AC 2008-171: ENGINEERING PERSONIFIED: AN APPLICATION OF THE ONE MINUTE ENGINEER

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1. Introduction

In the typical freshman engineering curriculum, instructors often talk about works of engineering such as bridges and automobiles, but not of the engineers that designed them. Discussion focuses on the science and mathematics behind such works, but not on the ideas and events that motivated their designers. One of the unfortunate consequences of such omissions is a disconnect in the minds of many students between their perception of what they currently are and what they aspire to be professionally.

At the First Year Engineering Workshop entitled "Dialogue II on Engineering Education: the Role of the First Year," held in July 2007 at the University of Notre Dame, David Billington, Sr., made the argument for the need to humanize engineering. In his presentation, he opined that entering students relate more to historical examples than to abstract principles. Among the points raised were that students should study outstanding engineers because the human element of engineering is missing from their classes; that ideas and personalities are part of engineering; and that students are naturally attracted to the best works of a field of study. Moreover, the field of engineering has transformed American society into a technological powerhouse, and future engineers need to understand how this happened. Simply put, Billington makes the claim that engineering needs to be somehow personified in the classroom so that the contributions made by those in the past and present are made known to students, allowing them to envision the possible contributions that they can make as engineers in the future.

2. Background

Previous ASEE Conferences have featured papers on the One Minute Engineer (OME), where students give short individual presentations on student-selected, engineering-related topics in areas such as devices, biographies, vocabulary, or current events. The OME is designed to be implemented with minimal sacrifice of class time, as only one to three short presentations are given each day. In a paper by Jaeger and Bilén[1], the development of the OME as a pedagogical tool is discussed along with its use at their institutions. The OME was initially introduced at Northeastern University as the Demo Minute in the fall of 2003 and 2004 in an effort to help students improve their public speaking skills. Topics used for the Demo Minute included demonstration of a device, word of the day and newsworthy/current events. With positive response from students at Northeastern and interest from a faculty member at the Pennsylvania State University (Penn State), the OME was introduced in the spring of 2004 in an Introduction to Engineering Design course at Penn State. Changes from its development at Northeastern included the addition of a category, biography, and the use of a Likert-type survey to evaluate the effectiveness of the tool. At Penn State, 93% of students agreed or strongly agreed that they felt more aware of engineering issues following completion of the OME and more than 82% felt the OME was useful and interesting.

The positive response from students with regards to the Demo Minute at Northeastern and the positive response of students at Penn State encouraged Jaeger to introduce the tool into a Northeastern Engineering Design course in the fall of 2005 and to further clarify the assignment and time limit. Jaeger also introduced the subject by demonstrating the OME to the students in the design course as Bilén had done at Penn State. At the completion of the OME, students in the course overwhelmingly responded that they were more aware of engineering issues throughout history and in current events.

Several other observations were made by Jaeger and Bilén. Students found the topics of device and newsworthy to be the most interesting and biography to be significantly less interesting, the majority of biographies presented by female students were about female engineers and tapping into students' interests provided knowledge not just to other students but to the instructors as well. The authors concluded that the One Minute Engineer can be effectively used in an introductory engineering course.

After seeing a presentation of the above paper at the 2006 national ASEE conference, the authors and other teachers of the first freshman engineering course at Ohio Northern University decided to implement the OME in the fall of 2006. It was modified slightly from its original format and implemented with slight variations across all sections of the course. Pre- and post-activity surveys similar to those at the initial institutions were used to assess the effectiveness of the OME, and rubrics were developed to assess the students' presentation skills. These results and comparisons to prior data were published and presented by Yoder, Jaeger and Estell at the 2007 national ASEE conference[2]. The results were sufficiently encouraging to keep the OME as part of the course for the fall of 2007.

3. Purpose

The primary purpose of this research is to adapt the OME for use in the personification of engineering by restricting the students' selection to only biographies; specifically, to select an engineer and give a brief presentation on the engineering-related contribution that this person made to society. This research was conducted at the authors' institution in five sections of their first-term introductory engineering course during the fall 2007 term. It is expected that students will be more aware of engineers, rather than just engineering artifacts. A secondary purpose of this research is to implement and evaluate some of the recommendations for future work mentioned in the previously published papers.

In an effort to examine the effect of the aforementioned "biography-only" approach, only two of the five sections incorporated this change; the remaining sections implemented the OME as presented at past ASEE conferences. Previously published pre- and post-activity survey instruments[2] were modified and used as the primary form of assessment in the evaluation of the effectiveness of this new methodology. This will allow comparisons to be drawn not only between the "biography-only" and traditional OME sections, but also to the current literature on the use of the OME.

4. Methodology

The methodology for the implementation of the OME for this research was straightforward. The student handout explaining the OME that is presented in both of the OME-specific ASEE papers[1,2] was used "as is" for the three sections utilizing the traditional OME format; the handout was then edited to leave "Engineers with an Impact" as the only allowable category for the remaining two sections. All presentations were given at the beginning of the class period. The typical class size in each section of the course was approximately 30 students; the presentations were scheduled such that either two or three students would give an OME presentation each class period during the duration of the assignment. As the course meets three times each week, the total amount of time needed for the presentations ranged from three to five weeks.

It was felt that the grading rubric presented in the Yoder *et. al.* paper[2], while useful, did not sufficiently address the evaluation of oral communication skills; additionally, no guidelines regarding what constitutes effective oral communication were presented to students. Given that the OME is being assigned to first-year students, it is unwise to assume that a certain inherent level of presentation proficiency was achieved by students during their high school experiences; instead, it is preferable to establish a level playing field through the utilization of materials that focuses attention on oral presentation skills. A paper by Renaud, Squier, and Larsen[3] discussed emphasizing oral presentation skills through use of the RSVP training framework that focuses students' attention on four key presentation areas:

- R – Responsiveness (*e.g.*, audience analysis),
- S – Speech Patterns (*e.g.*, speed, volume, enunciation),
- V – Verbal and Visual Rhetoric (*e.g.*, presentation structure, use of visual aids), and
- P – Physical (*e.g.*, use of stage, congruence of body language with message).

The RSVP framework helps students to more easily remember the evaluation criteria of an effective presentation. The developer of the RSVP framework was kind enough to share her materials[4] with the lead author of this paper. A one-page handout derived from these materials can be found in Appendix A. This handout was distributed to all students and was reviewed during one class session of the course in order to set appropriate presentation guidelines.

A new rubric featuring descriptive performance level indicators based on an appropriate subset of the RSVP framework was developed and distributed to the students ahead of the presentations, as it is important to provide specific information on expectations to both students and faculty prior to the evaluation process[5]. As presented in Appendix B, this rubric focuses on five specific areas. As this is, ostensibly, a "one minute" presentation, the length of the presentation is a relevant issue. The four other major evaluation areas are derived from the RSVP framework based on specific items identified as areas where the faculty wanted students to concentrate their efforts. Under "Responsiveness," the focus was placed on encouraging students to maintain good eye contact with the audience. For "Speech Patterns," emphasis was placed on speed, volume, and avoidance of the utterance of verbal tics (such as "umm…" or "okay…"). As visual aids were prohibited under this implementation of the OME in order to focus efforts on developing the content of an oral presentation instead of promoting reliance on PowerPoint slides, the "Visual Rhetoric" section of the framework was not used; however, both the appropriateness and the organization of the presented information were identified for the

"Verbal Rhetoric" performance criteria. Finally, the "Physical" category was used to discourage students from reading directly off of note cards and to evaluate them on the level of comfort displayed. Three explicit performance levels were developed for each criterion, and a biased weighting system was associated for these levels, with "practitioner" rated as a score of 3, "intermediate" rated as a score of 2, and "novice" as a score of 0. While a "minimal" level was not explicitly stated on the rubric, if an evaluator felt that the performance in a particular criterion rated between intermediate and novice, a score of 1 could then be assigned. A maximum of three points could be scored in each one of the five major criteria areas; for areas with multiple subcategories, the criterion score is based on the average score obtained in the subcategories.

In the Yoder *et. al.* paper[2], it was suggested that one could further promote student engagement through use of peer evaluations of the OME presentations. One of the benefits of rubrics is that they provide a common framework where performance in each criterion can be categorized according to exhibited traits that correspond to specific descriptive indicators, which minimizes the potential for inconsistent scoring[5]. Consequently, rubrics provide an ideal instrument for purposes of peer evaluation. To explore this further, one section of the first-term introductory engineering course was selected to use both instructor and peer evaluation through use of a common rubric. As the typical first-year student is generally inexperienced in the use of rubrics, the instructor provided in-class demonstrations of both good and not-so-good OME presentations that students evaluated through use of the rubrics. Additionally, so that students could better concentrate on the RSVP framework when performing peer evaluations, each student was assigned to perform two sets of evaluations (each usually consisting of three students) on the class dates preceding his/her own presentation (save for the students who presented first; they performed their evaluations on the last groups of students to present). For their first set of evaluations, students focused on the Responsiveness and Speech Patterns (or "RS") areas; for their second set of evaluations, students focused on the Verbal Rhetoric and Physical (or "VP") areas. In this way students only had to evaluate another student in four specific areas, which made the task more manageable. From the faculty standpoint, each student was being evaluated by a total of six students, with three performing RS evaluations and the other three performing VP evaluations.

To allow for better evaluation, the instructor used a digital camera mounted on a tripod to record each student's presentation. Following the last presentation, all of the students' presentations were evaluated by the instructor at one sitting in order to promote maximum evaluation consistency. This approach had the additional benefits of automatically recording the elapsed time of the presentation and permitting the instructor to loop the playback of the video recording, thereby allowing him to concentrate on items piquing his interest without having to worry about missing something that needed to be scored in one of the performance criteria. This allowed detailed comments to be constructed for each student. To further assist the students, a "closing the loop" process was implemented through the use of an additional assignment. All of the recorded presentations were made available to students on a restricted-access network drive. The students were required to first review the provided peer and instructor evaluations of their presentation, after which they had to perform a self assessment of their presentation by using the RSVP rubric. The results of this self assessment, along with reflection as to how to improve the student's specific oral presentation skills, were then submitted as a memo to the instructor.

5. Results

The results of this research are divided into four reporting categories: the ability of students to recall the names of famous engineers and to associate them with their artifacts, the students' awareness of engineering, additional post-activity survey results, and the effectiveness of the RSVP rubric.

5.1. Engineering Personalities and Artifacts

In both the pre- and post-activity surveys, students were asked to name five famous engineers. For the purpose of evaluation, the names of inventors were considered as acceptable answers. Table 1 shows the results of this name recognition exercise. The entries list the average number of correct responses in each class section:

Table 1. Average Number of Engineers Named

Section	Pre-Activity	Post-Activity	% Increase
A	1.94	2.29	18.10
B	0.77	3.24	321.20
C	1.37	4.77	248.97
D	1.78	3.63	104.17
E	2.83	3.13	10.77

Clearly, there was substantial variation between sections, both in averages and in the percent increase over the course of the quarter. Sections B and D were the ones where students were limited to "biography-only" presentations. While these two did show significant improvement (over 100%), it is also worth noting that section C showed significant improvement, and in fact had the highest post-activity survey average.

Next, student post-activity responses were checked to see if they had correctly correlated engineers with an artifact. Table 2 shows the results of this analysis, again separated by section.

Table 2. Engineer – Artifact Correlation

Section	Average % Correct
A	77
B	82
C	91
D	49
E	80

Here, it is interesting to note that, again, section C has done very well. Also, section D, one of the sections which required "biography-only" presentations, did more poorly than the others.

It should be noted that, by student choice, 17 of the 29 presentations (59%) in section C were biographical. This is very different than the student selections in 2006, when only 34% of presentations were biographical. The instructor of this section noted that many of the biographies presented focused on the device invented and its applications, which helps to explain

the high correlation level in Table 2. Furthermore, since individual faculty are free to implement the OME as they see fit, the instructor for section C included a weekly quiz related to the OME presentations. This may also help explain the very good scores for this section.

5.2 Awareness of Engineering

Pre- and post-activity surveys for evaluating the effectiveness of the OME have been presented in the relevant OME literature[1,2]; for comparative purposes, the same survey questions were used for this research in order to utilize the previously reported 2005 and 2006 data. First, the following three questions were used with a 5-point Likert scale (with 1 associated with "strongly disagree" and 5 associated with "strongly agree") to assess students' self-rating of their awareness:

- "I feel aware of engineering issues in history."
- "I feel aware of engineering issues in my surroundings."
- "I feel aware of the engineering issues in current world events."

A summary of the pre-activity survey results, reported as percentages to allow for better comparisons, is shown in Table 3. Please note that, due to rounding, not all rows add to 100.

Table 3. Comparison of Pre-Activity Survey Results

	% Strongly Disagree	% Disagree	% Neutral	% Agree	% Strongly Agree	Average
History:						
2007 (*n*=137)	4	23	39	34	0	3.04
2006 (*n*=144)	3	28	38	28	2	2.98
2005 (*n*=57)	2	39	37	23	0	2.81
Surroundings:						
2007	3	10	31	50	5	3.45
2006	1	15	29	49	5	3.41
2005	2	37	33	28	0	2.88
World Events:						
2007	3	15	33	46	4	3.33
2006	2	19	33	41	5	3.27
2005	2	33	39	26	0	2.89

Two things are worth noting. First, while there is some variation in the (mean) average values reported for the 2005 data, it must be noted that this data was taken from a different university than the data shown for 2006 and 2007. The distribution of responses, and hence the averages, are very similar for 2006 and 2007. This indicates that the incoming students had similar feelings about their awareness of their surroundings. Note that this data is reported in the aggregate, with no distinction between sections.

Table 4 shows the corresponding data from the post-activity survey. In this case, the first three questions still represent awareness, but with the questions modified slightly to read as follows:

- "Due to the activities of the One-Minute Engineer presentations, I feel aware of engineering issues in history."
- "Due to the activities of the One-Minute Engineer presentations, I feel aware of engineering issues in my surroundings."
- "Due to the activities of the One-Minute Engineer presentations, I feel aware of the engineering issues in current world events."

Table 4. Comparison of Post-Activity Survey Results

	% Strongly Disagree	% Disagree	% Neutral	% Agree	% Strongly Agree	Average
History:						
2007 (*n*=129)	2	5	15	71	7	3.76
2006 (*n*=138)	0	5	16	67	11	3.83
2005 (*n*=53)	0	8	26	62	4	3.62
Surroundings:						
2007	0	5	32	54	8	3.63
2006	1	4	30	49	15	3.73
2005	0	6	13	74	8	3.83
World Events:						
2007	2	8	37	46	8	3.50
2006	1	4	23	54	17	3.81
2005	2	8	21	53	17	3.75

Again, there are several interesting results. As was the case in prior years, most students either agreed or were neutral that OME activities increased their engineering awareness. However, the distributions in the Surroundings and World Events categories, and the corresponding average of responses, were both lower in 2007. This can be explained by the fact that these numbers represent the aggregate. In Table 5, the post-activity survey data for 2007 is shown, but now broken down by section.

Table 5. Post-Activity Survey Average Response by Section

Section	History	Surroundings	World Events
A	4.00	3.79	3.93
B	3.46	3.42	3.46
C	3.88	3.40	3.28
D	3.74	3.67	3.30
E	3.70	3.87	3.52

It is interesting, and somewhat expected, to note here that the sections that saw the largest improvements in the ability to name engineers (B, C, and D) have the lowest scores in Surroundings and World Events. Since most of the OME presentations in these sections focused on engineers, it could be predicted that students felt that OME had less of an impact on increasing their awareness in these two areas.

5.3 Additional Post-Activity Survey Results

The post-activity surveys included additional questions about whether the OME presentations are interesting and whether the OME presentations may be useful. These results are provided in Table 6.

Table 6. Responses to Interesting/Useful Questions

	% Strongly Disagree	% Disagree	% Neutral	% Agree	% Strongly Agree	Average
Interesting:						
2007 (*n*=129)	2	6	16	56	21	3.88
2006 (*n*=138)	1	2	10	49	37	4.18
2005 (*n*=53)	2	0	9	45	43	4.28
Useful:						
2007	1	7	19	63	11	3.76
2006	1	4	18	51	26	3.96
2005	2	2	11	68	17	3.96

Similar to the results of the previous questions, the students were still largely positive about the OME. However, they found it slightly less interesting and useful than they have in prior years. In 2006, students' surveys did indicate that while 34% of them did biographical presentations, only 6% of students said this type of presentation was their favorite. The fact that over half of the presentations this year (in the aggregate) were related to biographies may have lowered student enthusiasm somewhat.

Two new questions were specifically added to the 2007 post-activity survey to investigate how students feel about learning about engineers. These questions were:

- "Knowing about engineers makes me more interested in engineering as a career," and
- "Learning about engineers is more important than learning about devices."

The results of these questions are shown in Table 7.

Table 7. Responses to Career/Devices Questions

	% Strongly Disagree	% Disagree	% Neutral	% Agree	% Strongly Agree	Average
Career:						
2007 (*n*=128)	1	4	21	49	25	3.94
Devices:						
2007	5	30	56	9	0	2.69

74% of the students agreed or strongly agreed that learning about engineers made them more interested in engineering as a career, so from this point of view, the new approach was quite successful. However, only 9% of students agreed (and none strongly agreed) that knowing about engineers is more important than learning about devices.

Finally, the post-activity survey included several open-ended qualitative questions. Below are some notable student comments in response to these questions.

Regarding the awareness of engineering issues in the student's surroundings:

- "Everywhere I look I can find something and tie it to Engineering or how an Engineer played a role in the development of it."
- "Just about everything can relate to engineering somehow."

Regarding the OME presentations being interesting:

- "I thought that many of the presentations that were about certain inventions were very interesting."
- "Sometimes, depends how it is presented."

Regarding the usefulness of OME presentations:

- "I think it was useful for me because I got used to presenting technical information in front of others."
- "I learned how to pick out only the most important parts."
- "The presentations may have planted an idea for students to pursue."
- "Help people better understand the world we live in."

Regarding knowing about engineers making the student more interested in engineering as a career:

- "There are many different types of jobs as an engineer."
- "I like knowing who the main people are and how they got there."
- "It looks fun."

The following comments indicate some room for improvement in the use of the OME:

- "I don't feel that many of the presentations were about current world events."
- "Only a few OME were about current world events."
- "What engineers have done has no bearing on what I can do."
- "Have a group of people work together on a three to four minute presentation."
- "I think along with the students, the professors should also present an OME. And I think it would be cool if they briefly presented one every class. It wouldn't have to be as long or in-depth. Just so we learned even more engineers and devices."
- "What technology is still implemented and/or how engineers came up with their ideas."
- "Even though stressed the fact that OME wasn't on the midterm, emphasize that we still need to know them (…Quiz)."
- "Doing a current news report for engineers would be interesting and educational."
- "Even though I hate quizzes, a quiz on the engineers would have improved my knowledge of them considerably."

These comments will be considered as part of the review process for next year's offering of the freshman engineering curriculum. It is particularly interesting that multiple students suggested adding a quiz, as was done in section C. Although this would require a bit more class time, it seems clear from Table 2 that the section with quizzes had improved retention. Several students

also suggested that more presentation time would be helpful. This suggestion has been made in prior years and has been rejected, since that would defeat the purpose of the OME. Students should certainly have additional opportunities to do longer presentations, but those should be in addition to the OME.

The following are a few of the positive comments from students when asked how to improve the OME:

- "I wouldn't change anything; it is a great way to learn."
- "I thought it was fine the way it is."

Finally, the following comment that indicates that not all students enjoyed the experience:

- "Not having it cause (*sic*) it scared the heck out of me."

5.4 RSVP Rubric

The use of the RSVP rubric was found to be an effective way for both the instructor and students to assess oral presentation skills. The framework succinctly indicated those elements that constitute good oral presentation skills; the corresponding rubric focused evaluation efforts on a specific set of performance criteria and related performance level indicators that, in the past, have been identified as problem areas. The students were then able to use the results of the instructor and peer evaluations, along with using the rubric to perform a self-evaluation, to critically examine their presentation skills and determine what efforts, if any, are needed for improvement.

Given the disparity in evaluation experience between students and faculty, the use of inter-rater reliability analysis constitutes a means for examining the effectiveness of the performance level indicators in clearly stating the measures of a particular criterion. Unfortunately, a thorough and proper analysis cannot be undertaken here due to the nature of how the data was collected, in that each student performed, at most, only three RS evaluations and only three VP evaluations. Furthermore, the scores in the speech patterns, verbal rhetoric, and physical categories, all of which had multiple subcategories for evaluation, were reported as averages over the subcategories. However, some conclusions can be extracted from a casual examination of the data. An analysis was performed based on the difference between the instructor's score and the averaged students' score in all categories for each OME presentation given in one section. The results of this analysis are presented in Table 8.

Table 8. Comparison between Instructor and Averaged Student Evaluations

Category	Rater Agreement Percentage	Rater Adjacent Percentage	Landis/Koch Reliability Index Classification	Skew vector (% below, % above)
Responsiveness	42	77	substantial	(12, 46)
Speech Patterns	23	88	almost perfect	(38, 38)
Verbal Rhetoric	31	62	substantial	(35, 35)
Physical	19	69	substantial	(31, 50)

One method of indicating the relationship between the instructor and students' scores is through the use of a rater agreement percentage indicating the number of cases where there is exact agreement; it should be noted that, as the students' scores are averaged, it is possible that the instructor score might agree with the average but not with any one particular student score. Because of this inherent fuzziness, a second metric – the rater adjacent percentage – is used under the premise that, given the number of possible outcomes, having a value that is adjacent to another value constitutes being close enough in agreement to be counted as such for the purposes of inter-rater reliability. As the scores from three students are being averaged, the resultant difference in the average is 0.33 if one student deviates slightly from the others; accordingly, if the absolute value of the difference between instructor and students' average rating is less than 0.33, then for the purposes of this analysis that particular assessment is assumed to be in agreement. If it is assumed that the probability of agreement due to chance is zero, then the rater adjacent percentage can be used to represent Cohen's kappa coefficient, which is a statistical measure of inter-rater reliability[6]. Furthermore, Cohen's kappa coefficient can be easily interpreted using an index established by Landis and Koch. The results of applying this index are shown in the Reliability Index Classification column. While the authors cannot claim true inter-rater reliability because of the nature of the data involved, the results do show that the construction of the RSVP rubric was such that both the instructor and the students were sufficiently in agreement to conclude that the rubric's performance level indicators are at least adequately defined.

The final column in Table 8 is a skew vector, simply indicating the percentage of students' average ratings that were, respectively, below and above the instructor's rating. This was done to quickly determine if there was any relative inherent bias in the ratings. While the speech patterns and verbal rhetoric areas do not demonstrate any bias, there is bias shown in the Responsiveness and Physical sections where the students were more likely to rate those aspects of a presentation higher than the rating given by the instructor. Collectively, the lower rater agreement percentage values, lower Landis/Koch classification levels, and evidence of skewing are indicators for where efforts should be undertaken with the RSVP rubric to analyze specific performance level indicators for possible ambiguity and specific performance criteria where additional student training is required.

The combination of peer- and self-evaluation also proved to be an effective way of engaging students. A six-question survey was sent to the students of the one section performing this aspect of the research approximately three months after the completion of all course requirements concerning the OME. Each question was responded to using a 5-point Likert scale, with 1 being "strongly disagree" and 5 being "strongly agree". The results of the survey are presented in Table 9.

Table 9. Results of OME Peer Evaluation Survey

Question	Average	Percent in Agreement
It was valuable for me to watch my recorded presentation.	4.2	91
Performing evaluations of other students' presentations prior to my presentation helped me make a better presentation.	4.2	82
It was valuable to receive feedback on my oral presentation through use of the oral presentation evaluation rubric.	4.0	82
I found the One Minute Engineer experience in GE 104 to be helpful in identifying areas where I can improve my oral presentation skills.	3.9	73
It was valuable for me to receive feedback on my oral presentation from other students in the class.	3.8	64
It was valuable for me to perform a self-assessment of my oral presentation skills based upon watching my recorded presentation and reviewing the feedback I received.	3.6	64

The results from Table 9 indicate that students were most appreciative of having the opportunity to watch the recording of their OME presentation. Students also valued having the opportunity to evaluate other students' presentations. This is not surprising since by performing this activity, it better prepared them for their own forthcoming presentation. Receiving feedback through use of a rubric also scored well, probably because the utilization of a rubric provides an objective basis for judgment of an activity that has been often graded throughout one's academic career in purely subjective manners. The use of the OME in identifying areas for improvement of oral presentation skills rated somewhat lower; however, it is noted that this exercise was conducted as a short presentation without the use of images, so several areas of the RSVP framework were therefore not contained within this exercise. The student feedback rated low; it was noted that few students availed themselves of the opportunity to provide written comments on the rubric form, which limited the feedback received to just the performance level indicators circled on the respective rubrics. Finally, the performing of a self-assessment, since it did constitute an additional assignment that students in other sections did not have to do, rated lowest but was still considered positively by a majority of the survey respondents. However, it can be contended that, based on a careful examination of the submitted memos for this assignment, the performance of the self-assessment was a valuable experience. Among the written comments were the following statements concerning watching their own presentation:

- "Viewing and evaluating my own presentation helped me see how I speak in front of people and what areas I need improvement in."
- "After giving my One Minute Engineer Presentation then seeing what the evaluations said about it, it was nice to watch it for myself to see what I need to work on to become a better presenter."
- "After reviewing my One Minute Engineer Presentation I have gotten a clear understanding on what parts of my presentation that I need to correct for when I give future presentations."

The students also indicated that they observed the following shortcomings in their presentations:

- "I saw firsthand how I had just read basically straight off the note card to the audience."
- "I used too many verbal tics. This is something that will be harder to fix because I do not notice myself saying things like 'uh' in my presentations."
- "I feel that I need to do a better job of maintaining eye contact with the audience and being more relaxed."
- "I recognize that I didn't say the name of my engineer nearly enough."
- "The things I noticed were I was moving while I was presenting the information and I had points in my presentation where I stopped because I forgot what I was going to say next."
- "While watching the video of my recording, I realized that I relied on my notes entirely too much."
- "I thought that I looked a little nervous and you could tell by my pauses throughout the presentation."
- "The only thing that seemed off was how I looked before the speech started. The sneer I had along with cracking my knuckles made me look like a teamster's (*sic*) enforcer."

Finally, the students specified the following actions for improving their oral presentation skills:

- "I need to focus on keeping my hands still so they will not be distracting."
- "I should practice my presentation more so I don't have to read from the card and so I know the information by heart."
- "I could improve my presentation by: 1. Memorizing my information. 2. Making more attempts to look at the audience. 3. Looking at the audience in longer time intervals."
- "I can fix this problem by practicing speaking in front of a mirror, or I could just speak in public more. If I can do this, then I will become a much better public speaker."
- "My eye contact, use of notes, verbal tics and tension could have been fixed by practicing the speech a couple more times."

6. Conclusions

The students in the two sections that had "biography-only" OME presentations and the section that had a majority of biographical presentations showed a significant increase in their awareness of famous engineers relative to the other sections. However, a correlation was not sufficiently shown for associating these engineers with the artifacts for which they are famous. The best approach was actually developed in section C, where the OME presentations focused on both engineer and artifact, with reinforcement through the use of weekly quizzes based on the contents of the presentations. This approach will be incorporated into future applications of the OME at the authors' institution.

The results of the pre- and post-activity surveys confirm past research that the OME presentations increase a student's overall awareness of engineering-related issues, but the restriction to biographical presentations resulted in a lessened awareness of engineering as it relates to one's surroundings and to current world events. Combined with the fact from the previously conducted research that biographical presentations are not the most popular presentation form, this may have led to the students' lowered response to whether the OME presentations are interesting and whether the OME presentations are useful. While students were

appreciative of learning about famous engineers, they indicated that they felt it was at least as important, if not more important, to learn about the devices that these engineers developed. The qualitative assessment provided additional support for the use of the OME in the classroom as well as suggestions for further improvement.

The use of the RSVP framework and associated rubric that was tailored to the evaluation of OME presentations constituted a definite improvement, as it encouraged students to place a greater focus on their oral communication skills than in the previous year. On one of the submitted surveys a student stated the following:

> "I felt that this One Minute Engineer exercise was a good way to learn about oral presentations. Another bonus is that it didn't take up much class time with long and boring presentations. It is exercises like this that really help improve communication skills."

The inter-rater reliability measure indicated that the initial application of the RSVP rubric worked pretty well; however, there are areas where improvements can be made. One of the observations made regarding presentations was that many students mentioned the name of their eminent engineer only once during their presentations. While "judicious repetition" is mentioned in the rhetoric skills listed in the framework, it was not being evaluated through the rubric. By adding an additional subcategory to the Verbal Rhetoric criterion, students can be made better aware of this principle and thereby encourage greater effort in this area. With the appropriate students' permission, some of this year's recorded presentations will be used in future years to better train students in the use of the rubric, and in so doing assist in increasing the rater agreement and rater adjacent percentages. Adjustments in the wording of the performance indicator levels for the Responsiveness and Physical criteria will provide better definition and help to reduce the skewed results in these areas.

The use of peer evaluation further reinforced the RSVP framework, as a sizeable majority of the students surveyed indicated that this activity helped them to make a better presentation. Students were especially appreciative of being able to watch their own presentations; given the ubiquity of suitably-equipped digital cameras and the ability to obtain inexpensive tripods, instructors should seriously consider adopting this approach for use with OME presentations as it is a highly effective way to provide students with feedback. Although students were not, as a whole, thrilled with the idea of performing self-criticism, the written responses received indicate that they did learn about some of their own oral presentation shortcomings and were able to identify ways to address these issues.

In summary, the One Minute Engineer methodology has proven itself to be effective in exposing students to outstanding engineers as Billington called for in his presentation at the First Year Engineering workshop. However, because of the inherent time limitations of the OME, this improvement was accomplished at the sacrifice of the students' awareness in other areas and of their overall interest in the presentations, as they wanted to learn more about the devices than of the engineers behind the devices. While associations can at least be made via the OME to link engineer with artifact, other mechanisms will need to be employed to fully develop Billington's vision of incorporating the human element into the engineering curriculum.

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Appendix A.

Notes on Oral Presentation Evaluations

This class utilizes a rubric that measures a portion of the RSVP specification criteria for evaluating oral presentations developed by Jessica Renaud of The University of Iowa. Our goal is to help you to improve your oral presentation skills by focusing on remembering the criteria that makes for an effective oral presentation.

RSVP stands for the following:

R – Responsiveness **S** – Speech Patterns **V** – Verbal and Visual Rhetoric **P** – Physical

RESPONSIVENESS – Being responsive to an audience requires two separate actions:

1. **Understanding/analyzing the audience** requires a speaker to ask the following about the audience:
   - What do they need to know?
   - What don't they need to know?
   - What is their level of knowledge of this subject?
   - Why are they here? Why am I speaking to them?
   - How might I relate my science/technical information to their experience? If it's a lay audience: What kinds of analogies or metaphors might I use?
   - Have I explained/defined technical jargon?
   - Am I attempting to inform? Persuade? Excite intellectual interest? Assert the importance of my science?
2. **Creating an atmosphere of hospitality** allows a presenter to connect with the audience:
   - Using good eye contact.
   - Using names/shared experiences if appropriate.

SPEECH PATTERNS

1. **Volume** (Adequate to venue)
2. **Speed** **(**Easily discernable words)
3. **Enunciation** (To get too-fast speakers to slow down, get them to hyper-enunciate)
4. **Tonality** (not monotone; adequate tonal changes for emphasis)
5. **Tone down/Remove Verbal Tics.** Remove, as much as possible, "um" and "er" and—for the younger generation, "like". Learn to embrace silence between sentences/thoughts and don't use transitional 'and' and 'um' and other verbal sounds; end each sentence and then begin without a transitional sound.

VERBAL and VISUAL RHETORIC

1. **Verbal Rhetoric—structure of talk**. Oral speech differs from written in that it is ephemeral; it passes quickly. Therefore audiences for talks need a structured framework and judicious repetition. The old adage works here: "Tell them what you are going to tell them, tell them, and then tell them what you told them."
2. **Visual Rhetoric—effectiveness of visual aids**
   - Don't overuse slides.
   - Don't put too many words on a slide. Remember the 6x6 suggestion (6 lines/bullets; 6 words to a line).
   - Best use slides is for visual information (not just words), so use pictures, diagrams, graphs, charts and explain them well.

PHYSICAL

1. Does the speaker appear comfortable? (Note: some speakers are more comfortable behind a podium, some are not. It doesn't matter as long as the speaker appears comfortable and interacts appropriately with visuals and audience.)
2. Does the speaker use appropriate gestures? Gain a comfortable stance with his/her arms?
3. Does the speaker interact effectively with visuals OR does she/he look at them too much? Does she/he read off them?
4. Is the speaker's facial expression congruent with the material being presented (e.g., not smiling too much when providing serious information)?

Appendix B.

Ohio Northern University – Freshman Engineering 1 – Fall 2007 – Dr. XXXXX

One Minute Engineer Presentation Scoresheet

Student: _____ Date/Time: _____

Checklist:

- ☐ Email establishing topic received from student at least 48 hours in advance, excluding weekends.
- ☐ Topic area selected: Biography Device Newsworthy Word of the Day
- ☐ Topic: _____
- ☐ Memo containing content and references submitted by time of presentation.

Presentation: elapsed time _____ seconds

	Practitioner - 3	**Intermediate - 2**	**Novice - 0**
Length of Presentation	▪ 60 to 120 seconds	▪ 50 to 59 seconds, or ▪ 121 to 130 seconds	▪ < 50 seconds, or ▪ > 130 seconds
Responsiveness to the Audience	▪ Constant eye contact with audience	▪ Reasonable eye contact with audience	▪ Avoided eye contact with audience
Speech Patterns	▪ Speed neither too fast nor too slow	▪ Speed at times rushed or paused to fit time frame	▪ Speed was too fast or too slow
	▪ Volume was good – heard every word	▪ Volume was adequate; some words not heard	▪ Inadequate volume – many words not heard
	▪ No verbal tics (“um”) observed	▪ 1 or 2 verbal tics observed	▪ More than 2 verbal tics observed
Verbal Rhetoric	▪ Provided appropriate and interesting info on the announced topic	▪ Provided appropriate info on the announced topic	▪ Did not provide sufficient info on the announced topic
	▪ Well organized	▪ Reasonably organized	▪ Disorganized
Physical	▪ Did not or seldom used notes	▪ Occasionally referenced notes	▪ Read directly from notes
	▪ Displayed relaxed, self-confident nature	▪ Displayed mild tension	▪ Obvious display of tension / nervousness

Comments:

Final score: _____ Evaluator: _____