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Integrating Literature and Problem-Based Learning in a First-Year Engineering Academy

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STEM students often enter liberal studies classes with a lack of interest and enthusiasm, sometimes coupled with, and sometimes caused by, a lack of understanding of the value and rigor of the humanities and social sciences; this difficulty is only compounded by a popular culture that has become suspicious of scholarly expertise and an academic culture that has seen the decline of the humanities. This paper explains a classroom strategy designed to address STEM student resistance to liberal studies within a first-year composition class. This strategy integrates problem-based learning (PBL) and general engineering industry concepts (problem solving, professional practices, and quality control) to guide literary research and analysis and continuously improve students' written, oral, and visual communication (WOV) skills, as well as their abilities to understand new social, political, and economic contexts, an important criterion of EC 2000. In short, this strategy presents students with a problem: determine the best American fiction of a particular year. The faculty member then guides students through literary research practices, and a formal call for proposal process. She divides the class into teams, and each team proposes a selection of texts to read during the semester. After the winning proposal is selected, the students read the texts and write a number of literary analyses throughout the semester. In the last phase of the process, each student creates an argument to justify his/her selection of the best work of the year. While this may seem a risky endeavor, the risk is minimized by establishing appropriate parameters and standards by the "Project Director" (aka the English faculty member) in order to produce a course that is both academically rigorous and engaging to students.

This paper provides a brief literature review of current trends in first year composition (FYC) programs and situates this approach within these trends; describes the context of the course delivery, including school demographics and curriculum requirements; explains the course development and design, and includes important documents such as the class syllabus, entry documents (common in PBL), and requests for proposals (RFP); and provides some measures of results, according to student performance, course evaluations, samples of student work, and instructor reaction and reflection.

Literature review: current trends and debates in FYC in engineering education

The literature on FYC programs within Engineering Education is sparse. In 2009, Jon A. Leydens and Jen Schneider published "Innovations in Composition Programs that Educate Engineers: Drivers, Opportunities, and Challenges" in the *Journal of Engineering Education*.[1] This article appears to be the first comprehensive review of FYC courses situated specifically in Engineering Education. The article contains important information on historical shifts in FYC programs, as well as a description of current trends and their drivers. The authors examine the changes in curricula of several schools with strong emphases in engineering and conclude that "reductions," "transformations," and "innovations in absentia" are the three hallmarks of current teaching in FYC programs. The strategy described within this paper, integrating engineering concepts with literary and composition studies, falls within the "transformations" category, as it maintains the presence of a FYC course but includes the transformation of its delivery.

Leydens and Schneider also recount the important historical debates within engineering education about the place of humanities and social sciences (HSS). This debate historically, and to some degree, currently, occurs between some HSS faculty who seek to develop students' understanding of cultural, ethical, and political contexts, and some engineering faculty who see the study of language primarily as a tool for service within the profession and a method to improve WOV communication skills. This debate has become known as the culture/utility debate and the engineering curriculum has seen many shifts in the past 100 years, with each side gaining and losing traction according to different historical drivers (ranging from shifts in educational emphasis resulting from political events such as the cold war, to new accreditation standards and expectations for the profession). Today, after the launch of EC 2000[2] and the *Engineer of 2020*[3], negotiations between the culture/utility function continue.

Leyden and Schneider recognize EC 2000's Criterion 3 as an important driver in the changes in FYC programs, and as an important factor within the culture/utility debate. They note that of the 11 abilities specified for graduating engineers, only 4 of them are primarily technical. They divide the abilities in the following ways[1]:

> Engineering programs must demonstrate that their graduates have
>
> a) an ability to apply knowledge of mathematics, science, and engineering
> b) an ability to design and conduct experiments, as well as to analyze and interpret data
> c) an ability to identify, formulate, and solve engineering problems
> d) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
>
> e) an ability to design a system, component, or process to meet desired needs
> f) an ability to function on multi-disciplinary teams
> g) an understanding of professional and ethical responsibility
> h) an ability to communicate effectively
> i) the broad education necessary to understand the impact of engineering solutions in a global and societal context
> j) a recognition of the need for, and an ability to engage in life-long learning
> k) a knowledge of contemporary issues

In addition, the National Engineering Academy's profile of the *Engineer of 2020* identified guiding principles that will shape engineering in the future; among them is the principle that a "social, cultural, political, and economic focus will continue to shape and affect the success of technological innovation."[3] Together, these criteria and principles provide a catalyst for the new course design described in this paper, which integrates engineering concepts, composition, and the humanities, in a year-long sequence that introduces students to professional writing such as proposals and justification papers; professional situations that call for oral presentations, debate, and consensus-building; as well as literary analysis and scholarly research that increases student understanding of new social, cultural, political and economic contexts. In this manner, this approach blends general engineering industry concepts, the humanities, and composition to increase WOV skills, and develop students' capacities to understand new contexts, operational norms, and discourses.

Context of course design and delivery

The context of this course design is a small, Midwestern university with approximately 1400 students enrolled in a variety of degree programs including business, engineering, computer science, criminal justice and education. The university was originally established as an engineering school and maintains a strong focus in that area, with 34% of the enrollment in engineering and computer science. Most students, 89%, are domestic students, and the majority are from Midwestern states. The university maintains an emphasis on "career-focused professional education" and prepares students for participation in "an active, global society" and motivates them "toward a life of significance and worth." The 2015 class contained approximately 40% first-generation students, with an average composite ACT of 21, and an average SAT of 937 (critical reading and math combined).

The course was part of a pilot program called the First-Year Engineering Academy (FEA) that was designed for students entering as engineering majors but considered 'moderately at-risk' due to math placement in trigonometry. Due to their need for additional math development, students were placed in a cohort that was limited to 15 students; in efforts to create a supportive atmosphere, they were enrolled in the same math and English class sections. In addition to their regular course time in trigonometry, they were required, as part of their course schedule, to attend two math recitations per week (led by a full-time faculty member). To accommodate this design, the English instructor was tasked with two challenges: 1) accept students into the composition class regardless of English placement (so they could enter the cohort according to their math placement), and 2) create something special for Engineering students (in order that they might begin to identify as engineers). Students who may have placed lower than entry-level English Composition were expected to receive additional support through one-on-one tutoring with the faculty member.

The typical first year composition sequence at the university is a full-year sequence of English Composition I and II. The course descriptions and objectives are available in Appendix A. All courses traditionally use the same textbooks (due to a college-wide book rental system), which for Composition I includes a text that concentrates on writing modes, and for Composition II includes a literature anthology to engage in additional analysis and argumentation. However, for this pilot program, variance from the traditional text was permitted, and a budget of $1000 per semester was established.

Driver and design

While Leyden and Schneider identified drivers for change in composition programs that included revised accreditation guidelines and the publication of the Engineer *of 2020*, the redesign of this sequence was primarily driven by the desire for increased student engagement. The idea was to help this cohort of students begin to see themselves as engineers, to support them through a rigorous first year, and provide them with engagement and motivation, *even* within their FYC course. Aware of the typical resistance to HSS courses (in this case, literary study) of some engineering students, and the need to develop an engineering identity (especially for these moderately at-risk students), the instructor wanted to deliver the literary component

within the context of engineering, both as a gesture of goodwill, and as a soft 'entrée' into engineering contexts. To this end, the faculty member added the following outcomes to the standard English Composition course objectives (full syllabus available in Appendix A):

1. To increase the ability to understand new social, political, economic contexts and discourses (in accordance with EC 2000) through the entry into fictional worlds.
2. To build a team environment by sharing responsibility for the creation of the class reading list.
3. To increase the understanding and appreciation of literary culture.
4. To increase motivation to read, as well as develop a life-long interest in literature and continuous learning.

What evolved was a course design that includes the integration of the following concepts, all of which are explicitly explained to students throughout the semester: problem-solving approaches and processes, the Request for Proposal process, professional communication practices, quality control and continuous improvement, and the non-technical abilities identified within EC 2000.

Integration of problem-solving

The faculty member began with the broad idea that engineering is about problem-solving. Indeed, the profile of the *Engineer of 2020* states that "Engineering is problem recognition, formulation, and solution." [3] This was the first step in engaging engineering students in the study of reading and writing – to present a problem in need of analysis and a solution. Therefore, the English faculty member modeled the course on Problem-Based Learning (PBL), which is grounded in constructivist learning theory, and "begins with the assumption that learning is an active, integrated, and constructive process influenced by social and contextual factors."[4] In an "Overview of Problem-based Learning: Definitions and Distinctions," Savery explains that PBL is "an instruction (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem."[5] This approach was chosen because it complements the cohort model, which has been shown to create a supportive learning environment, and because it complements Engineering disciplines, as it is based on the presentation of a problem and the creation of possible solutions. This simulates a professional environment that requires effective problem-solving skills, utilization of the scientific method (research, the formulation of a hypothesis, testing, and documentation), and effective collaboration skills. As demonstrated by Duch, Groh and Allen, PBL develops "the ability to think critically, analyze and solve complex, real-world problems, to find, evaluate, and use appropriate learning resources; to work cooperatively, to demonstrate effective communication skills, and to use content knowledge and intellectual skills to become continual learners." [5]

In addition, PBL has been shown to develop intrinsic motivation, something that is especially important for students who are mathematically underprepared and will need to be dogged in their Engineering pursuits. This type of motivation is also important for students who may see themselves as Engineers, but not as writers, an identity that is sometimes undervalued by pre-professional Engineers. The problem-solving approach was adopted to increase their motivation to perform well in English since, according to Savery and Duffy, "Learner motivation

increases when responsibility for the solution to the problem and the process rests with the learner."[5]

The next step in the course design was to determine the specific problem. The English faculty member had previously experienced a lack of appreciation for the texts she had assigned engineering students, regardless of the literary prestige or reputation of the assigned texts. Students were quick to dismiss even Nobel Award winning texts and writers. The faculty member began to see the problem as one of an ignorance and disregard for both literary culture and scholarship, but also a more general suspicion of expertise (students saw literary prizes as political and self-promoting, and English faculty members as promoting their own self-interests and research – both of which, are, unfortunately, occasionally accurate). With this in mind, she designed an approach to decrease the ways in which she asserted herself as an authority, and increase student understanding of a much broader literary culture, which would ultimately demonstrate the rigor and value of the discipline. She determined that the students needed increased agency in order to discover, on their own, this literary world and discourse community. They needed to research, they needed to read, and they needed to develop their own criteria for great texts, again within a discourse community that was largely foreign to them.

The faculty member thus decided that as a class, and with thorough research, the students would choose their own texts. While this proposition may, at first, sound risky and reckless, it can be executed in ways that ensure academic integrity, accomplish the objectives of the English sequence, work towards the aspirations of the *Engineer of 2020*, and engage students in the construction of their own learning experiences. They simply need the appropriate parameters, guidance, and motivation. Students in the FEA cohort were therefore presented with the task (known as the 'problem' in PBL) of determining the best American work of a particular year. Obviously, the students could not read all American texts published in a particular year. Instead, they would need to analyze the task, survey existing knowledge, determine necessary research (including literary awards and criteria for evaluating fiction), and develop a proposal to solve the problem. The students were given timeline constraints, a requirement to read a minimum of 4 texts, and a budget of $1000 per semester. Students would break into teams to develop proposals (to be delivered in writing and orally). After delivery of the proposals, the class would choose the winning proposal. The remainder of the course includes the reading and discussion of the texts, as well as analysis papers, while applying criteria for evaluation of the texts. By the end of the course, students choose the best text and defend their choice in an argumentative paper. In semester 2, the Project Director (aka the English faculty member) determines a new year and then presents the challenge of integrating scholarly research into essays. The instructor therefore provides the scope and parameters, but students ultimately propose the texts.

While this student-driven approach contains some risk, it also begins with strong instructor intervention to minimize these risks, and then builds towards student self-regulation. In "Supporting Student Self-Regulated Learning in Problem- and Project-based Learning," Mary English and Anastasia Kitsantas identify three distinct phases in PBL and suggest appropriate teacher direction, student behaviors, and classroom environments for each phase[6]:

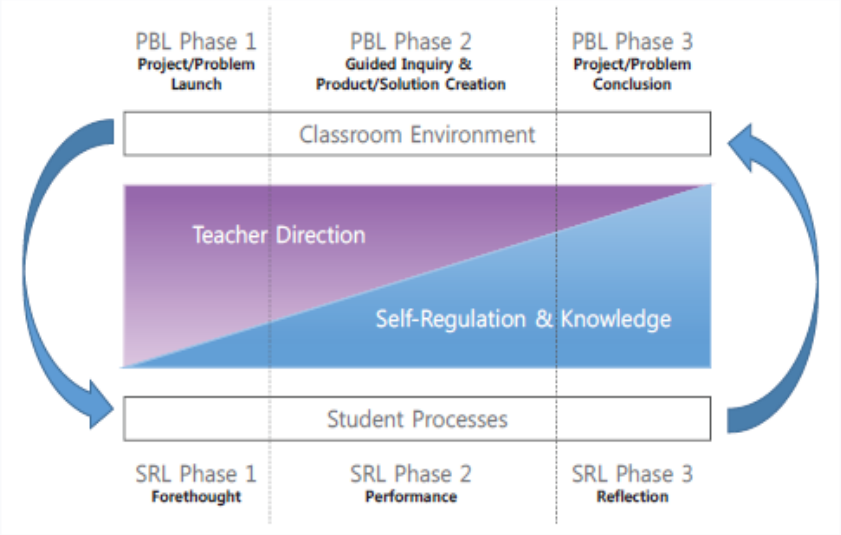

Figure 1. A model depicting the relationships among the phases of PBL and SRL.

Within the engineering course design, phase 1 includes the problem launch, which requires the highest level of teacher direction. This need is met through a detailed document known in PBL as the 'entry document' (see Appendix B for the fall semester document, and Appendix C for the spring document), as well as class discussions determining the approach to the problem. This phase also includes an instructor-led survey of existing knowledge of the literary world, and establishes necessary research into 'best of' lists (both from academic culture and popular culture) and literary prizes. Phase 2, which requires less direct involvement and guidance from the teacher, involves independent reading and writing, combined with instructor-led class discussion to analyze and evaluate the texts. Phase 3, the project solution, requires the highest degree of student self-regulation, and includes the individually written argumentative paper defending the solution to the problem. These following timeline provides an outline of the tasks within the 15-week semester:

Weeks 1-2

- Presentation of Problem and Introduction of Request for Proposal (RFP)
- Task Analysis
- Survey of Existing Knowledge
- Discussion of Necessary Research
- Creation of Teams

Week 3-4

- Research, Development, and Presentation of Proposals
- Proposal Selection
- Process Debriefing

Weeks 5-13

- Reading of the novels
- Interpretation and Analysis Essays
- Continuous Improvement Exercises

Weeks 14-15

- Argumentative Essays for best ‘solution’ to the problem

As stated earlier, the initial phase must involve a high level of instructor intervention in order to guide students through the necessary research, which often includes their first foray into literary scholarship and culture, and to produce a course with academic integrity.

Integration of requests for proposals and project management skills

Once the faculty member established the pedagogical approach of PBL, and the specific problem to be solved, she adopted the use of another common practice in engineering industry, the formal proposal process. She begins by introducing the RFP process and then distributes a very basic RFP (the complete documents are available in Appendices B and C). Students are then provided with a general model of a written proposal that requires a clear statement of the problem, a task analysis, a budget and a timeline, and the proposed solution and justification (including research). The process requires students to budget both time and money, and provide proper justification through research.

In order to ensure the integrity of the reading list, the faculty member reserves the right to substitute a book of her choosing. However, it is worth noting that much is to be learned from allowing a work of questionable quality into the reading list, in that students begin to see the difference between texts that are written primarily for popular consumption, and texts written for intellectual development.

Integration of professional communication practices

In semester I, students are required to formally present their proposals as groups. The instructor stresses the seriousness of the task and its prevalence in industry, requires visual communication tools, and professional dress. By providing such a high stakes venture, she increases attention to the importance of WOV skills. The instructor also allows for a question and answer session, whereby other groups can interrogate their choices and justification. Therefore, by the second week of their college career, these students have created and given their first formal proposal presentation, an early entry into professional engineering practices.

In semester II, the faculty member allows for a different experience in professional communication practices: a board-meeting style consensus exercise. In this scenario, students determine, through the same research process, their individual nominees for texts (one per student), present and justify their nomination, listen to other proposals, and then have to reach consensus for their reading list. For this exercise, the faculty member actually schedules class in the university’s boardroom. She explains that this type of decision-making is sometimes used in professional context, and though it is often time-consuming, it often yields different results than a democratic (voting) approach. The faculty member thereby exposes students to both kinds of processes, as well as the different solutions that can emerge from the processes. Thus, students see the advantages and disadvantages of these two managerial approaches early in their college careers.

Integration of quality control and continuous improvement processes

The instructor also integrates the concept and language of quality control and continuous improvement in order to improve students' writing skills and expose them to industry terminology. Students write analytical essays on each text, and then receive reports of their strengths and weaknesses. As part of the continuous improvement process (which is explicitly stated in these terms), they are tasked with improving particular elements in their writing before submitting their next papers (for some, the deficiency may have been a particular grammar issue, for others, organization skills, and for others, a lack of study of the original text). The faculty member focuses on only a few weaknesses per student at a time, and therefore emphasizes incremental change. She works with students independently to determine corrective actions. She also focuses on developing "lean writing," writing that is clear and concise, with minimal extraneous verbiage. In short, the faculty member stresses creating a systematic approach to avoiding errors in order to ensure quality control. In students' self-analysis of their final portfolios, the instructor asks that students create their own continuous improvement process in order to control their own errors through identification and corrective actions.

Integration of EC 2000 and the *Engineer of 2020*

The course was also designed to introduce students to the professional aspirations of the discipline. The instructor therefore integrates the language of EC 2000 and the *Engineer of 2020* directly into the course syllabus (available in Appendix A). The faculty member also brings a hard copy text of the *Engineer of 2020* to class so that students can see how seriously engineers treat their profession, and how they formalize their approach to education. She then transitions to the idea that HSS is integral to achieving these skills, and that each new literary text develops their capacities to understand new contexts (cultural, social, economic, political), operational norms, and discourses. This course, then, their *English* course, provides them with their first exposure to the formal documents of the profession.

Preliminary Results

Since this paper is primarily a description of a class practice, as opposed to a formal research study, it contains only preliminary results, limited at this time to pass rates, retention rates, student evaluations, and sample student work. At the time of this writing, this course has been delivered 3 times: during the fall and spring semester of a 2014-2015 cohort, and the fall semester of a 2015-2016 cohort. A study of pass rates and retention rates yields mixed results:

Course	Pass Rate	2nd Year Retention Rate
Cohort 1, Semester 1 (C1.S1), n=16	63%	-
Cohort 1, Semester 2 (C1.S2), n=8	100%	100%
Cohort 2, Semester 1 (C2.S1), n=13	69%	-
Cohort 2, Semester 2 (C2.S2), n=9	TBD May of 2016	TBD Sept of 2016

While the pass rates for Semester 1 are disappointing (and lower than the university average of 84%), the pass rates and retention rates for Semester 2 are encouraging, as 100% of the students who pass the first semester, also pass the second semester, and also return for their second year of study. Several factors may have contributed to the low Semester 1 pass rates. The C1.S1 cohort was incorrectly populated due to university error, and several students in the course were placed in higher-level courses than their placement scores indicated. This was remedied for C2.S1, which also may account for the increase in pass rates. In addition, the instructor required the reading of 4 texts in C1.S1, but then changed to a page count system for C2.S1. The university will continue to monitor these changes and their results.

Course Evaluations

Course evaluations have been favorable. While the evaluations of C1.S1 are unavailable, C1.S2 evaluations include a course rating of 3.69/4, with the following comments:

1. "The format was extremely helpful and effective. Letting us choose our own books kept the class interesting and made reading a lot easier."
2. "I was able to improve over the entire course. The class structure was suitable and conducive to my learning. I am pleased to say I improved grammatically throughout the entire course."
3. "I liked this format for selecting the books over last semesters. I also think we had very high quality books this semester which means the selection process was effective."

These evaluations indeed indicate some of the desired results. Comment 1 references the students' level of engagement, using the word "interesting" in regard to an English course. Comment 2 indicates an understanding of continuous improvement ("improved . . . throughout the course"), and comment 3 demonstrates an understanding of the advantages and disadvantages of the two decision-making models (voting and consensus) exercised during the proposal process ("the selection process was effective").

C2.S1 students completed a different evaluation due to a university-wide adoption of a new evaluation system. This electronic evaluation process yielded a lower rate of return and fewer comments. Nevertheless, the course rating was 3.53/4 with the following comment:

1. "Making this class more like an engineering English rather than a standard English class greatly benefitted me and I feel like I've learned a lot more."

This comment demonstrates an appreciation for the context of English delivery, as well as a belief in an added value. The evaluations did not contain any negative comments.

Student Samples

Another method of evaluating this course design is to review the quality of student work. In what might be a quintessential example of using a scientific approach to understand another discourse (in this case, literary), one group of students created a spreadsheet that tracked the number of recurrences of particular titles in 'best of' lists (both 'high-brow' such as *The New*

York Times Review of Books and low-brow such as goodreads.com), and then cross-referenced them with credible literary prizes (National Book Award, the Pulitzer, the Pen/Faulkner Award). This approach generated a list of books that a variety of readers recognized as one of the 'best,' and that had also earned literary merit. This proved to be an effective selection process of narrowing the nominees, as it combined reader engagement with literary quality. The typical student approach, however, has involved a less formal cross-referencing of lists, along with students' own interests becoming factors in their selections. While this sometimes increased student interest, it did not always create a high-quality reading list.

In regard to the students' analytical writing about the novels, the following excerpt of a student paper demonstrates an approach to understanding a new context: in this case, the world of low-stakes horse racing. The student wrote:

> *Lord of Misrule* is a novel that really challenges the idea of animal traits and human traits being almost parallel to each other. We see these comparisons being made within the characters and the horses together. What is interesting is that this relationship reveals an even more controversial issue that goes on in the world today: majority and minority power. Because the characters that show compassion do not have happy endings in the novel, are readers led to believe that power is only given to those who display more animalistic behavior? In any case, it is important to keep in mind that a power figure in the novel ended up dead: Joe Dale. Therefore it is certainly plausible to say that if given enough time, minority figures can eventually overthrow the majority. Readers must reflect on both issues carefully before coming to concrete conclusions. Does this novel foreshadow a possible future? Where will modern society end up in the future? These are questions that will remain unanswered until humans truly understand the power of compassion and what the effects of the abuse of power are.

This excerpt demonstrates a close analysis of power dynamics, of the behaviors of the characters, and asks and answers questions about the quality of life in this world. Such an analysis surely demonstrates the ability to understand new social contexts. Further, another example includes a student's interest in the effects of technology on characters in a novel that opens in the 1970s and closes in the 2010s:

> *A Visit from the Goon Squad* seems to present the strongest messages and critiques on the world around us. Its messages and critiques, warnings perhaps, include the dependence on technology, the effect we have on the environment, growing connected but drifting further away from one another, and many more that may not be so obvious. Out of these the point regarding the dependence on technology amongst people is the strongest, considering the passage in which Cara-Ann, who is so young she has absolutely no clue what technology really is, "'Das mine!' Cara-Ann proclaimed with guttural indignation, stretching from her sling and stabbing her pointer at Alex's pocket. Inside, the handset was vibrating" (Egan 322). That is terrifying message to convey causing the reader to deeply think how and why this happened.

The excerpt certainly exhibits an examination of what EC2000 identifies as the "impact of engineering solutions in a global and social context."[2]

The final justification paper can also provide evidence of course efficacy. In a demonstration of his ability to create an argument and provide justification, one student makes his argument for the best book of the year:

> It is common knowledge that all pieces of art have an idea or opinion to express, and novels should be no different. Whether that idea is at the forefront or something the audience has to dig for is up to the creator. The application is no different though; base the plot and characters around the themes of the story. Jennifer Egan set out to write a novel that explored time and its effect on life and its unknown elements. Egan adds multiple time skips to the past and future to highlight all the changes to each character's situation throughout their lives. With time being the main theme, innocence and maturity are also important. Egan killed two birds with one stone here because the themes are intertwined; through time, innocence evolves into maturity. Jaimy Gordon's theme of struggling to balance order with power is well represented through her character's trials and tribulations, but there are simply less overall themes and characters in her book in comparison with Egan's. However, *The Unnamed*' s themes are less clear; one can assume that the theme would be dealing an illness that has no cure, but the
>
> While not having any effect at all on a novel, an author's ambition can sometimes be felt through the words even if it is only superficially. Some of the most renowned pieces of writing are large in scope: *The Iliad, The Odyssey, The Bible*, and the *Declaration of Independence* to name a few. This is because they all suggested something radical, a challenging idea. *The Unnamed* suggests that not everything can be known, *Lord of Misrule* suggests that order interferes with the balance of power, and *A Visit from the Goon Squad* suggests that "time is a goon" and that our observations become altered through the lens of time. None of these suggestions are truly innovative as that is quite rare these days. However, Egan chose an old idea and added the spice of modern times to give context to what many people are feeling today. This ambitious relationship between the old and the new is what gives *A Visit from the Goon Squad* its edge over the competition.
>
> Each book has the advantage over another in some aspect; Jaimy Gordon's writing, dialogue, and prose, Egan's theming and characters, and Ferris's plot. But specializing in a few aspects of something will not be recognized as a classic; the whole is greater than the sum of its parts. The most complete package of 2010 was *A Visit from the Goon Squad*; Egan's ambition did not soil the satisfying conclusion, evolved characters, and well-rounded themes. Time is a very general and open idea, but that is its strength. The more open an idea is the more details that can be shaken out of it. That is why *A Visit from the Goon Squad* is the best novel of 2010.

This excerpt demonstrates a serious consideration of the criteria of evaluating the quality of a literary work. He considers themes, originality, and even authorial ambition. Further, he provides justification and analysis within these criteria. In this case, he assumes the role of critic, and does so with a certain amount of originality and ambition on his own part.

And finally, another student demonstrated the kind of appreciation for literature that the instructor hoped to create. In his argument for determining the best book of the year, he wrote

that "Although *A Visit from the Goon Squad* and *Lord of Misrule* possess interesting and unique characteristics in their own right, it is *The Unnamed* which capitalizes on their drawbacks and therefore proves to be the undisputed winner of the three; the best American fiction books of 2010." This indeed contains a respectful critique of all three books (the other books had "interesting and unique characteristics in their own right"), and recognizes the value of the texts.

And perhaps the comment that most demonstrated the course's aims came from a student who was an avid reader of plot-driven, popular novels, and often seemed disappointed with the class's reading choices. By the end of Semester 2, he stated about the course, "It's not like school, it's like education." In this case, he had made a distinction between a structured, mandated place ("school"), and a process of learning.

Instructor Reflections

The instructor reports several positive experiences and outcomes of the course. First, she noticed very little student resistance to the texts or the course itself. Occasionally, she encountered early negative judgement about novels, but these judgements tended to dissipate when put into the context of the early research and novel selection. For example, she found herself commenting that a particular text had risen to the top in the research, and she only had to suggest that they ascertain why. The students seemed less committed to their more critical remarks once they were reminded of the research that led to the initial text selection. The instructor also reports that it was much easier to consider critical comments about texts without being offended (after all, most literature faculty do have an intellectual investment in certain texts) since she had not chosen the texts. The instructor also reports that the courses were the most enjoyable courses she has had in classes solely composed of engineering students (she has worked with a different model of English integration within a software engineering cohort for several years). She also reports that since she was reading the texts simultaneously with students (often for the first time), she often looked forward to the next class in order to hear students' reactions to the reading assignments and discuss her own initial reactions. Reading texts that were new to her, though more time-consuming than re-reading already-known texts, reminded her of the excitement of coming to a text for the first time.

In addition, the instructor noticed an appreciation for a consensus model of decision-making, a model not always utilized in corporate environments, yet one that often yields results that are more thorough and comprehensive.

In a slightly negative critique, she notes that preparation time during the semester was more significant than a traditional class, in that instructors can prepare for traditional classes by reading and researching texts before the course begins. In this case, she had to read and learn synchronously with students.

Conclusion

This paper presents a current classroom practice designed specifically for engineering students in FYC. According to course evaluations and comments from students and the faculty member, this transformation of a FYC course in an engineering program effectively reduced

student resistance to HSS and produced a positive learning environment. In addition, it exposed emerging engineers to the standards of the engineering profession, and introduced them to broad engineering concepts and general industry practices, such as problem-solving, professional communication practices, quality control, and the study of ethical and social contexts. Early results in the form of student writing samples also demonstrate that this model can effectively achieve not only the aims of FYC, but also meet outcomes involving the knowledge and appreciation of literary culture, when delivered within an engineering/problem-solving context. However, the delivery of the course in semester 1 needs further evaluation and redesign to support students struggling in a reading-intensive environment. Overall, the practice is promising in its approach to integrating WOV skill acquisition, engineering concepts, and literature, all within the first year of an engineering student's academic career; therefore, continued study and refinement of this process would be an important contribution to the non-technical components of engineering education.

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4. Stanford University Newsletter on Teaching. (2001). *Speaking of Teaching: Problem-Based Learning.* 11.1: 1-7.
5. Savery, John. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning.* 1.1: 9-20.
6. English, Mary C., and Anastasia Kitsantas. (2013). Supporting student self-regulated learning in problem- and project-based learning. *Interdisciplinary Journal of Problem-based Learning.* 7.2: 128-150.

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Appendix A: Syllabus

Course Information

Course Number and Title: ENG2990: Special Topics in English – English for Engineers
Semester, Year: Spring , 2015-2016
Recurring Meetings: MWF, 10:00-10:50
Classroom:

Instructor Information

Instructor:
Phone:
E-mail:
Office: Academic Center 256
Office Hours: MWF 9:30-10, 12-1, 2-4:15; TR 10:00-11, 1:45-4:15

Text

Hacker, Diana.
A selection of novels, TBD.

Course Description

In this course, students will study the traditional concepts of English Composition, including the creation of essays for a variety of aims and audiences, the adherence to precepts of Standard Written English, the use of research, and the creation of argumentative strategies. After the completion of this course, student work will be evaluated for proficiency in ENG1270. (3 credit hours)

Pre-requisite: Placement or credit in ENG1250

Course Objectives:

Upon successful completion of this course, students will be able to:

1. Examine literary texts with writing that expresses, analyzes, criticizes, and assesses meaning and significance.
2. Support arguments using the basic tools of rhetoric: persuasion, evidence, and appeal.
3. Utilize information, ideas, and opinions from outside sources accurately and consistently.
4. Organize and write a formal research paper using MLA documentation and formatting.
5. Compose finished texts conforming to Standard Written English (SWE).

ADDITIONAL OUTCOMES:

In addition to meeting the above objectives, the instructor hopes to develop the following (less measurable) outcomes:

1. To build a team environment by sharing responsibility for the creation of the reading list.
2. To increase the understanding and appreciation of literary culture.
3. To increase motivation to read, as well as develop a life-long interest in literature and continuous learning.
4. To increase the ability to understand new social, political, economic contexts and discourses (in accordance with EC 2000) through the entry into fictional worlds.

A Note on Course Design:

The Problem Solving Model

English in the FEA will be modeled on Problem-Based Learning (PBL), which is grounded in constructivist learning theory; "it begins with the assumption that learning is an active, integrated, and constructive process influenced by social and contextual factors" (Stanford University 1). In "Overview of Problem-based Learning: Definitions and Distinctions," Savery explains that PBL is "an instruction (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem" (12).

This approach was chosen because it complements the cohort model, which has been shown to create a supportive learning environment, and because it complements Engineering disciplines, as it is based on the presentation of a problem and the creation of possible solutions. This simulates a professional environment that requires effective problem-solving skills, utilization of the scientific method (research, the formulation of a hypothesis, testing, and documentation), and effective collaboration skills. As demonstrated by Duch, Groh and Allen, PBL develops "the ability to think critically, analyze and solve complex, real-world problems, to find, evaluate, and use appropriate learning resources; to work cooperatively, to demonstrate effective communication skills, and to use content knowledge and intellectual skills to become continual learners" (qtd. in Savery 12).

At the beginning of the class, all students will receive what is called an 'entry' document. This document contains the problem that must be solved during the course of the semester.

Engineering Criteria 2000

According to the *Engineer of 2020*, future engineers "are broadly educated, see themselves as global citizens, can lead in business and public service, as well as in research, development and design, are ethical and inclusive of all segments of society" (59). In addition, it's worth noting that in 1996, the ABET Board of Directors adopted a new set of standards, called Engineering Criteria 2000 (EC 2000). EC 2000's Criterion 3 lists 11 abilities required for all future engineering graduates. Interestingly, only 4 of these criteria are *primarily* technical:

Engineering programs must demonstrate that their graduates have

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to identify, formulate, and solve engineering problems
d) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

e) an ability to design a system, component, or process to meet desired needs
f) an ability to function on multi-disciplinary teams
g) an understanding of professional and ethical responsibility
h) an ability to communicate effectively
i) the broad education necessary to understand the impact of engineering solutions in a global and societal context
j) a recognition of the need for, and an ability to engage in life-long learning
k) a knowledge of contemporary issues

In the manner that the list has been arranged, according to an analysis by Leydens and Scheneider (2009), it's obvious that ABET values many abilities outside of the technical; fortunately, many of these abilities can actually be refined through the study of literature and through our course design. For example, you'll notice the ability to communicate effectively; this is important not just for your written documents, but also for your proposals and class discussion. You'll also notice the requirement that students have "the

broad education necessary to understand the impact of engineering solutions in a global and societal context." Every time we read a new piece of literature, we enter a new context. Through our readings, then, we come to understand new communities, complete with their own operational norms; social, economic and political realities; and of course, language usage.

Course-Specific Policies

Use of Blackboard for Class

I will utilize Blackboard to email class announcements, to keep your grades current, and to provide extra copies of the syllabus and assignments. In addition, I require that your upload your written assignments into BB.

Grading Events and Points

(Please note: this is subject to change, dependent upon the accepted proposals)

Assignments	Points
Proposal Document for Board Meeting	25
Oral Presentation/Contributions	10
Reading Quizzes	300
Mini-Essays (3-4, TBD)	375-525
Final Argumentative Paper	100
Final Board Meeting Participation	10
Participation/Contribution Grade	50

Grading Scale

92-100	A	78-79	C+
90-91	A-	72-78	C
88-89	B+	70-71	C-
82-87	B	60-69	D
80-81	B-	60 ⇓	F

Assignment Submission Policy

All papers must be submitted on or before their due date, regardless of student absence. I do not accept late papers, though every student is granted one extension throughout the semester.

Contribution/Participation Grade

This class is specifically designed so that we can learn from one another, rather than just instructor lecture. For this reason, engagement and participation during class is CRITICAL! Your "Contribution" grade will be determined by your active participation, in positive, productive ways in class. This means that not just any comments will do – please keep the purpose of the course in mind. However, also keep in mind that active participation doesn't have to mean making grand statements about a text's significance or literary symbolism – good participation can include asking questions, talking about initial responses, or even saying, "did anybody think that . . . ?" or "I'm not even sure how to respond to this because . . . .", or "I didn't understand the part about . . . ". The point is to engage the material and be thoughtful as we read and become a community of learners. I will assign the grade at two different points during the semester in order to communicate your performance level. This grade will also include your contributions to your group proposal, which will be measured by observation during class, and if necessary, peer review forms.

If you tend not to be a vocal person, you might consider emailing me some thoughts, ideas, questions, which I will present (anonymously) to the class.

Attendance Policy
Absences will affect your participation/contribution grade – if you aren't in class, then you aren't contributing. Your *earned* participation grade (based on contributions, see above policy) will be reduced in proportion to your absences. For example, you may have earned an 85% for your participation/contribution grade. However, you missed 25% of classes. Your participation/contribution grade is therefore a 60%.

Standardized University Policies
(Omitted for purposes of confidentiality)

Date		Class Focus/Activities	Assignments Due
W	1/20	Introduction to Course, "The Problem," Assess existing knowledge	
F	1/22	Review Databases, In-class Work Time	
M	1/25	In-class Work Time	
	1/27	The Board Meeting	Memo
	1/29	The Board Meeting, Continued (if necessary)	
M	2/1		
	2/3		
	2/5		
M	2/8		
	2/10		
	2/12		
M	2/15		
	2/17		
	2/19		
M	2/22		
	2/24		
	2/26		
M	2/29		
	3/2		
	3/4		
M	3/7		
	3/9		
	3/11		
M	3/14	Spring break	
	3/16		
	3/18		
M	3/21		
	3/23		
	3/25		
M	3/28		
	3/30		
	4/1		
M	4/4		
	4/6		
	4/8		
M	4/11		
	4/13		
	4/15		
M	4/18		

	4/20		
	4/22		
M	4/25		
	4/27		
	4/29		
M	5/2		
	5/4		
	5/6	Final Board Meeting	
	Final Exam		

References

ABET. (2000). *Engineering Criteria 2000*. Available at www.abet.org.

English, Mary C., and Anastasia Kitsantas. (2013). Supporting student self-regulated learning in problem- and project-based learning. *Interdisciplinary Journal of Problem-based Learning.* 7.2: 128-150.

Leydens, Jon A., & Schneider, Jen. (2009). Innovations in composition programs that educate engineers: Drivers, opportunities, and challenges. *Journal of Engineering Education.* July 2009. 255-271.

National Academy of Engineering. (2004). *The engineer of 2020: Visions of engineering in the new century.* Washington, DC: National Academies Press.

Savery, John. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning.* 1.1: 9-20.

Stanford University Newsletter on Teaching. (2001). *Speaking of Teaching: Problem-Based Learning.* 11.1: 1-7.

Appendix B: Fall Semester "Entry Document"/RFP

ENG2990: English for the First-Year Engineering Academy
Presentation of Problem/ "RFP" (Request for Proposal)
Fall 2015

This semester, we will organize our English course around finding a solution to a problem (this is, after all, what Engineers do!). In scholarly communities, this approach is often referred to as "Problem-Based Learning." Since this course is devoted to the study and use of language, our 'problem' will be centered on books!

The Problem

We have been tasked with determining the best American work of fiction of 2010.

This problem also comes with some constraints and requirements:

- Timeline: We have only 15 weeks to come to a decision.
- Minimum workload: We must read at least 3 texts (approximately 900 pages total) and write justifications of our choice.
- Budget: We can purchase books, but we have a budget of only $1000.
- The Project Director reserves the right to substitute one selection of her choosing.

This document will serve as the "RFP" (Request for Proposal) for your first assignment, which is to write a formal proposal.

The Process

To begin solving this problem, we will work together to analyze the task, assess our existing knowledge, and determine necessary research. Then, we will break into groups; each group will be tasked with conducting research and writing a proposal that contains the following items:

- Criteria for evaluation of 'best' works of fiction
- Our reading list (and a justification of this reading list which explains how and why the books were chosen)
- A proposed budget

Each group will submit their proposal to the instructor, but will also be required to present their proposal to the rest of the class. As a class, we will then determine the winning proposal.

The rest of our course will be devoted to reading the texts, discussing and writing about the texts, and finally, determining the 'solution' to the problem – that is, what is the best work of fiction of 2010!

Appendix C: Fall Semester "Entry Document"/RFP

ENG2990: English for the First-Year Engineering Academy
Presentation of Problem
Spring 2016

This semester, we will organize our English course around finding a solution to a problem (this is, after all, what Engineers do!). In scholarly communities, this approach is often referred to as "Problem-Based Learning." Since this course is devoted to the study and use of language, our 'problem' will be centered on books!

The Problem

We have been tasked with determining the best American work of fiction of 2011.

This problem also comes with some constraints and requirements:

- Timeline: We have only 15 weeks to come to a decision.
- Minimum workload: We must read a minimum of 3 texts (depending upon length) and justify our choices.
- Budget: We can purchase books, but we have a budget of only $1000.
- The Project Director reserves the right to substitute one selection of her choosing.

The Process

To begin solving this problem, we will work together to analyze the task, assess our existing knowledge, and determine necessary research. Then, as individuals, we will each nominate a book for inclusion into our reading list. The nomination and selection process will be conducted through a 'board meeting' style. Every student will arrive at the board meeting with a written proposal for a selected book, and a planned oral argument and defense. As students present choices, others will have a chance to question them about their selection. At the end of the meeting, we will have either 1) an anonymous, closed-ballot vote, or 2) a consensus decision.

Please note that there is one other difference this semester: as a requirement of ENG1270, we must begin to incorporate scholarly research. Therefore, one of your criteria for books should be the availability of scholarly articles on the book (we will discuss this during the first two days of class). Other criteria remain the same. We should be looking for books with literary significance, and books that generate meaningful discussions.

The rest of our course will be devoted to reading the texts, discussing and writing about the texts, and finally, determining the 'solution' to the problem – that is, what is the best work of fiction from 2011!