Integrating Written and Oral Communications into a Manufacturing Processes Class

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Abstract - **This document is primarily a merging of anecdotal information that has been collected since 2003. At that time, engineers, technologists and technicians were known to have poor writing skills. The joke of the day was that engineers may be good at math but their vocabulary was limited to about fifty words. While this was a gross exaggeration, it certainly paints an ugly picture of the writing skills of our students. The overall picture was poor. There are many colleges and universities, both public and private, in Southeastern Michigan and they all have enjoyed the luxury of having high ranking automotive leaders on their boards of trustees. The economy had not yet taken the catastrophic turn that would soon affect us all. The general feeling for most of us was one of "let me do my work," and I will stay out of the way. Early in 2003 the leaders of automotive industry laid down some demands that shocked us into reality. The people who hired our graduates were not upset with the way we were teaching our technical courses but they were hitting us hard with claims that our graduates wrote poorly. This paper addresses the approaches that were taken to help solve the problems**.

Index Terms – Written Communications, Spoken Communications, Oral Communications, Manufacturing Processes and Integration of Communications

Introduction

At many universities, there is a lot of animosity displayed between the faculty of the English department and our colleagues within engineering and technology departments. It was easy to blame the English department faculty for "not doing" what they get paid to do. They tended to accuse us of not holding up our end of the bargain. Whoever is at fault is an irrelevant question because a change had to take place regardless. Our university, at the direction of the Provost, formed a committee to examine what could be done to improve the situation. The problem was examined and some changes were implemented. An attempt to write across the whole campus was initiated [1]. A writing proficiency examination was designed and every student who held junior status had to take and pass the exam. If they did not pass, they could, after a period of time, be eligible take it again. If they failed it a second time, they were required to take remedial class and again take the writing proficiency exam. The remedial class has proven a success as indicated by the 100 percent rate of diplomas granted.

Our university implemented some steps to be undertaken for the whole university but also encouraged us to implement some improvements to the classes that we teach as well. The final outcome was to determine if Manufacturing Processes 1 could be used to support writing across the curriculum. The question was soon asked, "what will be taken out of the program to compensate for what is being put in? More importantly, is writing proficiency the only thing to address or should other topics be considered as well? Very quickly the whole subject of communication rather than just writing was identified as the issue that was relevant. Writing needed support but so did oral communication as well. Who could best help identify what material was to stay and what was go? In 2003 it was in vogue in the literature to involve students in decision-making whenever it was possible. It was decided to try using students who were in the class. That was not an easy move to make based on the author's age and ego.

A class period was set aside to discuss and brainstorm how, if possible, it could be accomplished. Students were placed together in groups of three. The class was handed over to the students and given a modified version of Robert's rules. They were given chalk and markers and the instructor went and sat in the back row. They elected a moderator to keep things under control. The moderator was given a list, by the instructor, of major concerns that had been enumerated on PowerPoint. The class was empowered to make suggestions without fear of retaliation. They were then asked the ultimate question, "what material can be removed from the course to make room for the new material"? Their response was astounding.

Manufacturing Processes 1 was, and still is, a fairly traditional class that tends to be an encyclopedia-like course. It was originally designed to have lectures, demonstrations, laboratory experiences and four examinations, the last one being a comprehensive final examination. The student's response to this was immediate and thorough. They left nothing untouched.

They went about ripping apart nearly everything that was viewed to be sacred to the course.

The students started by attacking traditional grading and test procedures. The group agreed that because of the nature of manufacturing processes classes, that the only thing most tests prove is that that one can memorize well. The students did agree that some memorization was needed but generally, memorization proved very little. The class period was nearly over and we were just getting to things that we all agreed were important. They moved and seconded that we should have another session. The following Thursday was selected and they came to class very well prepared. They had designed a simple syllabus that was the basis for the rest of our program. These students, now acting as a team, divided the syllabus to include three (not four) examinations. The team gave each exam a weight of 20 percent, for a total of 60 percent. They then gave 20 percent weighting for a written communication project and another 20 percent for an oral presentation. The fundamental question again was still, "what are we taking out, and what will we replace it with?" The team had manufacturing processes text books to back-up their suggestion. DeGarmo's Materials and Processes in Manufacturing [2] has more information than we will ever complete in a semester. Kalpakjian's Manufacturing Processes for Engineering Materials [3] is the same. The team collectively asked, "why not make up a written assignment that deals with manufacturing?" The team that had performed so well had come to a near standstill. They had performed admirably but had come to the end of their abilities. What direction should be taken at this point?

The team that created itself was very supportive of the program design. This team was instrumental in designing the course. What they did not design was the actual written or oral project. We were comfortable with the idea of introducing the project to the Manufacturing Processes 1 class in the spring of 2004. We used the new syllabus that was designed by the previous a team and we started off in a positive direction. That class had been apprised of the work that the previous class had completed. They liked the idea of not having a traditional comprehensive final exam, but instead, having merely a third exam. The projects involving written and oral communications were yet to be designed. As we discussed what had been envisioned for the writing project, a sarcastic reply came from one of the students. He had muttered, "it better be publishable." The paper should indeed be publishable. To do that however would be quite challenging. The groundwork had been laid and there was much to accomplish. The previous team that suggested that the written project should deal with something in the field of manufacturing had again made another powerful suggestion. The written and oral communications project appeared to be a challenge. What should be used for topics? The students in the fall 2004 class were given the opportunity to participate in the written communications project. The team determined what the written subject would be and how it was to be selected. They brought in many interesting topics, all of which were within the realm of traditional manufacturing processes.

The Manufacturing Processes 1 classes consisted primarily of commuter students, of which nearly 80 percent held fulltime employment. Time was of great value to them so the idea of having a team project in writing was both positive and negative. It was appealing because each person was only responsible for a portion of the work. The negative to this plan was that students had to spend weekends and off-nights meeting with other students.

Initially, a team had four members. If there were more than four members on a team the students appeared to get in one another's way. Less than three members was not representative of how a team interacts. Teams were chosen by self selection. If the student didn't get onto the team that he or she wanted, the student was assigned a position by the instructor. Students had the first opportunity of picking their team members. The projects they were going to do fell into two categories. The written work was to be a paper, written by the group. It involved researching a topic and collecting your information. The oral portion will be presented the last week of regular class.

Writing in Detail

The instructor handed out a three page document that listed all of the writing rules and procedures for the project. The project was to acquaint members of the class with new and/or innovative processes in manufacturing. Students were to work in teams, ideally, of four members but under certain conditions, as few as three or as many as five members, at the instructor's discretion. Team members were responsible for equal amounts of work and participation on the team. The project involved research, writing of the document and a final presentation. The written document was a minimum of eight pages and a maximum of sixteen pages, excluding the title page. Spelling and grammatical errors will not be tolerated because the students had "spell check" and "grammar check" on their lap-top computers. The group would create a project proposal that was in the form of an abstract. The abstract will start with the word "Abstract" centered in bold type. The actual body of the abstract contained approximately 300 words and it will be single-spaced. The topic was a current or new process that was of interest to the team members. The paper should include an introduction, which was a good place to give a brief historical account of the process or practice. The second chapter would be the main body of the paper and would include most of their information. The second chapter was usually the longest. The third chapter would include al conclusions, observations, and recommendations. One must not use run-on sentences, incorrect punctuation,

noun/verb disagreement or noun/pronoun disagreement. The paper was written formally in the third person. "I" is never used because this is not a testimony to one's self. Examples of topics that include, but not limited to the following;

- Low pressure injection molding,
- Water jet cutting,
- Low pressure injection,
- Three dimensional printing,
- Thin wall die casting,
- Reaction injection molding,
- Rapid prototyping,
- Epoxy dies and molds,
- In-process gauging,

These topics were examples of manufacturing innovations and processes that were considered to be modern manufacturing methods. The project culminated in a group presentation to the rest of the class. The document should have the following:

- Title page,
- Disclaimer,
- Table of contents,
- Lists of illustrations,
- Chapters, (at least three)
- References,
- Pagination and numbers

Abused Words and Phrases

One should be aware of abused words and phrases. Examples include the following:

- Do you mean affect or effect? One is a verb and the other, a noun.
- Have you used the word "done" correctly? "Done is a pizza at 375 degrees after ten minutes."
- Be careful with if/then statements.

Speaking in detail

The students were expected to speak in front of groups or important leaders. It is usually less worrisome to speak before a large impersonal audience than to speak formally to one's boss. The oral communications project was started after the draft writing assignment was nearly completed. All team members were expected to stand on the stage and deliver their part of the presentation. The oral presentation was be at least fifteen minutes long and no more than twenty minutes. The instructor was responsible for keeping track of time. When the team was presenting teir information to the class, the instructor had two signs that he brought with him to the presentations. The first sign had the number "15 Min" on it. When the team presenting their project work and findings had been on stage for fifteen minutes the sign was held up until one of the presenters nodded an acknowledgment. The second sign had a number that said "2 Min," meaning that they had only a maximum of two minutes left before the instructor announced "stop." The stop command signified that the presentation was over. The setup time was five minutes in length. The first presenting team of the day had five minutes to setup their stage. After that, there was five minutes between the finish of one team and starting of the next team.

Continuous Quality Improvement

The collection of data from this long-term study has yielded some interesting results. The original ideas that were initiated in 2003 and 2004 were interesting. The major selection of projects for both written and oral communications have worked out better than expected. Selecting a topic looked as though it might have been difficult. The students however, had found no problem at all finding interesting topics. They had a couple topics that were approved even though they were not directly in the arena of manufacturing. The topics were approved by the instructor because the information given was informative support information to many manufacturing processes. One paper and presentation required that a non-disclosure agreement be signed by all in the class that saw and the presentation.

During the 2005 through 2006 academic years many minor problems were identified from the class evaluations. It was important that students had a good environment to work in because it made them comfortable when giving critical suggestions. The most significant finding that was found was the number of team members on a functional team. The instructor started by assigning an ideal team of four members. Things began to fall apart with this number during the first year. Feedback was continuous that the ideal number of students on a team should be three. That was acted upon and the team member count was changed to three. We had a couple of times when we chose, for whatever reason, to have a team of four members. Immediately, the evaluations identified three as the best number. The process has smoothed out since 2003, and by 2009, it seems to be working well.

English as a Second Language (ESL)

Higher education in the United States and Canada is a major industry. Foreign students come to our colleges and universities in large numbers. There is a whole series of classes and tests that are taken by our foreign students to improve their spoken and written English. ESL students learn to read and write non-technical English, but they are not exposed to technical English. Manufacturing Processes 1 is one of the first classes that students take in engineering and technical programs It is generally where both ESL Manufacturing Processes 1and non-ESL students are exposed to technical vocabulary for the first

time. When teams are formed for written and oral communications, it is tempting to put two or three ESL students together, particular if they are from the same language background. This model would appear to make both faculty and the ESL student more at ease but it does nothing to help the ESL student learn technical English. It is imperative that their writing is carefully read and corrected rapidly so that they have current and relevant feedback. These same students also are a part of a team that will do an oral presentation. Evaluation forms and observations both indicate the positive value of immersing ESL students that into groups with students who have proficient English and writing skills.

Learning Outcomes Before and After the Addition of Written and Oral Communications

After two years of integration of written and oral communication into our program, we were comfortable with examining the progress before the integration and then again after the integration. Most of the topics were compared before and after with little significant difference. The question asked by most readers is "what was taken out"? Material removal (machining) was the portion of the course that the students chose to reduce. We discovered that basics of milling, turning, and grinding could still be introduced. The higher level material removal subjects have been left off, the students who want to learn more machining, need to select it as an integration subject. Integration did not reflect a significant change in grade distribution; the grades are about the same as before the integration. Grades fluctuate slightly but that does not seem to be a function of the integration because pre-2004 grades are quite similar to post- 2006 grades.

Student Responsibilities and Evaluation

Students evaluated the written work of their team members by reading and critiquing one another's work. This was accomplished in their groups as part of the process of presenting in front of the entire class. Each student was given a simple peer evaluation form to fill out critiquing their team members and themselves. This form was completed and submitted before their team presented.

The form asks, "What percent of the work was done by you, and what percentage by your colleagues"? This is not a scientific document. It is merely an estimate of whether or not everyone had shared equal portions of the work. Most students were harshest on themselves, therefore assigning slightly higher evaluations to their colleagues. The typical student in a three person team gave themselves 30 percent credit while they gave their teammates 35 percent each. This is normal behavior from American students. When this formula is skewed and a team member gave him or herself a higher score it signaled an obvious problem.

This sent up a flag that something was not right. The professor at this point, took command and addresses the issue because the team members were working for an equal grade. They were all expected to bear the responsibilities equally.

When this problem arose, the team members, were interviewed individually and as a group. The instructor had final authority to make a pragmatic decision. This has only happened three times since 2004. The same form was also used during the oral presentation; again, they were evaluating their team members exclusively. All team members were required to participate in the oral presentation as well. Many wear terrified, particularly if they were ESL students. Setting up rules of order in the classroom can relieve some of the discomfort and it gives the instructor the opportunity to interject if needed. The instructor had ground rules concerning etiquette that were discussed with the class. The students and the professor set the rules to be followed during the presentation. Everybody was required to carry their own weight.

Conclusion

The collection of data has been an ongoing activity since 2003. It has helped us to recognize what can be done without spending a lot of money. A team of students in 2003 laid down our basic design. This was a new and different approach. I had never been involved in something like this before and frankly, was quite uncomfortable with the idea. We were quick to learn that students can be very helpful if they are given a level of equality. The integration of written and oral communications into Manufacturing Processes 1 has exceeded my expectations.

References

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