Assessment of Students' Learning Experience in an Oral Communication Course at MIT for EECS Majors

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Abstract – Electrical Engineering and Computer Science (EECS) majors at MIT are required to take an oral communications course that teaches oral presentation skills and other professional skills that students will need to be effective in the workplace. In this paper, we describe an assessment of the oral presentation skills component of this course performed during the Spring 2009 semester. This assessment consisted of two instruments: (1) a class survey of 71 enrolled students (with 60 respondents or an 85% response rate) and (2) student interviews in which 7 out of 10 randomly-selected individuals participated. The findings from both were consistent and positive: students were enthusiastic about the course, found it useful and viewed the experience positively.

Index Terms – Assessment, Technical communication skills, Oral presentations, Professional skills development.

INTRODUCTION

“6.UAT” is the name of a communication-intensive course, designed and taught by the second author, that is required for all MIT undergraduates majoring in Electrical Engineering and Computer Science (EECS). It is a course consisting of lectures and recitations that encourages students to think about effective oral technical communication and equips them with communication skills necessary to succeed in a professional technical academic/industry setting.

The course is offered every semester, and consists of a series of approximately 15 lectures and 17 recitations that take place over a 14-week period. Lectures are large group (70-250 students in attendance, depending on the semester). Students also meet separately in smaller groups of 8-9 individuals called “recitations”. Each recitation is led by a recitation instructor (an EECS Faculty member) and a teaching assistant (an EECS graduate student). While lectures are suitable for disseminating information and demonstrating material, the recitation is an intimate, interactive and supportive setting that is more conducive to small-group activities such as in-class exercises that complement/reinforce lecture material, and oral presentations that the students give as part of oral presentation assignments. (A more detailed overview of the course is given in [1].)

At the end of the course, students should have gained experience on how to:

- Critically evaluate technical presentations,
- Architect technical presentations,
- Present technical material to different audiences at different levels of detail,
- Give and receive feedback and
- Communicate more effectively in a professional setting.

In this paper, we review the findings of an independent assessment of the course which consisted of a survey and interviews.

METHODS

To assess the effectiveness of 6.UAT, we designed a survey and a 20-30 minute interview session that probed the following questions:

- How much experience and confidence did students possess at the beginning of 6.UAT?
- How did students find the 6.UAT learning experience?
- What impact did 6.UAT make?
- Would students take 6.UAT if it were not mandatory?

The survey questions and interview format were both primarily developed by the first author, in consultation with the second. Both instruments were administered late in the semester, i.e. after the last lecture and recitation have occurred, but before the completion of all final oral presentations. The entire process (design, administration and analysis of both instruments) was overseen by the first author who is not a member of the 6.UAT teaching staff and is affiliated with MIT’s Teaching and Learning Laboratory, an entity that is separate from and independent of the EECS Department.

Recruitment

Students enrolled in 6.UAT in Spring 2009 received an email requesting they bring their laptops to the last class so
that they could complete a short online survey. We emailed students who did not attend the last class asking them to complete the survey. In addition, we independently invited ten randomly selected students to participate in individual interviews where they would have an opportunity to discuss their 6.UAT experience. We offered no incentive for either survey or interview participation.

Survey

The EECS 6.UAT Survey consisted of 71 items that addressed class profile, learning experience, activities, impact, and students' view of the experience, and took about 12 minutes to complete. Question formats included multiple-choice questions and rating scale items. Most of the rating scale items followed a Likert scale format: students rate their degree of agreement with each statement by means of a seven-point rating scale where a value of "1" represents "strongly disagree," "4" represents "neutral," and "7" represents "strongly agree."

A scale is a group of survey items that collectively represent a behavior or attitude, and this survey included two: one on explaining ideas ("explaining") and another on impromptu speaking ("thinking on feet"). These two scales measured students' perception about how well they thought they could express their ideas and think on their feet while making an oral presentation.

Interview

We conducted individual interviews with randomly selected students who agreed to participate. Using open-ended questions, we explored their views about impact, motivation, intent to continue to work on presentation skills, and a willingness to take 6.UAT if it were not required. Interviews were taped with a voice-recording device and lasted about 20-30 minutes.

Statistical Analysis

The analysis included the following procedures: descriptive statistics (means, standard deviations, frequencies), factor analysis (varimax rotation), coefficient alpha, paired t-test, and MANOVA. Factor analysis was used to develop the two survey scales. Coefficient alphas were computed to determine the reliability of each scale. MANOVA determined if there were any differences due to recitation instructor in terms of explaining, thinking on feet, or perception of how well other students improved.

RESULTS & DISCUSSION

Of the 71 registered students, 60 responded to the survey (response rate of 85%) and 7 (out of 10 randomly selected individuals) agreed to be interviewed (response rate of 70%). Their responses generated findings that are not only very positive, but also very credible given the high response rates and confluence of findings from (1) the EECS 6.UAT Survey and the student interviews that explored (2) students' views' of their experience and gains they observed in their own abilities, in addition to (3) the gains they observed in other students.

In this section, we review four areas of survey data: class profile, learning experience, skill reinforcement, and impact. We then summarize findings that emerged from the content analysis of students' interview comments about the impact of 6.UAT, student motivation, and student willingness to take 6.UAT if it were not required. Although the recitation sections were taught by three different instructors, we do not report results by instructor because an MANOVA revealed no statistical differences among the three instructors (Wilk's Lambda: \( F=1.239, p=.294 \)).

Survey Findings

Profile of Participants

The sixty students who participated in the survey study included 5% sophomores, 80% juniors, and 15% seniors. Respondents included 63% male and 37% female. Students began 6.UAT with limited experience making oral presentations. Prior to 6.UAT, 64% had given four or less oral presentations as part of their course work; only 27% felt confident that they could make effective presentations. Thirty two percent\(^1\) began the class with a negative attitude; but 81% were motivated to improve their presentation skills at the start of the semester.

Learning experience

Students' responses indicate strong support for 6.UAT. They enjoyed the class, were pleased they took the class, and found 6.UAT an effective learning experience: 84% reported they found the experience effective, and 94% believed the oral presentation skills they learned will be of value in their future academic/professional life.

Students were motivated by 6.UAT. They reported that the class made them aware they were capable of improving their presentation skills and helped them to identify areas where they needed to improve. In terms of responses, 91% reported that the class motivated them to improve; 87% reported that they made an effort to produce high-quality oral presentations, and 84% reported that as the class progressed they became more comfortable presenting.

Skill reinforcement

There are several skills that various learning activities try to reinforce. For example, having students give impromptus is worked into three different recitations and in an assignment. Other skills include: explaining technical material, giving feedback, receiving feedback and being persuasive. Students were asked about the effectiveness of  

\(^1\) The percentage represents the percentage of students who responded slightly agree, agree, or strongly agree to the statement When I began 6.UAT, I had a negative attitude about the class.

Percentages reported in the remainder of the paper represent the same subset of responses.

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how these skills were reinforced through various activities in the course. They rate highly: explaining technical material (5.60), giving impromptus (5.09), and receiving feedback (5.31).

**Impact**

In terms of students' observations of gains made by other students, 92% of the respondents reported they saw improvement in presentations of the other students, and 88% reported they observed other students become more confident in their presentations.

In terms of students' perception of the gains they themselves made, students reported that as a result of 6.UAT they are more confident in their ability to present in real world professional situations (5.39), more aware of how well they communicate with others (5.49), and more aware of the effectiveness of other speakers (5.55).

The *explaining scale* mean of 5.28 suggests that 6.UAT made a significant impact on students' ability to express their ideas well. Respondents indicated they present more clearly (5.39), are more effective explaining their ideas (5.33), and are more confident explaining complex concepts to non-experts (5.20) and peers (5.22). In addition, every student reported that they/him/her improved on some aspect of delivery, e.g., gestures, posture, eye contact, or voice inflection. Students indicated they design more effective slides, think more about how to storyboard the information, and possess more effective strategies when they prepare their presentations.

Although positive, the *thinking-on-feet scale* suggests that the course made less of an impact (4.80) on thinking on one's feet than it did on explaining (5.28). Two factors most likely contributed to the difference. The curriculum focused more on explaining. And, thinking on one's feet is a more difficult behavior to strengthen cognitively from the perspectives of learners and instructors because it represents a more complex task, e.g., responding in a stressful situation to the unexpected by remaining calm, thinking clearly, and answering effectively.

However, although the *thinking-on-feet scale* mean is lower than the *explaining scale* mean, this does not indicate that 6.UAT did not have an impact on thinking on one's feet, it did. The *thinking-on-feet* data are encouraging. On one of the scale items, students indicated that as they present orally, they are more confident thinking on their feet (4.94). The ratio of positive to negative responses for the item was 67%:10%.

On another scale item, students responded moderately positively that they are less likely to become flustered by tough questions during Q&A (4.73). Among the non-scale items, we asked this question from a slightly different perspective: *I think in future academic/professional settings, I am more likely to remain calm and think clearly when asked tough questions during my presentation.* To this question, students responded more positively with a mean 5.39, a relatively high mean that supports the claim of the impact. That this mean differs at a statistically significant level from the 4.73 mean of the related scale item (paired t-test: \( t = -4.449; p = .000 \)) leads to the question, how strong was the impact in this area. Three other non-scale items related to thinking on one's feet indicate the impact might be stronger than suggested by the mean of 4.73. Students reported they are more confident handling interruptions or the unexpected (4.96), speaking extemporaneously in front of a small group (5.10), and speaking extemporaneously in front of a medium sized group.

**Interview Findings**

The comments of the students who participated in the interviews echo the survey findings. They were enthusiastic about 6.UAT: found it useful, viewed the experience positively, and believed it made an impact.

**Impact**

As a result of 6.UAT, they became more comfortable speaking; for several students this was a significant gain, given their high level of anxiety.

Students attribute their feeling of being more at ease to increased awareness of the importance of practice, greater understanding of how to prepare, and the number of opportunities to present formally and informally.

Students became more aware of the importance of presentation style, ranges of possible styles, value of storyboarding, and the roles that signposting, hand gestures, and intonation play in shaping presentations. Moreover, they gained a greater awareness and understanding of how to use the different components to make a cohesive presentation.

Students discussed that as they became more knowledgeable and skilled in presenting, they became more attentive when listening to other speakers in both academic and non-academic settings.

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2 Students used seven-point rating scales to indicate their degree of agreement with statements about the 6.UAT experience. For questions about the effectiveness of the course, the following rating scale was used. "1" represents very ineffective, "4" represents neutral, and "7" represents very effective. The value in parentheses is the mean of the responses for the item. A mean greater than 5.00 represents a very positive response.

3 Positive responses represent the percentage of respondents who slightly agreed, agreed, or strongly agreed with the statement. Negative responses represent the percentage of respondents who slightly disagreed, disagreed, or strongly disagreed with the statement.
Part of their stronger listening behavior centered on critiquing presentations: style, hand gestures, eye contact, and how speakers responded to questions. These critiques not only included how speakers used specific presentation skills, but also how they used them collectively to create a successful or less than successful presentation.

The 6.UAT experience increased students' realization that presentation skills would be of value in graduate school and their professional life. One student summed it up as follows:

These are the skills I need when I want to convince people that my ideas are good or when I'm seeking feedback. If you cannot communicate your ideas, technological or not, people are not going to pay attention.

Intent to continue work on oral presentations

Without exception, every student interviewed stated he/she would continue to work on presentation skills.

Now that I am more aware of what I'm doing, it's easier to work on communication skills. Because of Tony, I am motivated, willing to get into things or situations where I can work on my skills or participate in activities that force me to become more outgoing.

6.UAT has given me everything to prepare and give a good presentation. I am definitely more comfortable. I have more tools; the ball is in my court, now, it's up to me. I will continue to work on my communication skills, especially negotiation. I also want to work more on my hand gestures and intonation. I will continue to work on these areas through practice in UROPs [Undergraduate Research OPPortunities at MIT] and internships.

Motivation

The course motivated students. While one student admitted he wished he had worked harder, the other students discussed how hard or thoroughly they worked to prepare for their presentations. One underestimated the demands of the course, several realized the importance of the ability to present well, and some were motivated by their recitation to work hard.

I enjoyed my recitation. I liked the other students. 6.UAT did a good job of respecting your time. I was motivated because I knew how much time I should devote to put into each presentation. I was also motivated because I got along with the other students in my recitation. I wanted to present well in front of them.

Everyone in the recitation participated. Everyone had fun, we laughed a lot. The recitation was a friendly atmosphere.

If 6.UAT were optional

6.UAT is currently a required course for all EECS majors. When asked “If 6.UAT were optional, would you still have taken it?”, six of the seven students responded that although 6.UAT made an impact, they would not have taken 6.UAT if it were optional. Their reasons vary tremendously:

If Tony was not teaching the class, it might not have been a good class. The lectures and recitation are very dependent on the teachers. Although I learned a lot about presentations, I would not have taken the class. I would have taken a voice class.

If optional, I would not have taken the class. I would have been looking for a class that covers requirements or addresses my academic interests. If it were optional, I don’t think many students would take it.

I would not have done 6.UAT if it were optional because of the workload; it was too much.

No, not likely. It’s highly improbable I would have taken this class if it were not required because I’d rather be in my comfort zone. I would not have known what I did not know about presenting.

If 6.UAT were optional, I would not have taken it because I’m a double major.

If 6.UAT was optional I would not have taken because of previous experience and need to meet requirements in two different departments.

CONCLUSIONS

Both survey and interview findings suggest that the 6.UAT experience is effective in helping students develop their oral presentation ability. Student perceived an impact both in themselves and in their peers, and we conclude this paper with some remarks from students regarding the impact that 6.UAT has had on them.

Although before the class started I wasn’t expecting much from it, it turned out to be one of my favorite classes.

Before 6.UAT I had done a lot of presentations in industry and for subjects. However, the class showed me that my presentation skills were not as good as I thought. I learned a lot in 6.UAT.

By practicing, I got over my nervousness. I was confident before, but when it came to presenting, I would get shaky. Now, there is still an adrenalin rush, but I can harness it.
I realize it takes a lot of time to create a presentation. In the past, my preparation consisted of making slides. Now I practice.

6.UAT helped me to create cohesive presentations. I know how to storyboard, how to use slides. I use slides so that they don’t detract from what I’m saying. Now I think about the message I want to convey.

I am more analytical when I listen to other speakers. I am more aware of when a presentation goes well, and can identify the factors that made it work.

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REFERENCES


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Appendix: Interview Questions

1. Who was your recitation instructor?
2. What impact did 6.UAT make on you?
3. What changes did you observe in other students in your recitation?
4. How motivated were you? How much effort did you put into the assignments?
5. Do you intend to continue to develop your communication skills? If so, what and how.
6. What from the experience do you believe will be useful within the next few years?
7. If 6.UAT were optional, would you still have taken it?