagogy and writing pedagogy.

Dr. Praveen Kumar Sekhar, Washington State University, Vancouver

A Preliminary Study on Supporting Writing Transfer in an Introductory Engineering Laboratory Course

Abstract

Engineering undergraduates are exposed to writing curricula such as first-year composition (FYC) in their early program of study. However, they often have difficulties meeting the expectations of writing in engineering courses. The goal for this study is to improve engineering students' writing performances through better understanding how writing transfer occurs and then applying pedagogical strategies designed to support writing transfer institution-wide. This poster reports preliminary data and findings on improving writing transfer for engineering undergraduates. Instructional materials for lab report informed by a rhetorical approach to writing were piloted in an introductory engineering laboratory course. The quality of students' writing and their assessment scores were found to improve. Based on the data collected from student surveys and rhetorical analysis conducted on student writing artifacts (engineering lab reports), the summary of the rhetorical strategies that students successfully carry over and/or adapt as they move from FYC to an introductory engineering laboratory course will be shared. In addition, the students' perspectives of writing transfer from FYC to the introductory engineering laboratory course will be discussed.

1. Introduction

In spite of the emphasis engineering practitioners place on communication, surveys of employers and alumni continue to show low satisfaction with the writing preparation engineering students receive[1,2]. Often, students in the engineering program express enjoying hands-on activities, such as engineering labs or capstone projects; however, they dislike writing lab reports or project reports. Many studies report that engineering students struggle with writing in engineering programs. There are ongoing research efforts addressing the need for efficient writing skills. Conrad et. al[3] has focused on the discrepancy between the writing skills of program graduates and the demands of writing in the workplace. They implemented five key principles to improve writing: collaboration with practitioners, empirical analysis of writing, a functional perspective on language, direct instruction, and integration into existing courses. The approach was considered innovative as it integrates the expertise of engineering practitioners, engineering faculty, and writing specialists, and it is empirically grounded in the analysis of a large collection of practitioner and student writing.

Writing guides for students have been actively developed in many engineering programs. Saftner et. al[4] described the development of a writing guide for a civil engineering department and its use to assess student writing prior to implementing the guide. The writing guide, resulting from a collaborative effort between departments of civil engineering and writing studies, provides an overview of the mission and typical elements of each report section, as well as including situations when writers might omit or add to the typical advice presented in the guide. The goal of this writing guide design was to provide students with generally acceptable practices when writing a variety of reports (i.e., testing summaries, design reports, research summaries, etc.), so

the advice is necessarily broad. Further, Ekoniak et. al[5] studied an experimental approach to compare use of a handout based on an assignment developed collaboratively by course instructors and an expert writing teacher. Their study also included the addition of an in-class workshop conducted by the writing teacher to accompany the instructional materials.

Most engineering curricula have strong written communication components, including required courses such as first-year composition (FYC) and/or technical writing. Engineering instructors expect that students are ready to write good quality reports before coming to their engineering courses. However, the reality is that engineering students often struggle in transferring their writing knowledge and writing skills from FYC or technical writing into their engineering courses and writing assignments [6]. This study focuses on how engineering faculty can improve the writing performances of students in lab courses by cueing for writing transfer in previous writing classes. By demonstrating for students how engineering lab reports do and do not employ some of the rhetorical principles and strategies that they have learned in courses like FYC, students are better positioned to understand the disciplinary conventions and expectations of lab reports and to compose them as discipline-specific genres.

Student learning often relies on what they already know. Learning theories commonly point out that learning is an individually tailored process of building new ideas or concepts based upon current knowledge and past experience [7]. Transfer of learning theories [8,9] describe the process and the extent to which past experiences (the *transfer source*) affect learning and performance in a new situation (the *transfer target*). Engineering students' transfer of writing skills from FYC (English) to engineering courses can be defined as "far transfer" or "high-road transfer" because those two disciplines are abstractly distinct [10]. Unlike near transfer, which refers to knowledge transfer between very similar contexts, far transfer of learning involves skills and knowledge being applied across situations that are different.

This study aims to improve engineering students' writing performances through better understanding how far transfer of learning on writing occurs in their early engineering curriculum. In particular, we focus on the students' writing transfer from FYC to junior level engineering laboratory courses, where students are often assigned engineering lab reports for the first time. This paper reports preliminary data and findings on improving writing transfer for engineering undergraduates. Based on data collected from student surveys and rhetorical analysis conducted on student writing artifacts (FYC research papers and engineering lab reports), the rhetorical "moves" that students apply, negotiate, and adapt as they move from one discipline (FYC) to another (junior engineering lab courses) are discussed.

2. Rhetorical Analysis of the Courses.

In order to better understand the context within which students perform writing assignments, we reviewed instructional materials (syllabi, assignments, etc) and analyzed the writing conventions and expectations for student writing in two courses: FYC (Engl 101: College Composition) and an introductory engineering lab course (Mech 309: Introduction to Engineering Materials). This analysis helped us to identify and map the rhetorical characteristics that are valued and highlighted in each course's writing assignments respectively. The genres of student writing that

we reviewed were limited to research papers and laboratory reports. Table 1 shows the genres, audience, purpose, characteristics, and disciplinary Situation/Inspiration of the writing assignments.

Table 1. Genres, audience, purpose, characteristics, and disciplinary Situation/Inspiration of the writing assignments between FYC (English 101) and the introductory engineering laboratory course (Mech 309).

	English 101	**Mech 309**
Students	Freshmen	Juniors
Genre of writing assignments	Research paper	Lab report
Audience	College student peers (general academic audience)	Engineers and engineering college student peers (general audience in the engineering field)
Purpose	To introduce students to academic writing; To construct a well-developed argument; To persuade; To assert and support a position	To introduce students to discipline/professional writing; To present experiment procedures and the experimental results; To evaluate the importance of results through data analysis and use of sources.
Characteristics	Claims, evidence, analysis Use of sources (summary, paraphrase, quote) Synthesis and analysis Logical organization Qualitative reasoning Negotiation of various rhetorical appeals (logos, ethos, pathos)	Claims, data, analysis, support, and summary. Self-supporting. Quantitative reasoning. Visual presentation (graph). Sources/literature review. Data cycle: generate, observe, evaluate, analyze, present conclusions/findings. Emphasis on logos and ethos Emphasis on scientific form, style, voice.
Disciplinary Situation/ Inspiration	Rhetoric/art of persuasion General education Intro to academic writing Genre approximation: emphasis on “academic writing moves” (academic)	To apply knowledge in order to innovate, To report experimental procedures in order to reproduce in the future; To communicate findings. Genre approximation: testing reports (professional/industry) and journal articles (academic).

As demonstrated in Table 1, we found that there are some broad similarities yet a number of distinct differences in writing conventions and expectations across the two genres. Whereas the primary purpose of the research paper in FYC is to introduce students to the expectations of academic writing in a college setting, the primary purpose of the lab report in entry-level

engineering courses is to present and evaluate the results of discipline-specific experiments. The audience for the FYC research paper is thus a general academic audience, situated as undergraduate student peers more specifically, while the lab report assignment identifies engineers and the engineering field as the intended audience. As such, another purpose of the FYC research paper is to have students develop rhetorical knowledge and practice rhetorical strategies for constructing arguments, while employing a range of rhetorical appeals (logos, ethos, and pathos). An additional purpose of the engineering lab report is to introduce students to a genre that they are likely to encounter as professionals within their field, giving them opportunities to practice the kinds of writing skills that are relevant within the engineering discipline and profession.

Consequently, characteristics of each genre (genre features) are both shared and distinct. For example, both genres require use of claims, evidence, and analysis. At the same time, claims are identified as hypotheses in engineering lab reports and as thesis statements in FYC research papers. Quantitative evidence and reasoning is valued and required in the engineering lab report while qualitative evidence and reasoning is valued and often emphasized in the FYC research paper. Furthermore, engineering lap reports require the use of visuals, such as charts, graphs, tables, and figures. In contrast, FYC research papers allow such visuals but do not require or emphasize them. The two genres both require an understanding of rhetorical knowledge and principles, such as audience awareness, rhetorical appeals, and structure in the composing process, but the genre features and characteristics employed are quite distinct and context specific.

3. Lab Report Writing Instructional Materials

Informed by the above review of genre features and characteristics, preliminary lab report writing instructional materials were prepared for the introductory engineering laboratory course (Mech 309 Introduction to Engineering Materials) for Fall 2015 as a pilot course. Mech 309 had five materials science laboratories, all of which require lab reports. The instructor first offered a rhetoric writing session before Lab 1. The topics of this one lecture session included the following:

- An FYC review that included definitions of rhetoric and academic writing, rhetorical appeals, research paper formatting, and 3 organizational patterns for developing paragraphs.
- A review of the CWPA (Council of Writing Program Administrators) outcomes for first-year composition, which include rhetorical knowledge; critical thinking, reading, and composing; writing processes; and knowledge of conventions.
- An explanation of the rhetorical features of Mech 309 lab reports, including audience, writer, reader, and context.
- A list identifying what do to before, during, and after the lab session when composing lab reports.

The preliminary instructional materials included an evaluation rubric, which was based on the most recent CWPA outcomes statement published in 2014. These nationally-endorsed outcomes describe the writing knowledge, practices, and attitudes that undergraduate students should

develop in their writing courses (particularly designed for first-year composition). The rubric highlights these outcomes and organizes them into three categories: rhetorical knowledge, critical thinking and composing, and conventions. The rubric used for the evaluation process is shown in Table A-1. The instructor also provided feedback on each student lab report and offered one-on-one lab report feedback sessions with each student to discuss the lab reports' strengths and to identify areas for improvement.

4. Evaluation Results

4.1 Lab Report Scores

Figure 1 shows the average score changes for the three categories outlined in the lab report rubric designed and piloted in the Mech 309 course: rhetorical knowledge and awareness, critical thinking and composing, and conventions. Average report scores for Lab 1 are the lowest of all. This low average may be the result of the students not having developed a comprehensive understanding of lab reports yet as a genre. In addition, the students lacked information on the instructor's expectation for lab reports. The scores of Lab 2 show upward trends for all three categories. This trend suggests that students tend to have a better understanding of the genre features of lab reports and the instructor's expectations for writing lab reports after receiving their first lab reports with comments and scores accompanied by the rubric. All of the scores become steady after Lab 3, nearing "3" out of 4 in average, which is the "meet the expectations" level. It is worth noting that their critical thinking and composing skills demonstrated the largest improvement towards Lab 5. This improvement might be because students studied the lab-related content materials in order to prepare for their final exam just prior to submitting the final lab report.

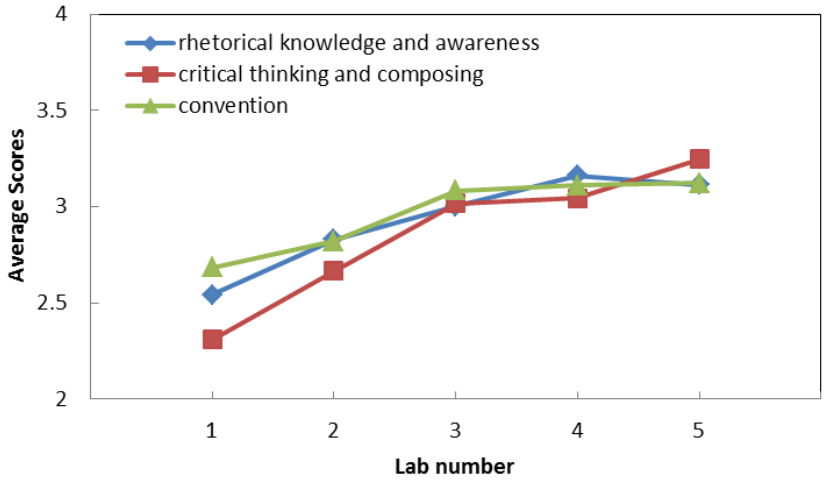

Figure 1. Average scores of each lab report

Analysis of student lab reports suggests that explicitly promoting transfer in the engineering course can positively influence students' writing performances. A comparison of the first and last lab reports written by one student, Nathaniel (a pseudonym), is representative of the kinds of improvements that many students demonstrated in their writing near the end of the term.

Nathaniel's lab reports show improvement in each of the rubric categories: rhetorical knowledge, critical thinking and composing, and conventions. Furthermore, the rhetorical strategies that Nathanial employs in his final lab report exhibit a better understanding of the genre expectations of engineering lab reports.

In his first lap report, Nathanial's objective is unclear and not explicitly addressed in his introduction. In his final lab report, he clearly identifies his objective in his introduction: "My intended purpose for this lab was to test the effects of different heat treatments on microstructure and hardness of steel specimens." His first lab report also employs the wrong standard unit system, indicating that he does not recognize the need to use the audience's preferred system. In his final lab report, he uses the metric system, the correct standard unit system identified by the instructor for the class. These changes demonstrate an improvement in rhetorical knowledge and awareness.

Nathanial's critical thinking and composing skills also show improvement after experiencing the professor's instructional materials, materials designed to cue for transfer and identify lab report features as genre specific. In his final lab, Nathaniel does a much better job using specialized concepts and defining his terms. For example, when mentioning "heat treatment" for the first time in the results/discussion session, he goes on to define the term as "cooling a specimen" before moving forward in his discussion. Furthermore, while his first lab report includes figures and tables with little to no introduction or explanation, his final lab report does a much better job of introducing figures and tables within the text and of explaining and interpreting the figure or data presented for the audience. The final lab report also shows improvement in both the synthesis and analysis of multiple sources while the first lab report included only two references and barely referenced these sources within the body of the report.

Finally, Nathaniel's final lab report demonstrates a better understanding of the style and conventions appropriate for engineering lab reports. Whereas in the first lab report, he consistently misuses APA citation in-text, by the final lab report his in-text citation is consistently displayed and primarily accurate. His overall formatting improved by the final lab report, too. For example, his final lap report includes page numbers, which are properly placed, and consecutively numbered tables and figures. His placement and labeling of figures and tables is much improved in the final lab report as well, demonstrating awareness that data visualization is a very important component of engineering lab reports.

4.2 Student Survey Results

During the last week of instruction of the pilot course, all students were given an anonymous survey with ten questions designed to depict their perceptions on writing in engineering, their knowledge on genres and their rhetorical writing as introduced FYC and its application in engineering lab reports of the pilot course, and the effectiveness of rhetorical writing approach for engineering lab reports. This survey was designed to assess students' knowledge of rhetorical perspectives of writing transfer. Table 3 presents the questions and the average scores from the student surveys that were conducted.

Table 3. Categories, questions, and average scores from student survey.

Category	Questions	Average score: 4 max
Overall	1. In your opinion, how important are writing skills for engineering majors?	3.4 (important)
	2. How prepared did you feel to write engineering lab report before this course?	2.5 (Prepared)
Genre	3. The writing skills I learned in English 101 helped me to understand that genres (writing assignments and projects) are discipline-specific.	2.4 (Maybe)
	4. The instructional materials used in this engineering course helped me to understand the genre expectations of engineering lab reports.	3.2 (Yes)
Rhetoric	5. I developed an understanding of rhetorical knowledge and rhetorical concepts in English 101.	2.5 (Maybe)
	6. I understand the rhetorical features of engineering lab reports.	2.8 (Well)
Transfer	7. The rhetorical strategies that I learned in English 101 help me to write engineering lab reports.	2.0 (A few times)
	8. There are connections between the writing I did in English 101 and the writing I do for ENGR lab reports.	1.9(Somewhat strong)
	9. How well did English 101 help you when you write ENGR lab reports?	2.0 (Somewhat strong)
Effectiveness	10. How likely are you to improve your writing skills in the engineering field through this class's lab report assignments?	3.5 (Very likely)

Survey results demonstrate that students understand the importance of writing skills for engineering majors while also assessing their own readiness for writing engineering lab reports as minimal at the beginning of the pilot course, which is an entry-level engineering laboratory course. As shown in Table 3, students were not sure of how FYC helped them to understand discipline-specific genres, yet they believed that the rhetorically focused instructional materials piloted in the engineering course helped them to understand the expectations of lab reports within the discipline of engineering. Scores suggest that students saw both FYC and the engineering lab course as moderately helping them to understanding rhetorical knowledge and concepts. Scores on the efficacy of FYC and the piloted course for developing an understanding of knowledge or concepts were moderate. The students' perspectives on transfer from FYC to engineering lab report writing are mostly negative. Students did not perceive many connections between the kinds of writing or genres that they performed in FYC and engineering lab reports, but they did perceive transfer of some writing skills. Scores reveal that students see FYC as somewhat supporting their writing for engineering lab reports. In contrast, scores suggest that students believed that the engineering course materials focusing on lab report writing significantly supported and improved their writing of lab reports.

4.3 Focus Group Results

The students selected to participate in the focus group represented the diversity of students enrolled in the pilot course (Mech 309 in Fall 2015): two women, six men, one student of color, and two older, returning students. Participates were also selected to represent a range of writing skills as demonstrated in graded lab reports. The focus group was conducted by the co-author, an English faculty member from outside of the Engineering Programs.

The purpose of the focus group was to solicit more specific details from students on survey responses. The focus group questions were not given to the participants beforehand and were designed to allow for three types of questions: engagement questions, exploration questions, and exit questions. Focus group questions included the following:

1. Why is writing skill important in your discipline?
2. What do you understand the genre features of the engineering lab report to be?
3. What genre features of the engineering lab report have you improved upon through the ENGR course?
4. When did you take English 101 and where? What kinds of papers (genres) did you write in that class?
5. What did you learn about rhetorical knowledge and strategies from English 101?
6. What kind of research skills did you learn about and/or practice in English 101?
7. What do you see as the similarities/connections between the writing you did in English 101 and the writing you are doing for ENGR lab reports?
8. What do you see as the differences between the writing you did in English 101 and the writing you are doing for ENGR lab reports?
9. What writing skills that you have learned from English 101 have helped you when writing ENGR lab reports in this ENGR course?
10. What writing skills did you develop and/or adapt in this ENGR course, specifically?
11. What else, if anything, would you like to add?

Results from the focus group demonstrate that students understand the importance of writing in their field. Responses to this question included an emphasis on the role of writing in communicating ideas, in providing instructions and advice, and in conveying information. Significantly, students also noted the role of persuasion in the writing of professional engineers. They recognized that as professionals they would also need to be able to convince supervisors and/or clients in project proposals and the marketing of products, etc.

Focus group responses suggest that the engineering instructor's promotion of writing transfer improved students' understanding of lab reports as a distinct genre with genre-specific features. Students identified an organized structure, concise language, and the use of visuals, such as figures and diagrams, as essential features of engineering lab reports. Responses also pointed to the importance of numerical data and quantitative information and identified engineering lab reports as "highly informative" with respect to purpose. When asked what genre features they thought they had improved upon in lab report writing over the course of the semester, students listed layout, structure, organization, the integration of visuals, and lining up data within diagrams, and editing. Some respondents also noted that they had gotten better at developing their argument and "selling their idea," indicating an improved awareness of audience and of the

role of persuasion in lab reports. Student responses in the discussion also revealed an awareness of other genres important to the field of engineering. Students mentioned the role of emails, journal articles, and grants, suggesting that approaching lab reports as genres encourages them to develop an understanding of genre-specific features among other genres, too.

Focus group responses noted both similarities and differences among writing assignments in FYC and engineering laboratory courses. Students agreed that writing assignments in both courses included writing for an audience with a purpose in mind, employing rhetorical appeals (logos, pathos, and ethos), and using evidence as support. Many of the distinctions that students noted emphasized differences in how these elements were employed. For example, students noted the difference between using thesis statements in research papers and using hypotheses in lab reports to define the genre's purpose. They also observed that there is little pathos in lab reports, and that lab reports tend to emphasize logos and ethos instead. They also perceived an emphasis on qualitative sources in FYC research papers versus an emphasis on quantitative data and sources in engineering lab reports. Moreover, they described the structure of engineering lab reports as "dictated" and the structure of FYC research papers as "more open" and flexible. Collectively, focus group responses indicated an awareness of how writing skills (such as rhetorical knowledge, audience awareness, and conventions) might carry over from one writing context to another while also needing to be adapted in this new and different context. Responses also suggested that students developed a broader understanding of genres, recognizing that genre features are genre specific and informed by disciplinary contexts.

5. Conclusion

Preliminary findings suggest that students' writing skills improved significantly when supported within the engineering lab course by instructional materials based upon a rhetorical approach to composing instead of a more traditional modes-based approach. In supplementing instructions on lab report writing with these rhetorically-informed materials, students tended to have a better understanding of lab reports as genres and subsequently to compose lab reports of higher quality, better meeting the instructor's expectations on rhetorical knowledge/awareness, critical thinking/composing, and conventions after receiving feedback on their first lab report that reinforced the rhetorical principles addressed in the class and in the rubric.

Focus group responses revealed that students see very little connection in the kinds of writing tasks and genres that they are asked to in FYC and engineering lab courses, but they do see broader similarities among writing skills develop in FYC and then use in engineering laboratory courses. These skills include writing for an audience with a purpose in mind, employing rhetorical appeals (logos, pathos, and ethos), and using evidence as support and differences. Many of the distinctions that students noted emphasized differences in how these elements were employed. Examples include thesis statements in FYC research papers versus hypotheses in lab reports, qualitative sources in FYC research papers versus an emphasis on quantitative data and sources in engineering lab reports, small use of pathos and an emphasis on logos and ethos in lab reports, a more open and flexible structure of FYC versus the well-defined structure of lab reports.

Focus group responses showed that students felt strongly that they were supported in the development of their lab report writing skills over the course of the semester pilot, and that they improved as writers. Students' perceptions of knowledge transfer related academic writing from FYC to engineering lab course was somewhat mixed and they believed the learning outcomes from FYC did not help much when writing engineering lab reports. Students' responses indicated an awareness of how writing skills such as rhetorical knowledge, audience awareness, and conventions carried over from one writing context to another while needing to be adapted in the different context. They identified such skills as outlining and composing, developing arguments, avoiding fallacies, punctuation, revisions, and developing familiarity with writing in general. At the same time, most students reported having taken FYC at another institution and believed that they had received only minimal training in rhetorical knowledge and strategies in FYC coursework. Follow up research is needed to investigate the kinds of FYC genres that students might encounter across institutions in order to negotiate and promote writing transfer across institutional contexts.

Acknowledgement

The authors greatly appreciate the support of NSF (DUE #1505066) and WSU Vancouver Research Mini-grant for this research project.

References

1. Berthouex, P. (1996). Honing the writing skills of engineers. *Journal of Professional Issues in Engineering Education and Practice, 122*(3), 107-110.

2. Donnell, J., Aller, B., Alley, M., & Kedrowicz, A. (2011). Why industry says that engineering graduates have poor communication skills: What the literature says. *Proceedings of the 2011 American Society for Engineering Education Conference and Exposition*. Retrieved from http://www.asee.org/public/conferences/1/papers/1503/view

3. Conrad, S., Kitch, W.A., Pfeiffer, T.J., Smith, T.R., and Tocco, J.V. (2015). Students Writing for Professional Practice: A Model for Collaboration among Faculty, Practitioners and Writing Specialists. *Proceedings of the 2015 American Society for Engineering Education Conference and Exposition (Paper ID #12608).*

4. Saftner, D.A., Christiansen, M.U., Hanson, A.T., Jenson, J.D., Ojard, S., Teasley, R.L., abd Woster, E. (2015). Enhancing Communication Practices through Development of a Departmental Civil Engineering Writing Guide. *Proceedings of the 2015 American Society for Engineering Education Conference and Exposition (Paper ID #13645).*

5. Ekoniak, M., Scanlon, M.S., Mohammadi-Aragh, M.J. (2015). Teaching Peer Review of Writing in a Large First-Year Electrical and Computer Engineering Class: A Comparison

of Two Methods. *Proceedings of the 2015 American Society for Engineering Education Conference and Exposition (Paper ID #13867).*

6. Olson, W. and Kim, D. (2014). Exploring Writing Transfer: From English To Engineering, Two-Year College English Association - the Pacific Northwest Writing Centers Association Joint Conference, Vancouver, WA, Oct 10 -11.

7. Illeris, K. (2004). The three dimensions of learning; : contemporary learning theory in the tension field between the cognitive, the emotional, and the social, Malabar, FL: Krieger Pub. Co.

8. Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. New Jersey: Prentice-Hall.

9. Meyer, J. H., Land, R., & Baillie, C. (Eds.). (2010). *Threshold concepts and transformational learning*. Rotterdam: Sense Publishers.

10. Perkins, D. N., and Salomon, G. (1992). Transfer of learning. International Encyclopedia of Education (2nd ed.). Oxford, UK: Pergamon Press.

Appendix

Table A-1 Rubrics used in the introductory engineering laboratory course (Mech 309)

		4.0 Exceeds expectations (~100%)	**3.0 Meets expectations (~85%)**	**2.0 Need improvement (~70%)**	**1.0 Need significant improvement (~55%)**
Rhetorical Knowledge and Awareness	**Rhetorical Knowledge and Awareness Total Score**				
	1) Establishes purpose using clearly stated objective.				
	2) Address audience's expectations, including well-defined and concise descriptions of experimental processes, analyses, and interpretation and effective summarization.				
	3) Applies appropriate rhetorical appeals by arguing from the data and credible sources.				
	4) Appeals to an audience's reasoning powers by establishing cause/effect relationships and confining commentary to the object of study.				
Critical Thinking and Composing	**Critical Thinking and Composing Total Score**				
	1) Demonstrates knowledge of the subject and use of specialized concepts or theories.				
	2) Presents objectives, results, and the chain of logic connecting them, both qualitatively and quantitatively.				
	3) Presents the data with appropriate choice of figure or table to support claims.				
	4) Evaluates reliability and accuracy of data.				
	5) Demonstrates critical thinking process by actively analyzing, synthesizing, and/or evaluating information gathered from the data and/or sources.				
Conventions	**Conventions Total Score**				
	1) Presents sections and subsections appropriately named, labeled, and formatted.				
	2) Establishes stand-alone figures and tables by detailed labeling.				
	3) Includes references, properly placed and accurately cited.				
	4) Demonstrates control of documentation, mechanics, and style.				

Table A-2. Student survey questions

Overview Questions	Please circle one for each question.				
1. In your opinion, how important are writing skills for engineering majors?	Very important	Important	Somewhat important	Not important	I don't know.
2. How prepared did you feel to write engineering lab report before this course?	Very prepared	Prepared	Somewhat prepared	Unprepared	I don't know.
3. The writing skills I learned in English 101 helped me to understand that genres (writing assignments and projects) are discipline-specific.	Definitely yes	Yes	Maybe	No	I don't know.
4. The instructional materials used in this engineering course helped me to understand the genre expectations of engineering lab reports.	Definitely yes	Yes	Maybe	No	I don't know.
5. I developed an understanding of rhetorical knowledge and rhetorical concepts in English 101.	Definitely yes	Yes	Maybe	No	I don't know.
6. I understand the rhetorical features of engineering lab reports.	Very well	Well	Somewhat well	Not well	I don't know.
7. The rhetorical strategies that I learned in English 101 help me to write engineering lab reports.	Always	Most times	A few times	None	I can't remember.
8. There are connections between the writing I did in English 101 and the writing I do for ENGR lab reports.	Very strong	Strong	Somewhat strong	Not strong	I don't know
9. How well did English 101 help you when you write ENGR lab reports?	Very helpful	Helpful	Somewhat helpful	Not helpful	I don't know.
10. How likely are you to improve your writing skills in the engineering field through this class's lab report assignments?	Very likely	Likely	Somewhat likely	Not likely	I don't know.
Any comments on lab report writing:					