AC 2008-74: ORAL COMMUNICATION SKILLS WORKSHOP FOR STUDENTS IN ENGINEERING AND APPLIED SCIENCE

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Oral Communication Skills Workshop for Students in Engineering and Applied Science

Abstract

This paper provides an overview of a two-week non-credit workshop that focuses on the skills needed for effective formal oral and poster technical presentations. It is required for all graduate students in the Department of Chemical and Biomolecular Engineering at the National University of Singapore. Special considerations are a relatively large number of students (45-75) from diverse cultural backgrounds, many of whom do not have English as their first language. The Workshop involves a four-hour overview focusing on the organization and style components of both formal oral and poster technical presentations. Examples of both a PowerPoint® and poster presentation are given to illustrate effective communication skills. Each student gives a short presentation that is digitally recorded and critiqued by the Workshop Coordinator and seven other students. Subsequently the Workshop Coordinator discusses the digital recording with each student via a 30-minute one-on-one consultation. All Workshop materials including the digital recordings can be downloaded by the students from a dedicated website. Student feedback is obtained via an anonymous formal evaluation and via postings on the website.

1. Introduction

The focus of this paper is to provide an overview of a Workshop on Oral Communication Skills that the author has taught for the past two years in the Department of Chemical Engineering at the National University of Singapore. This non-credit Workshop is required for all graduate students in the Department. The Workshop goals are to prepare students to make both formal oral as well as poster technical presentations. Considerations that present special challenges are that the Workshop involves a relatively large number of students (45-75) from diverse cultural backgrounds (primarily from China, India, Indonesia, Malaysia, and the Middle East) for many of whom English is not their first language. As such, many of these students are more reticent and less outgoing than typical U.S. students. Interestingly, components of effective public speaking such as maintaining good eye contact, lightening up a talk with humor, or 'dressing for the occasion' can be difficult to implement for students from some cultures.

In writing this paper the author had some difficulty in deciding in which voice to write the paper; that is, whether to consider the reader to be a student, who might be taking this Workshop, or an educator, who might be faced with coordinating a similar workshop. The end result was a compromise between the choices. Hence, parts of this paper that deal with the creation of the website for this Workshop, the nature of the materials posted on this website, evaluation and student feedback, and the challenges faced in coordinating this Workshop are directed towards the educator. However, parts that deal directly with good oral communication skills technique are directed towards the student. Hopefully looking at what is presented to the student will be helpful to the educator who is interested in teaching a similar workshop.

This paper is organized as follows. Section 2 describes the materials posted on the dedicated website created for this Workshop. Section 3 provides an overview on organizing a technical

presentation. Section 4 discusses preparations prior to making a presentation. Section 5 focuses on delivering the presentation. Section 6 discusses special considerations in making a poster presentation. Section 7 discusses how representative PowerPoint® and poster presentations are used to illustrate effective oral communication skills. Section 8 discusses the format for the critiquing of the student presentations. Section 9 reviews how the one-on-one student consultations are conducted. Section 10 summarizes the student feedback and Workshop evaluations. Section 11 provides some metrics that document the effectiveness of the Workshop. Section 12 summarizes continuing challenges faced in coordinating this Workshop.

2. Workshop Materials and Website

A dedicated website was created from which the following materials could be downloaded by the students: (1) Workshop syllabus; (2) Workshop Coordinator's qualifications; (3) handout on organizing a technical paper presentation; (4) handout on style considerations in presenting a technical paper; (5) handout on making a poster presentation; (6) typical criteria used in judging a poster competition; (7) list of references on oral communication skills[1–8]; (8) schedule for student presentations; (9) critique form for the student presentations; (10) sample critique form completed by the Workshop Coordinator to indicate how constructive feedback can be provided to the student presenters; and, (11) Workshop evaluation form to be completed anonymously by the students. The digitally recorded student presentations, four hours of lectures by the Workshop Coordinator, and illustrative PowerPoint® and poster presentations given by the Workshop Coordinator were also posted on the website. The website also serves as a forum for feedback from the students.

3. Organizing a Technical Paper Presentation

A technical paper presentation can involve the following components: (1) Abstract; (2) Title Slide; (3) Outline; (4) Introduction; (5) Review of Prior Studies; (6) Research Plan; (7) Discussion; (8) Conclusions; (9) Future Work; (10) Acknowledgments; and (11) 'Thank You' slide. Components (2), (3), (4), (5), (7), and (8) are critical to any technical presentation, whereas the others might not be necessary in some cases.

3a. The Abstract

An Abstract is not used for a formal oral presentation, but might be used for a poster presentation. The value of an Abstract is that it helps a poster to be clearly understood even when the presenter is not there to discuss it. The Abstract should include the following: summary of the research focus; brief statement as to the importance of the focus area; concise statement of the research objectives; and selected specific major results or conclusions.

3b. Title Slide

Both formal oral as well as poster presentations must have a Title Slide. The title should be descriptive but as brief as possible. The Title Slide must include the co-authors and their affiliations. Optional items include the forum for the presentation (i.e., the name of the meeting, conference, etc.) and the presentation date. It is also good to include your email address and/or

website or that of your research group. Including this contact information is important if you are searching for a post-doctoral position or a job.

3c. Outline Slide

The Outline of a technical presentation should indicate how it is organized. Mention briefly what will be covered in each part of the presentation. It is essential to indicate where the objectives will be stated and conclusions summarized.

3d. Introduction Section

The purpose of the Introduction is to generate interest. It should indicate the general focus of the presentation and provide some background information on it. Some rationale should be given for studying the particular focus area. This should lead to the problem(s) that will be addressed in the presentation. The specific objectives of the work usually are stated in the Introduction. Remember to define any special terminology such as acronyms that will be used.

3e. Review of Prior Studies Section

Nearly all technical presentations build upon prior studies. Prior studies can be summarized as a chronological review of relevant papers, theses, patents, etc., or presented in a table summarizing the principal contributions. Alternatively, papers can be cited via footnotes, which are helpful when space is limited. Provide a critique at the end of the review of prior studies in which you critically assess the state-of-the-art. An effective critique should provide strong justification for the stated objectives of the study. In some cases it might be appropriate to state the objectives at the end of the Review of Prior Studies rather than at the end of the Introduction.

3f. Research Plan Section

A Research Plan is not needed if the presentation is a review of the state-of-the-art without including any of your own research. Begin the Research Plan by indicating the challenges or design considerations that had to be addressed in the work being presented. Indicate how the particular problem was addressed. Provide a concise explanation of the methods used. In discussing the design methodology for experimental studies you should summarize the final experiment design. It is good to include a schematic, photograph, or animation of the apparatus. Summarize the design parameters and the range of the variables that were studied. Indicate how the relevant variables were measured. Summarize the procedure for the experimental studies. In discussing the design methodology for modeling studies, begin by summarizing the modeling approach. Indicate the assumptions involved in the model. A synopsis of the principal equations might be appropriate. However, keep the number of equations to a minimum especially if speaking to an audience who are not experts in the field. A block diagram is convenient for summarizing a complex solution methodology.

3g. Discussion Section

It usually is impossible to present all your results within the time constraints of a typical presentation. Hence, you should present representative results in the form of graphs, figures, tables, photographs, micrographs, simulations, etc. It is important to clearly label with large font all graphs, figures, micrographs, etc. Show experimental or numerical simulation data via discrete points on graphs. Show analytical solution results via continuous lines without points. Indicate how any lines through your data were determined; that is, by eye or via some best fit procedure. Indicate the goodness-of-fit via some appropriate measure such as the correlation coefficient. Always indicate the scale for photographs, micrographs, etc. Indicate the reproducibility of your data via some appropriate measure such as replicate runs, error bars, statistical norms, etc. Discuss interesting observations emanating from your data or modeling studies. Be certain to stress the novelty and significance of your results.

3h. Conclusions Section

A Conclusions section is required even if you are making a presentation on an overview of the state-of-the-art in some field. The Conclusions should be brief and concise. They also should relate back to the specific objectives. In general there should be at least one conclusion corresponding to each objective, although there certainly can be more.

3i. Future Work Section

A Future Work section is usually not included in presentations at technical conferences and symposia. However, it might be quite appropriate for presentations such as a thesis defense, seminar for a job interview, and reports for work being done under contract or for an employer.

3j. Acknowledgments Section

The Acknowledgments should include any agency and grant or contract number that provided funding for the research. The Acknowledgments should also include anyone who provided significant help such as other researchers in your laboratory, faculty members who provided useful suggestions, and other technical and clerical personnel who provided special help.

3k. 'Thank You' Slide

The 'Thank You' slide is a simple slide thanking the audience for their attention. It is a good idea to include your email address on this slide. This is particularly important if you are looking for a post-doctoral appointment or a job.

4. Preparations Prior to Giving a Presentation

4a. Preparing an Outline

It is important to outline your presentation so that you are acutely aware of its flow. Keeping a small card in your pocket with a mini-outline can help if you forget where you are in your presentation. If you do forget what comes next in your presentation, avoid using awkward

interjections such as ‘ah’ or ‘um’. It is better to pause for a moment and if necessary pull out the mini-outline to get back ‘on track’ in your presentation.

4b. Preparing the Visuals

In general one needs to avoid complexity or too much material in preparing the visuals. When it is necessary to have a lot of material on a visual, use PowerPoint® animation to have successive lines ‘enter’ upon a mouse click as they are discussed. This avoids having the audience read the entire visual while you are trying to explain the material sequentially. For a PowerPoint® presentation you should use a font size that can be read easily from the most distance point in the room. Use Arial, Tahoma, Verdana, or similar simple font rather than more florid fonts such as Times Roman, which is the default font in PowerPoint®; the former are easier to read especially when the font size becomes smaller or for people whose first language is not English. You need to be aware of the room lighting; a color scheme for the visuals that looks good in dim light might be washed out in brighter light. It is a good idea to use dark fonts (black or dark blue) on softer lighter backgrounds. However, avoid sharp contrasting colors such as black on white, red on green, yellow on black, etc. Maintain a color scheme for the visuals with an occasional departure for emphasis. Be careful in choosing a template; some templates can be distracting or can reduce the amount of space available for presenting your materials. An attractive template is often one that promotes your organization; most universities have a template that includes their logo. Note that changing the color or size of the font is effective for emphasizing particular words or phrases in the visuals. Number the visuals since it makes it easier for people to ask questions later about the information on a particular one. Finally, proofread your visuals thoroughly; do not trust using ‘spell-check’ utilities.

4c. Scoping Out the Presentation Forum

Scope out the room for your presentation with respect to its layout, lighting, and sound system. Visit it beforehand in order to assess its layout so that any problems with respect to maintaining effective eye contact can be identified. Determine if a microphone will be available and whether it is fixed or will permit you to roam. If the latter, determine whether it will be a clip-on or hand-held. It might be necessary to clip the microphone transmitter onto a belt or place it in a pocket in which case you need to dress appropriately. It might also be necessary for you to control the LCD projector, the microphone volume, or the lights. Hence, it is imperative that you learn how to do this before the presentation. Determine if a laser pointer will be provided and learn how to use it. Carry a back-up laser pointer since the one provided by the conference, symposium, etc., might malfunction; indeed, the batteries fail only when in use! Consider purchasing a laser-remote that serves as a laser pointer while also permitting control of the LCD projector via a USB port plug-in that does not require installing any software.

4d. Dressing for the Occasion

Formal presentations at technical meetings generally require a suit or sport coat for men and a smart outfit for women. Exceptions are when the meeting is in a casual setting or in a very warm climate. Determine the proper attire well in advance of your presentation. Women need to consider wearing attire that will permit clipping on a microphone and possibly accommodating a

pocket transmitter. If the microphone is the portable type, help the session chair clip it onto your lapel or jacket and to slip the transmitter into your pocket.

4e. Exchange Information with the Session Chair

Beforehand it is helpful to pronounce your name for the person who will be introducing you. You also should learn how to pronounce the name of this person so that you can thank them by name after being introduced. Avoiding mispronunciations can save some embarrassment for both of you. Do not repeat the title of your talk or the names of the co-authors if they are mentioned when you are introduced.

5. Giving Your Presentation

5a. Beginning Your Presentation

Generate interest early in your presentation. This can be done by providing some provocative figures (e.g., world energy use, the increase of CO_2 in the atmosphere, the impact of exponential population growth on water resources), using a rhetorical question (e.g., "How would you solve the problem of pulmonary disease patients who need oxygen when traveling on commercial airlines?" or "How would you minimize greenhouse gas emissions without severely impacting the world economy?" or "How would you propose to address exponential population growth with due consideration to varying religious beliefs?"), by using a provocative image (e.g., the size of a MEMS device for delivering pharmaceuticals next to a familiar object such as a coin or the calving of glaciers in the high Arctic owing to global warming). A general recommendation is to create an electronic file of provocative figures and images that you can use as a resource when you need material of this type.

5b. Pacing Your Presentation

Have a good idea of the time that you want to allocate to each part of your talk. A good rule-of-thumb is to allow at least one minute for each visual. In general you should reach the objectives of your study approximately one-quarter to one-third of the way into your presentation. Remember that the principal part of your presentation is usually your results; hence, it is very important to allow ample time to discuss them. Look at the time throughout your presentation to make certain that you are on schedule. Never run over your time limit even if keeping on time requires that you delete material from your presentation.

5c. Vocalization

It is very important to speak loudly. This is easier for men with stronger voices than for women. For this reason women need to work on projecting their voice. Use a microphone if it is available. Avoid talking directly into and then away from the microphone; this can cause very annoying variations in the loudness of your voice. Do not speak in a monotone voice; use voice inflections occasionally; show excitement regarding your research results. Occasionally use the pause for emphasis. If English is not your first language and you speak with an accent, make an effort to speak more slowly so that you can be easily understood. Try to suppress coughing or

sneezing during your presentation. When necessary direct a cough or sneeze away from the microphone so that it is not amplified. Remember to excuse yourself if you cough or sneeze.

5d. Eye Contact

Be aware of effective eye contact. Try to engage individuals located at every point in the room. When presenting to a large audience, identify five individuals located at the near right and left, middle, and far right and left. By subsequently remembering to establish good eye contact with these five individuals, you will be aware of maintaining good eye contact everywhere in the room. Watch eye contact to your right if you stand to the left of the screen as viewed by the audience; similarly, watch eye contact to your left if you stand to the right of the screen. Be careful that you do not continuously look at the screen; look to see what is on the screen and then turn to your audience to discuss it. Know the flow of your presentation so that you can anticipate your next visual. Effective eye contact as well as easy access to looking at the screen when necessary can be achieved by standing to one side and positioning your body at an angle of 30–45° to the screen so that you are always facing the audience.

5e. Body Language

Watch your body language. Do not shuffle or engage in awkward mannerisms such as scratching your head, adjusting your glasses, playing with the laser or mechanical pointer, etc. Avoid body language that sends the wrong message such as a clenched fist. Assume a professional posture; avoid slouching, shuffling, having your hands in your pockets, and other undesirable negative body motions. Be aware of the acoustic system for your presentation. Stay by the microphone if it is attached to the podium. However, moving around a bit can be effective. In a small room moving towards the audience can be useful to engage them. Remember, moving around can be done only if you have an attached microphone or are in a small room not requiring a microphone.

5f. Using a Pointer

Use a laser pointer for presentations in a large room. Hold the laser pointer steady since small movements are magnified with increasing distance from the screen. If your hand shakes, try holding the pointer with two hands. Never direct the laser pointer toward the audience. Use the laser pointer to point to specific elements on your visuals (e.g., bulleted objectives, important details in your apparatus, specific trends in your data, etc.); avoid waving the laser pointer randomly. Use a mechanical pointer for a poster presentation since your audience is too close for effective use of a laser pointer.

5g. Using Humor in Your Presentation

Using humor is somewhat of a cultural thing; Westerners tend to use it more than people from Eastern Europe, the Middle East, or Far East. Surprisingly, people from all cultures seem to enjoy humor when it is done in good taste and in moderation. In general, avoid humor involving politics, gender, race, religion, and sexual orientation. Humor can be introduced either orally or via one's visuals; clip-art is an effective way to introduce humor without the need to say anything about it. A good way to introduce humor verbally is to use a quotation from a famous

person, a familiar adage, or a poem. It is usually difficult to find just the right quotation, poem, clip-art, etc., when you need it; hence, it is a good idea to keep an electronic file of good material for your presentations when you find it.

5h. Using Animations and Sounds

Animations, other than for introducing material sequentially in more detailed visuals, should be used sparingly since they can distract from what you are trying to say. If you do use an animation, do not continuously run it; have it repeat two or three times at the most. One effective use of animations is to illustrate how an apparatus works; these can be far more effective than just showing a photograph of the apparatus. In general, sounds should be avoided unless you have a very good reason for using them.

5i. Ending Your Presentation

Including a 'Thank You' slide can provide a nice way to end your talk on a 'light note' with some humor. Thank the organizers of the meeting or conference for the opportunity to make the presentation. Thank the audience for their attention. Invite questions if they are allowed. It is especially important to put your contact information, email address and/or web site, at the bottom of your 'Thank You' slide since if you have given a good talk, someone in the audience might be interested in learning more about you and/or contacting you about a job.

5j. Handling Questions

Determine whether you or the session chair will recognize questions from the audience. If the room is large and the people asking questions do not have access to a microphone, always repeat the question. Thank the person asking the question and perhaps add a nice compliment such as "That is a very good observation." Try to be brief in answering questions so that you can field as many as possible. Avoid any arguments with people asking questions; if disagreement arises, suggest that you can discuss the issue with the questioner after the session. Do not be embarrassed to say that you do not know the answer to a question; if one of your co-authors (e.g., your research advisor) is present who might be able to answer the question, refer it to them; this means that you need to know where they are sitting in the audience!

5k. Handling Nervousness

Everyone becomes a bit nervous before giving a presentation. Nervousness is an expression of the excitement you experience when making a presentation; if handled properly, it can be channeled into excitement that you can project to the audience. You need not be overly concerned if English is not your first language and you speak with an accent. Believe it or not, most native English-speaking peoples enjoy hearing English spoken with an accent! Your nervousness can also be projected to the audience, which can make them uncomfortable since they will empathize with your discomfort. Hence, you should try to reduce any manifestations of nervousness as much as possible.

Nervousness can be controlled. Remember that for most technical presentations you are an authority in the field that you are talking about; hence, you have no reason to be afraid. It is important to watch what you eat before giving a presentation. Some foods are not easily digested when you are excited; this can cause added discomfort. Having a glass of water available can help control the 'dry mouth' that sometimes accompanies nervousness. One visible sign of nervousness is shaking the laser pointer; avoid this by holding the laser pointer with two hands. Sometimes introducing humor early in a talk helps to loosen up both you and the audience. Another way to loosen up for a presentation is to ask a question or two of the prior speakers in the session. Yet another way is to smile occasionally at people in the audience whom you know; these people will inevitably then smile at you, which will be reassuring for you. A very effective way to combat nervousness is to memorize a 'show stopper' at the beginning of your talk. For example, if you are giving a talk on developing a hydrogen energy economy, you might start your talk with a statement such as "Do you know that if we do not develop an economic safe method for hydrogen production within the next ten years, none of us will be driving a car in 25 years!"

Avoiding all mistakes in a presentation is virtually impossible. Hence, be ready to handle mistakes in a professional manner that will not make your audience feel uncomfortable. If you make an awkward mistake, you can use the occasion to introduce spontaneous humor. For example, when the author states something incorrectly in a talk, he sometimes says "Oh, I forgot to tell you that you should not pay attention to what I am saying but should focus on what I am thinking – what I was thinking was……" (and then he corrects the error!) This gets the audience to laugh and puts both them and the speaker at ease. Develop some 'one-liners' for this purpose that you can 'pull up' when you need them.

Remember that giving a formal presentation is your chance to 'shine' – take full advantage and enjoy every minute of it! The easiest way to avoid nervousness is to practice public speaking as often as possible. Look for opportunities to present your work; begin with research group meetings and regional conferences and work up to national and international meetings. If possible, make poster rather than formal oral presentations at your first few major meetings.

5l. General Tips on Developing Style

When listening to a presentation that you really think is very good, try to determine why the speaker was so effective. The critique sheet used to provide feedback for the student presenters in this Workshop is also a good guide for dissecting a technical presentation to determine why it was particularly good or bad. Pay attention to how polished speakers use humor and animations. Each of us is different – develop your own style!

6. Special Considerations for a Poster Presentation

6a. General Comments

Determine how much space will be allocated for your poster. Determine if tape, thumbtacks, or Velcro® will be provided to put up your poster. It is a good idea to bring tape and thumbtacks even if the organizers indicate that they will be provided. Bring a mechanical pointer for your

presentation; never use a laser pointer for a poster presentation. The general rule for a good poster is that it should be understandable even if you are not there to talk about it. The color scheme should be chosen in view of the fact that poster sessions are always given in a well-lighted room; color schemes that could be too harsh in a dark room might look very good for a poster presentation. In general the color scheme should be uniform since the entire poster is viewed at once; changing the color scheme can be distracting. Although a poster is less formal than an oral presentation, it requires that you be much better prepared since you will be interrupted continually during your overview; you need to know the flow of your presentation extremely well. Proofread your poster material thoroughly; do not trust spell-check utilities. Most student technical paper competitions tend to be poster sessions; hence, it is strongly recommended that you master the art of presenting a poster well!

6b. Organizing Your Poster

Determine if you are going to use a left-to-right row or column layout. If for some reason you need to mix the row and column layouts, use easy-to-see arrows to indicate the flow. It is good practice to number each panel in your poster irrespective of whether you print it as one or more panels containing multiple visuals or as individual pages; this helps people follow the organization of the materials in your poster. Include the title of your poster, the co-authors, and their affiliations; this can be done in a 'banner' than spans your entire poster or by using just one visual of your poster; however, in general the latter is less effective. Include your email address and/or web site, either at the bottom of the title banner or at the bottom of the last visual. Use sufficiently large type font for your visuals; the general rule is that anything on your poster should be easily readable from three meters.

6c. Printing Your Poster

The norm is rapidly becoming printing a poster as one or more panels containing multiple visuals. This format is very polished and professional. It has a limited height (typically ~100 cm) but unlimited width if printed in the 'banner mode' using PowerPoint®. The printing can be glossy or laminated; the latter provides some protection against scratches, moisture, etc. The panels are easy to put up. However, this format is more expensive (~$75) for the typical poster. This mode requires more lead time. Moreover, errors cannot be corrected or additions made conveniently. The panels are more difficult to transport particularly on an airplane. Special rigid tubes can be purchased for carrying the rolled-up panels.

You can also print your poster as a series of individual visuals or pages. This format is less professional in appearance and takes more time to put up. However, it has the advantages of being inexpensive, requiring little lead time to prepare, permitting changes to be made easily even on site, and transporting it very easily.

Irrespective of which mode you choose for printing your poster, it is a good idea to provide copies of your poster for interested listeners. If possible, put these copies into a folder or envelope affixed to the board provided for your poster.

It is important to proofread your printed poster. Do not assume that your printed poster will be error-free just because you carefully proofread the file that generated it. If the printing was done on a printer that did not have or used a different version of the software (e.g., MathType®) than you used in preparing the poster, some symbols might not be printed correctly.

6d. Engaging Your Audience

Be prepared to go through your entire poster in five minutes or less. Do not give your poster to just one person when other people are present. Bring 'late arrivals' to your poster 'up to speed' on where you are in your overview. If someone arrives when you are nearly at the end of your overview, recognize the late arrival and tell them that you are just finishing and will provide them with an overview shortly. Effective eye contact and body language are even more important in poster presentations.

6e. Techniques to Make Your Poster More Effective

Remember that humor can also be used to make a poster more entertaining; clip-art can be very effective for this purpose. Bring along a sample or something to pass around (e.g., a microchip, a hollow fiber membrane, samples of 'before' and 'after' such as dirty water feed and clean water permeate). Give them something to take home with them (e.g., an LCD screen wiper or pen with your school logo on it). Include a 'pocket' or small box on your poster that contains your business cards. A 'pocket' on your poster can also be used for copies of the visuals for your poster or a list of relevant publications of your research group.

6f. Poster Session Courtesy

Presenting a poster requires that you be aware of special courtesy considerations. Be at your poster throughout the times for your session. Since poster sessions involve simultaneous presentations, be aware of the other presenters around you. Avoid having your audience 'spill-over' into the space of the poster presenters adjacent to you. Be careful not to 'drown-out' other poster presenters particularly if you are a man with a loud voice. Sometimes poster sessions involve refreshments; be careful not to talk when you are eating! A significant difference in giving a poster is that you are in close contact with your audience; hence, be careful about what you eat before you give your poster; in particular, onions, garlic, coffee, etc., can give you an objectionable bad breath that could cost you an award! Welcome the people who come to your poster and thank those who stayed for your overview.

6g. Criteria Used in Judging Poster Competitions

Most student technical paper competitions involve poster rather than formal oral presentations. The judging is based on both the technical and non-technical aspects of your presentation. The technical typically accounts for 60% and is subdivided equally between content and comprehension. Content relates to the importance of the problem studied, how well it was introduced, the professional maturity of the approach taken to address the problem, the significance of the results presented, and the strength of the conclusions drawn from the study. Comprehension relates to how well the judge perceives that you understand the problem you

studied and the significance of the results you obtained; clearly, handling the questions well contributes to a good score on comprehension. The non-technical aspect accounts for 40% and is subdivided equally between organization and presentation. These two components have been discussed in detail in sections 5a-5f.

7. Presentations Illustrating Effective Oral Communication Skills

7a. PowerPoint® Presentation

The Workshop Coordinator gives a PowerPoint® presentation to illustrate effective oral communication skills. This presentation is digitally recorded and posted on the Workshop website so that the students can download it. During this presentation, which takes around 30 minutes, the Coordinator frequently will stop to point out how he has used some technique for emphasis or to get the audience's attention such as animation, humor, template color or design, the pause, voice inflection, body language, etc. Students are encouraged to ask questions during this presentation.

7b. Poster Presentation

The Workshop Coordinator also gives a poster presentation using a two-panel format, each panel of which contains several visuals. A box is included on the poster board that contains the Coordinator's business cards and an envelope is posted containing copies of the visuals. The students are encouraged to make this poster presentation as difficult as possible for the Coordinator! They are encouraged to come to the poster board at random times so that they see how new arrivals can be accommodated. They also are encouraged to distribute themselves in order to challenge the Coordinator in terms of eye contact and audience contact. This poster is also available for downloading on the Workshop website.

8. Critiquing of Student Presentations

Each student is required to prepare a 20-minute talk of which they present only the first ten minutes during which no questions are allowed. Eight students present during each two-hour Workshop session scheduled over as many days as needed to accommodate all the students. Each student presentation is digitally recorded and posted on the Workshop website. Five minutes are allocated after each presentation during which the Workshop Coordinator comments on the positive aspects of the talk. Focusing on the positive aspects is done to avoid embarrassing the student. Constructive criticism of the student presentations is done during the one-on-one consultation sessions. Each of the other seven students presenting on a given day also provides a critique of each student presentation using a two-sided template, one side of which focuses on the organization and the other on the style of the presentation. Having the students critique each other gives them practice in discerning positive and negative aspects of technical presentations and also provides peer-input to the student presenters. The student critiques are given to the student presenters at the end of the two-hour Workshop session.

9. One-on-One Consultations

The Workshop Coordinator schedules a 30-minute consultation with each student. Prior to this consultation the Coordinator has both attended the student presentation and viewed the digital recording. He begins the consultation session by going over his critique of the student presentation while pointing out particular things that they should observe when viewing the digital recording of the student's presentation. Ample time is allocated during the consultation for the student to ask questions.

10. Feedback and Evaluation of the Workshop

The Workshop website provides a forum for students to provide anonymous feedback. Each student is also requested to submit anonymously an evaluation form that is emailed to them for which a 90% response is typical. The evaluation requests that the student evaluate on a 4-point scale (4 = excellent) and provide comments on five components of the Workshop. The evaluations received for these five components for the three Workshops offered thus far are summarized in the following:

1. Value of written handouts (Fall 2006 − 3.59/4.00; Spring 2007 − 3.36/4.00; Fall 2007 − 3.38/4.00)
2. Value of Coordinator's overview and presentation on communication skills: (Fall 2006 − 3.82/4.00; Spring 2007 − 3.81/4.00; Fall 2007 − 3.89/4.00)
3. Value of students listening to and critiquing student presentations: (Fall 2006 − 2.91/4.00; Spring 2007 − 3.53/4.00; Fall 2007 − 3.56/4.00)
4. Value of one-on-one consultations with Coordinator: (Fall 2006 −: 3.77/4.00; Spring 2007 − 3.71/4.00; Fall 2007 − 3.69/4.00)
5. Overall rating of this Workshop on oral communication skills: (Fall 2006 − 3.41/4.00; Spring 2007 − 3.65/4.00; Fall 2007 − 3.61/4.00)

When the Workshop was first offered in the Fall of 2006, all students were required to attend every student presentation, which involved a commitment of 20 contact hours. For this reason the evaluation of components 3 and 5 for the Fall of 2006 were somewhat lower. The dramatic improvement in these components resulted from requiring only the eight students presenting on the same day to critique each other's presentations. Interestingly, the slight decrease in the evaluations for component 1 in 2007 appear to be correlated with making the Workshop materials available on a website rather than handing out hard copies. Providing an example of a poster presentation during the Fall of 2007 appeared to have no significant effect on the evaluations. These improvements in the Workshop resulted from constructive student comments.

11. Metrics of Success

Students who took this Workshop during the Fall of 2006 won the 1st , 2nd, and 3rd place awards in the oral papers competition and 1st and 2nd place awards in the poster competition at the 2006 Graduate Student Symposium at the National University of Singapore. Students who took this Workshop during the Spring or Fall of 2007 won the 4th place award in the oral papers competition and 2nd , 3rd, and 4th place awards in the poster competition at the 2007 Graduate Student Symposium at the National University of Singapore. A student who took this Workshop during the Fall of 2006 won 1st place among 230 posters presented at the 2006 Third Joint Asia

Oceania Human Proteome Organization and Fourth Structural Biology and Functional Genomics Conference.

12. Continuing Challenges in Coordinating this Workshop

This Workshop requires at least 20 contact hours in the classroom and 20 to 35 hours for the one-on-one consultations. An additional 6 to 12 hours are required to review the digital recordings of the student presentations. As such, this Workshop is very time-intensive and represents a major teaching commitment. The students would like to have more time for their presentations and for questions from the audience. The students have also suggested that the Coordinator give some examples of poor communication skills or things to avoid in public speaking. Another frequent suggestion from the students is to provide a similar workshop that would focus on written communication skills.

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