AC 2008-1954: RHETORIC OF GRAMMAR FOR ENGINEERS: DEVELOPING A WAC (WRITING ACROSS THE CURRICULUM) WORKSHOP FOR ENGINEERING TECHNOLOGY STUDENTS

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Rhetoric of Grammar for Engineers: Developing a WAC (Writing Across the Curriculum) Workshop for Engineering Technology Students

Abstract: This paper explores the ongoing development of a teaching workshop for use in engineering technology courses, which contain a significant writing component. The main purpose of the workshop (module) is to bring students up to a minimum standard of accepted grammar structure in short order through specific targeted subject areas including person, active/ passive voice and documentation. It was hoped that increased student skill in these areas will dramatically improve student effectiveness in creating readable and grammatically correct technical reports, laboratory reports and daily engineering communication appropriate for the field. Pre and post assessment instruments were employed with the workshop to measure the impact on the student learning of subject areas. Results of the assessment findings will be discussed. Lastly, the workshop has been taught both on site and from remote location by use of distance learning Web CT and Smart board technologies. Comparisons and limitations between on site and remote teaching locations are reviewed by the authors.

Introduction

When the Mechanical Engineering Technology Department assigned one of the authors the task of teaching MET 210W, a capstone engineering design course that also met a writing intensive requirement for ABET, the instructor gave little thought to special preparation for the course beyond technical requirements for the engineering content of the course. Only after seeing how previous faculty handled the writing intensive portion of the course by assigning students the laborious task of outlining all material covered in the text did the author search for a better technique for teaching WAC.

Product Design (MET 210W) is a fourth semester writing intensive and capstone engineering design and analysis course for students enrolled in the Associate Degree Mechanical Engineering Technology Program as offered by The Pennsylvania State University. This three credit-hour course teaches engineering design and analysis principles through team-oriented design projects supported by communication skills: written, graphical and oral [1].

The major objective of MET 210W is to provide students with methodologies to design and select machine elements found in mechanical systems. The elements include key design and analysis, roller ball bearing selection and analysis, chain and sprocket selection and analysis, linear helical compression spring design and analysis, spur gear design, selection and analysis, transmission power shaft design and analysis, clutches and brakes selection and analysis, and bolts/fasteners selection and analysis. The final group Gear Reducer Design Project for possible use in the Penn State Altoona SAE Mini Baja vehicle requires a written project proposal that includes function and design requirements along with progress reports. Each group submits a detailed final report at the conclusion of the project. Students also write about their group experiences in the form of an interoffice memo. The project requires students to apply learned course techniques and knowledge to complete the design and analysis of the speed gear reducer. Students interact with commercial vendors to select components. Prerequisites for the course include statics, strength of materials, kinematics, and dynamics. CAD and solid modeling software experience is also necessary along with MS-Office skills in generating

engineering reports and drawings. The course text is *Machine Elements in Mechanical Design, 4 th edition*, by Robert L. Mott [2].

Review of Literature

Many instructors without Composition training assigned to teach a writing intensive course ask a series of questions: what should a WAC course do? How do I teach writing when I don't have a degree in composition? How do I add one more component to my already filled syllabus? A cursory search of academic articles in *College English* will turn up some depressing results: hundreds of articles, spanning twenty years, which contradict and argue one another - not even the composition experts have definite, practical answers to these questions.

What should a WAC course do?

Most faculty understand WAC to promote "writing as a way of learning" in specific disciplines [3]. From this view, one can take a formalist approach and assign research papers, training the student in hunting and gathering information to toss together in a mix of academic discourse and student slang. Or one could assign journal entries or short reader response papers, allowing the student to "express" his or her thoughts about the material, without the formality of disciplinary conventions.

Many programs attempt to use writing in the classroom to inspire critical thinking and to engage students with the material they read: "The goal of many programs is to encourage higher-level thinking, instead of rote memorization of facts" [4]; others see WAC in a more practical light: "WAC assessments may more closely mirror real-world applications of skills" [4].

Catherine Pastore Blair of Bucknell University simply states, "Writing in context still seems to me to be the point of writing across the curriculum" [3]. "Writing in context," when simply stated, teaching writing in the context of a discipline isn't as foreign to most instructors as freshman composition. It is something that most instructors do regularly, and therefore should feel comfortable teaching their own practices.

How do I teach writing when I don't have a degree in it?

The insecurity of non-English faculty in their composition skills leads them to defer to the English Department, which is then accused of colonizing writing [3], [5]. Patrick Bizzaro of East Carolina University identifies the persistent belief that the disciplines should teach writing the same way composition courses teach it. He explains "idiosyncratic memory" perpetuates English Department's control of writing, these beliefs or vague memories of the instructor's own experience in first-year composition [5].

How do I add one more component to my already filled syllabus?

Confusion here leads many instructors to fail "to distinguish between assigning writing and teaching it" [3]. In many writing assignments, instructors ask a research question and fail to direct the student to appropriate sources, provide guidelines for correct format and documentation, and to make transparent the disciplinary writing style.

These teachers expect students to learn through trial and error, imitate what they read, figure it out on their own or beg enlightenment at their university's writing center.

Once the student fumbles his or her way through the assignment, how then does the teacher assess it? Again, most instructors think WWED (what would the English do?) and spend hours trying to recreate the comments they received on their own freshman comp papers. Frequently, the larger concerns like content and organization are glossed while the margins fill with comments about grammar because it is the most tangible element of writing. Louise Smith, director of Freshman English at University of Massachusetts in Boston, encourages English departments to invite collaboration and discussion from departments teaching writing intensive courses before WAC (writing across the curriculum) becomes EAC ("editing across the curriculum") [6].

Christina Bourgeois and Christopher McGahey of Georgia Tech presented material concerning writing in Engineering at the ASEE 2002 Annual Conference. In order to develop a taxonomy of Engineering discourse, they reviewed over sixty ECE journal articles, published between 1988 and 2000. In their presentation, they suggested that "the taxonomy is fixed or enduring – not likely to change much over time" [7]. Therefore, it is logical that those who have been writing and publishing in the field are well equipped to teach writing to up-and-coming writers in the field.

The Skills

1. 1st, 2nd, & 3rd person
2. Active/passive voice
3. CSE documentation

Pedagogy

Most non-Composition instructors feel more comfortable with grammar because it is more tangible than higher order concerns, paragraphing and organization of ideas, which Composition departments favor over grammar. WAC courses must also meet the demands of professional writing for clear, concise, grammatically-correct sentences. To bridge the writing concerns of both fields, this workshop design teaches writers to be sensitive to how grammar functions as part of meaning. In order to do so, these lessons focus on descriptive grammar, which explains how parts of speech work in sentences, rather than the prescriptive grammar of old high school classrooms. First, descriptive grammar treats the students as thinkers rather than empty vessels learning arbitrary grammar rules. Second, students begin to understand how the language works, so they can manipulate it to their advantage in their everyday and professional writing. The authors' goal in teaching students about passive voice is not so that they eliminate it altogether, but so they recognize its rhetorical value in addition to its complications. This instruction module does not replace Freshman Composition, but builds on what students already know about writing to provide a focused discipline-specific rhetorical approach to one aspect of writing in the Engineering field.

Methods

Spring 2006

The authors' collaboration began as discussion Fall semester 2005 as the Engineering instructor sought the advice of the Composition instructor on how to incorporate writing into Spring 2006 MET 210W to meet the ABET requirements of a writing intensive course.

In Spring semester 2006, the Composition instructor conducted a writing workshop with the MET210W class. In preparation for the workshop, the authors discussed methods to professionalize student writing in a short amount of time by providing students instruction and handouts on person, passive voice, and documentation. The class project concerned the design of a SAE Mini Baja vehicle, so an abstract of their student research provided an opportunity for practical writing. Students exchanged writing samples and read one another's abstracts aloud. As they read, they addressed what "sounded good" and discussed why some writing sounded more professional (or more like what they read in articles and text books) than others. In this way, they began to develop an ear for the writing of professionals in their field. Because scientific writing demands the illusion of objectivity, scientific scholars use third person, which often results in passive voice (removing the actor who did the action, which in most cases is the writer).

Spring 2007

Noting success with the workshop, but not having data to support their observations, the authors continued the collaboration and integrated a pretest. The materials required some revision to avoid the perpetuation of the overuse of passive voice through imitation. The instructors took a rhetorical approach to the grammar instruction in a virtual visit to the Spring 2007 MET 210W class.

A more detailed handout targeted the same skills as Spring 2006 (*appendix 1*), which begins with 1st, 2nd, and 3rd person because it is often the easiest concept for students to grasp. A brief explanation that scientific reports are primarily about the research project, not about the researchers, clarifies preference for third person in scientific writing. Using third person places the focus on the subject, and takes it away from the researchers, unless the writer simply replaces "I" with "the researcher." Unfortunately, students tend to use passive voice when eliminating references to themselves in their writing.

An explanation of the most basic structure of English sentences: Subject (the thing the sentence is about) + Verb (what that thing is doing) + Direct Object (what that thing is doing it to) helped students to understand active and passive voice. When students identified the subject and verb in the sentence, they could see the direction of the action in the sentence. In a passive sentence, the direct object becomes the subject, because it receives the action of the verb.

Most composition teachers encourage complete elimination of passive voice because it serves as a "speed bump" for readers: if the action of the sentence moves backward, reflecting back on the subject, rather than forward onto the direct object, the brain must follow that recursive path to interpret meaning. Essays written in active voice,

where the action moves forward onto the direct object and there is a definite actor, "flow" better. With this understanding, students see why active voice is preferable to passive.

Working from that understanding, sometimes passive voice can be useful. For example, instead of "I broke your iPod," one might want to say, "your iPod was broken," removing the person to blame and placing the focus on the iPod, since it is now in the place of the subject. This rhetorical approach to verb forms encourages students to think strategically about their writing by using the prominence of the subject to emphasize the procedure or the material with which they are working.

Using sample sentences from articles published in their field (*see appendix 2*), students worked through a whole group exercise to apply the lessons to practical writing. At the end of the semester, students took a post test targeting the same skills (*see appendix 4*). In the post test, examples from writing published within the discipline helped to create a more authentic, real-world application of the skills. Results of pre and post assessment exams for Spring 2007 MET 210W are shown below.

Pre and Post Assessment Exam Results Spring 2007 MET 210W

Active/Passive Voice Questions

Pre-test questions with % Correct	Post-test
1. 56%	1. 44%
2. 53%	2. 48 %
3. 65%	3. 46%
4. 40%	4. 32%
5. 31%	5. 60%

Person (1st, 2nd, & 3rd person)

Pre-test questions with % Correct	Post-test
1. 90%	1. 84%
2. 100%	2. 20%
3. 100%	3. 92%
4. 90%	4. 76%
5. 87%	5. 92%

Documentation

Pre-test questions with % Correct	Post-test
1. 43%	1. 68%
	2. 40%
	3. 80%

The results of the pre and post assessment tests Spring 2007 MET 210W showed a noticeable decrease in student scores for 4 of the 5 Active/Passive questions. This was much unexpected as the students had received training and completed worksheets on active/passive voice before taking the post assessment test. One possible explanation for the decrease in student scores could be because the pre and post assessment tests were not identical (*see appendices 3 and 4)*. The post assessment test had been rewritten with new questions, using excerpts of articles from the mechanical engineering field. These new

sentences were more complex than the simple sentences on the pre assessment exam. Although the in-class exercises used similar sentences to the post assessment exam, a few of the students commented on the increased difficulty of the test. Due to the use of real-world examples, the post assessment exam was more rigorous than the pre assessment exam.

The Person (1st, 2nd, & 3rd person) questions also showed drops in student scores for 4 of the 5 questions. Again this was unexpected since the students had completed exercises this area. It should be noted, however, that this section of the assessment test showed some of the highest scores. Still the decrease in scores is troubling, and the authors put forth the same possible reason, increased complexity of the sentences, for the poor post assessment scores as given for the Active/Passive section of the exam.

The results of the documentation questions showed increases in student scores on the post assessment exam for all three questions. This was encouraging but is probably due to the nature of the questions, it being easier to identify correct documentation than person and active/passive voice.

Due to the experimental nature of this semester, the differences between the pre and post assessment exams were drastic. The changes in the scores may address the instructors' learning curve more than the students' acquisition of the material.

Fall 2007

Fall semester 2007, the authors decided to continue the gathering data by administering a revised pre assessment test to a group of 3rd semester engineering technology students enrolled in a Strength of Materials Laboratory class MCH T 214 (*see appendix 4)*. This laboratory course requires students to write several laboratory reports during the semester. The post assessment test used in the Spring 2007 MET 210W class served as the pre assessment exam for the Fall 2007 MCH T 214 students. The post assessment exam scores of Spring 2007 MET 210W students that received Active/Passive voice, Person and Documentation training can be compared to test scores of Fall 2007 MCH T 214 students that had not received training. Results of the pre assessment tests for Fall 2007 MCH T 214 pre assessment tests are below.

Pre and Post Assessment Exam Results Fall 2007 MCH T 214

Active/Passive Voice Questions
Pre-test questions with % Correct
1. 60%
2. 70%
3. 50%
4. 40%
5. 50%

Person (1st, 2nd, & 3rd person)
Pre-test questions with % Correct
1. 70%
2. 30%
3. 100%

4. 60%
5. 80%

Documentation
Pre-Test questions with % Correct
1. 60%
2. 80%
3. 30%

The comparison of results for the of Spring 2007 MET 210W students that received instruction and Fall 2007 MCH T 214 students that did not receive instruction curiously shows the students without training scoring higher in 4 of the 5 questions related to Active/Passive Voice. These results indicate a further need for clarification and revision to the instruction in this area. Results between the two sets of students are more evenly distributed with students with training scoring better in 3 of the 5 questions concerning Person. Lastly, comparison between the two students groups showed students with training score higher on 2 of the 3 questions about documentation as would be expected.

Complications

Distance

Of course distance creates problems with scheduling and interactivity. Video conferencing provided an affordable alternative to a plane ticket. Face-to-face instruction engages students with the material more effectively than watching a TV screen. Ideally, a Composition instructor would provide guidance, while the Engineering instructor delivers the instruction. Receiving the information from the engineering instructor reinforces the practical application of these discipline specific lessons.

Timing & Planning

In the first semesters, the authors taught these lessons as their ideas developed, neglecting a global view of the semester and the course goals, so the writing instruction seemed more like an anomalous growth than a natural appendage to the course. Unfortunately the lessons do not yet appear integral to the course, since they are subject to the authors' schedules, not where they are appropriate for the students' learning.

Collaboration & Expertise

In the beginning, the Composition instructor lacked fluency with the standards in the discipline, and the Engineering instructor was not familiar with or confident in his writing skills. The authors have spent many hours educating each other. Purdue's Online Writing Lab, Virginia Tech's writing guidelines for Engineering and Science students, and Diana Hacker's online documentation guide provided much of the necessary technical information.

Discussion

Students would most benefit from regular instruction throughout the semester: a pretest in the first week, 3 or 4 face-to-face or video instruction meetings, more germane

assessment that weighs into their grade (lab reports or a final paper), and the post test (ungraded, for data-gathering only). Writing abstracts during the writing workshops provides a brief real-world writing experience that emphasizes clear, concise communication.

When the authors began this collaboration, they felt as if they were reinventing the wheel, or perhaps a better analogy would be a power transmission system. Although the current results indicate a need for much revision, the authors are encouraged to continue developing a set of lesson plans and assessment tools that can be implemented in ME writing-intensive courses. They hope this project will empower non-Composition instructors teaching writing intensive courses by giving them specific teaching tools, which these instructors can add to their repertoire.

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5. Bizzaro, P. Working against the grain: English departments and the colonization of writing in the disciplines. Southeastern Writing Center Conference; 2007 Feb 8-10; Nashville, TN.
6. Smith, L. (April 1988). Opinion: Why English departments should "house" writing across the curriculum. College English April 1998; 50(4): 390-395. Available from Proquest. Accessed 2008 Jan 18.

Suggested Websites

Hacker, D. Research and documentation online.
http://www.dianahacker.com/resdoc/home.html

Purdue University Online Writing Lab. http://owl.english.purdue.edu/

1. Virginia Tech writing guidelines for engineering and science students. http://www.writing.eng.vt.edu/

Appendix 1: Handout

Active & Passive Voice

Active voice is preferable, but sometimes you will need to use passive voice to eliminate first person.

Active: working; doing the action
In active voice, the subject of the sentence performs the action of the verb.

Ex. I *measured* the length of the chain. (subject = I)

Active Voice	Singular (present/past tense)	Plural (present/past tense)
First Person	I lead/led	We lead/led
Second Person	You lead/led	You lead/led
Third Person	He, She, It leads/led	They lead/led

Basic sentence structure: (Subject) + (verb) + (direct object).
(Dr. Frankenstein) (built) (a monster).

Passive: acted upon
In passive voice, the subject of the sentence receives the action of the verb.
The length of the chain *was measured*. (subject = length of chain)

Passive Voice	Singular (present/past tense)	Plural (present/past tense)
First Person	I am/was lead	We are/were led
Second Person	You are/were lead	You are/were led
Third Person	He, She, It is/was lead	They are/were led

Passive Voice: (Subject) + (verb).
(A monster) (was built).

When writing in the sciences, you want to avoid calling attention to yourself. The focus should be on your project, not you. The subject is the focus of the sentence. Therefore, the subject of your sentence should not be "I."

Compound sentences can be tricky because they have two clauses, joined by a coordinating conjunction. So, one part can be passive, and the other can be active.

(Subject) + (verb) + (direct object), (coordinating conjunction) (subject) + (verb) + (direct object).

Dr. Frankenstein *built* a monster, but his monster *was killed*.

Appendix 1: Handout cont.

Vague Pronoun Reference

Your writing should be as specific as possible; therefore, you should define your pronouns. Do not start sentences with "this is." Often, "this" refers back to an idea stated in the previous sentence. Think about what "this" is referring to and define it, such as "this exercise is tedious," instead of "this is tedious."

Documentation

Of course, you need to use documentation any time you borrow language (citing word for word, or quoting) or refer to specialized information (not common knowledge) (paraphrasing).

The documentation style used by engineers is called CSE (Council of Science Editors), formerly known as CBE (Council of Biology Editors), which has two forms: the name-year style and the number style. Engineers most commonly use the second form, number style.

In-text citations
Insert a superscript number[1] or a number in brackets [1] immediately after the cited information or name.

Example: Research by Henry [1] indicates that road surfaces may have caused the driver to lose control of the vehicle.

List of references
Every citation within the paper should correspond to an entry in your list of references.

Example:
[1] Henry, J. Pavement surfaces. New York: Transportation Research Board; 1989.

See http://www.dianahacker.com/resdoc/p04_c11_o.html for a style guide.

Appendix 2: Active/Passive Voice Identification Exercise

1. The sound pressure level in a one-dimensional piston-pipe enclosure is controlled using the Active Compression Damping (ACD) treatment. Passive voice
2. The ACD treatment, which is bonded directly to the driving piston, uses the compression and expansion deformations of visco-elastic material sandwiched between the electromagnet and a permanent magnet to dissipate the acoustic energy inside a piston-pipe system. Active voice
3. ACD treatment is an active/passive hybrid controller. Active voice
4. When the active part fails due to a malfunction of any element in the control circuits, the passive part still operates and gives acceptable control efforts. Active voice
5. The behavior of the system is evaluated by monitoring the sound pressure level at the closed end of the pipe with single tone, two-tone and broad band noise excitations. Passive voice
6. Proportional and Derivative feedback control are used to activate the electromagnetic actuator. Passive voice
7. The results obtained indicate significant attenuation of the acoustic energy inside the pipe. Active voice

Source:
Chen, T., P. Chaiwanon, A. Baz. Control of Sound Pressure in a Piston-Pipe System using Active Compression Damping Treatment. Journal of Vibration and Control. Vol. 12, Iss. 6, Jun 2006. pp. 601-617.

Appendix 3: Writing Standards Pre Assessment Exam for Spring 2007 MET210W

Active/Passive Voice

Identify whether the sentence is using active or passive voice. Then rewrite the sentence using the other voice.

For example:
Scientists conducted a study. Active Voice
The study was conducted (by scientists). Passive Voice

1. The course is offered by the Engineering Department.
2. The professor gave a lecture on thermodynamics at the 1995 ASTM conference.
3. C.P. Snow wrote an intriguing essay, titled "The Two Cultures," analyzing the separation between the Humanities and Sciences in academia.
4. Engineers are often labeled as poor writers.
5. Scientific writing doesn't have to confuse readers with wordiness and jargon.

Person (first, second, or third)

Identify whether the sentences are in first, second or third person. If they are in first or second, revise them so they are third person.

For example:
You work well under pressure. Second Person
The student works well under pressure. Third Person

2. I wrote the lab report two hours before it was due.
3. You will notice that the writing is not clear.
4. You tend to pay more attention to what you did in the lab than the communication of those procedures in the report.
5. Writing is tedious, but if I can't give clear instructions to put together a brake system, what will happen to the driver of the car?
6. The driver of the car lost his brakes and hit a pile of manure.

Appendix 3: Writing Standards Pre Assessment Exam for Spring 2007 MET210W cont.

Documentation

Which one of the following passages uses the appropriate documentation method?

Method 1

The eleven outcomes (Criterion 3) which apply to all engineering programs are as follows:
(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 design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
(d) an ability to function on multi-disciplinary teams;
(e) an ability to identify, formulate, and solve engineering problems;
(f) an understanding of professional and ethical responsibility,
(g) an ability to communicate effectively,
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
(i) a recognition of the need for, and an ability to engage in, life-long learning;
(j) a knowledge of contemporary issues;
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (ABET, 2004).
Shuman, Besterfield-Sacre, and McGourty divide Criterion 3 into the five technical skills: a, b, c, e, and k; and the equally important professional skills: d, f, g, h, i, and j. The professional skills are important because of rapidly changing technology, corporate downsizing, outsourcing, globalization, student and professional mobility, and the social imperative (Shuman et. al, 2005). Their importance has been stressed repeatedly at ASME international conferences (ASME International Council on Education, 2004).

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Kulacki, F., and E. Vkchos (1995). Downsizing the curriculum: A proposed baccalaureate program and contextual base. *Journal of Engineering Education*, 84(3), 225-234.

Shuman, L., M. Besterfield-Sacre, and J. McGourty (2005). The ABET 'Professional Skills'-Can they be taught? Can they be assessed? *Journal of Engineering Education*, 94(1), 41-55.

Excerpt from:
Jarosz, Jeffrey P, and Ilene J Busch-Vishniac (Jul 2006). A Topical Analysis of Mechanical Engineering Curricula. *Journal of Engineering Education*, 95(3), 241-248.

Appendix 3: Writing Standards Pre Assessment Exam for Spring 2007 MET210W cont.

Method 2

The eleven outcomes (Criterion 3) which apply to all engineering programs are as follows:
(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 design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
(d) an ability to function on multi-disciplinary teams;
(e) an ability to identify, formulate, and solve engineering problems;
(f) an understanding of professional and ethical responsibility,
(g) an ability to communicate effectively,
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
(i) a recognition of the need for, and an ability to engage in, life-long learning;
(j) a knowledge of contemporary issues;
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice [25].
Shuman, Besterfield-Sacre, and McGourty divide Criterion 3 into the five technical skills: a, b, c, e, and k; and the equally important professional skills: d, f, g, h, i, and j. The professional skills are important because of rapidly changing technology, corporate downsizing, outsourcing, globalization, student and professional mobility, and the social imperative [13]. Their importance has been stressed repeatedly at ASME international conferences [15].

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[14] Kulacki, F., and E. Vkchos, "Downsizing the Curriculum: A Proposed Baccalaureate Program and Contextual Base," Journal of Engineering Education, Vol. 84, No. 3, 1995, pp. 225-234.

[15] ASME International Council on Education, "A Vision of the Future of ME Education," November 2004.

Excerpt from:
Jarosz, Jeffrey P, and Ilene J Busch-Vishniac. A Topical Analysis of Mechanical Engineering Curricula. Journal of Engineering Education. Vol. 95, Iss. 3, Jul 2006, p. 241-248 (8 pp.).

Appendix 3: Writing Standards Pre Assessment Exam for Spring 2007 MET210W cont.

Method 3

The eleven outcomes (Criterion 3) which apply to all engineering programs are as follows:
(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 design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
(d) an ability to function on multi-disciplinary teams;
(e) an ability to identify, formulate, and solve engineering problems;
(f) an understanding of professional and ethical responsibility,
(g) an ability to communicate effectively,
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
(i) a recognition of the need for, and an ability to engage in, life-long learning;
(j) a knowledge of contemporary issues;
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (ABET).
Shuman, Besterfield-Sacre, and McGourty divide Criterion 3 into the five technical skills: a, b, c, e, and k; and the equally important professional skills: d, f, g, h, i, and j. The professional skills are important because of rapidly changing technology, corporate downsizing, outsourcing, globalization, student and professional mobility, and the social imperative (Shuman, Besterfield-Sacre, and McGourty 43-44). Their importance has been stressed repeatedly at ASME international conferences (ASME).

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Excerpt from:
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Appendix 4: Writing Standards Post Assessment Exam for Spring 2007 MET210W & Pre Assessment Exam for Fall 2007 MCHT214

Active/Passive Voice

Underline the subject and circle the verb. Identify whether the sentence is using active or passive voice.

1. The integrated design and manufacturing methodologies for structural composites are presented through two student projects.

2. The composite intensive vehicles (CIV) constructed for Formula and Baja racing represent, respectively, stiffness driven and strength and toughness driven applications which call for different material and processing strategies.

3. The use of monocoque design in the manufacture of a two-part chassis via the wet layup of knitted fabric and in the fabrication of a single component chassis by braiding illustrate a substantial consolidation of parts which will lead to the economical manufacturing of structural composites.

4. Improvements in the areas of tools, organization, program activity, supplier involvement, and communication have helped to increase the role of CAE.

5. In this paper, a design of experiment setup using the Taguchi Methods was done to reduce the nonuniform shrinkage of molded parts in injection molding processes.

Appendix 4: Writing Standards Post Assessment Exam for Spring 2007 MET210W & Pre Assessment Exam for Fall 2007 MCHT214 cont.

Person (first, second, or third)
Identify whether the sentences are in first, second or third person. If they are in first or second, revise them so they are third person.

1. A test was conducted to see who could write clear, specific directions.

2. We were given a shape by our instructor and asked to write instructions for drawing the shape.

3. I wrote instructions on how to draw a square.

4. Writing accurate instructions is harder than it seems.

5. I revised my directions three times before my partner's drawing resulted in a square.

Appendix 4: Writing Standards Post Assessment Exam for Spring 2007 MET210W & Pre Assessment Exam for Fall 2007 MCHT214

Documentation

The following passages contain three different types of documentation styles. Review the passages carefully and answer the questions that follow.

First Passage

The turbine was put into production in November, 1995. On February 10, 2000, the turbine was found to be vibrating severely. The oil level in the oil collection groove decreased greatly. Upon opening the housing, the central axis of the piston rod was found to have broken at the joint of the M540 nut with the crosshead fallen into the cone (see Fig. 2). The nut structure was then changed to a retainer ring structure (Zhong, 2001). However, five years later, on March 16, 2006, the retainer ring structure also broke at the same location (see Fig. 2). A comprehensive investigation was then performed including dynamic analysis of position rods to identify the design problem.

References

Zhong, S. (2001). Failure analysis and design strength study of piston rod for the Shuikou hydroelectric power unit 6. *Large Electr Mach Hydraulic Turbine*, 7, 7–11.

Second Passage

The turbine was put into production in November, 1995. On February 10, 2000, the turbine was found to be vibrating severely. The oil level in the oil collection groove decreased greatly. Upon opening the housing, the central axis of the piston rod was found to have broken at the joint of the M540 nut with the crosshead fallen into the cone (see Fig. 2). The nut structure was then changed to a retainer ring structure (Zhong). However, five years later, on March 16, 2006, the retainer ring structure also broke at the same location (see Fig. 2). A comprehensive investigation was then performed including dynamic analysis of position rods to identify the design problem.

Works Cited

Zhong, Su. “Failure analysis and design strength study of piston rod for the Shuikou hydroelectric power unit 6.” *Large Electr Mach Hydraulic Turbine* 7 (2001): 7–11.

Appendix 4: Writing Standards Post Assessment Exam for Spring 2007 MET210W & Pre Assessment Exam for Fall 2007 MCHT214 cont.

Third Passage

The turbine was put into production in November, 1995. On February 10, 2000, the turbine was found to be vibrating severely. The oil level in the oil collection groove decreased greatly. Upon opening the housing, the central axis of the piston rod was found to have broken at the joint of the M540 nut with the crosshead fallen into the cone (see Fig. 2). The nut structure was then changed to a retainer ring structure [1]. However, five years later, on March 16, 2006, the retainer ring structure also broke at the same location (see Fig. 2). A comprehensive investigation was then performed including dynamic analysis of position rods to identify the design problem.

References

[1] Zhong, S. Failure analysis and design strength study of piston rod for the Shuikou hydroelectric power unit 6. Large Electr Mach Hydraulic Turbine 2001; 7: 7–11.

1. Which one of the above passages uses the appropriate documentation method for Engineering?
    a. Passage One
    b. Passage Two
    c. Passage Three
    d. None

2. What is the name of the appropriate documentation method for Engineering?
    a. MLA
    b. CSE
    c. CMS
    d. APA

3. Which two elements should you look for to identify the appropriate documentation method for Engineering?
    a. In-text documentation uses numbers in brackets and references are numbered in order of appearance
    b. In-text documentation uses the last name of the author(s) and date and references are alphabetized
    c. In-text documentation uses part of the title in quotation marks and references are alphabetized by the primary author's last name
    d. In-text documentation uses the last name of the author(s) and the references are called works cited