1. Oral Presentations

Nothing should be explained in a way that it cannot be understood by an intelligent 12 year old.—Albert Einstein

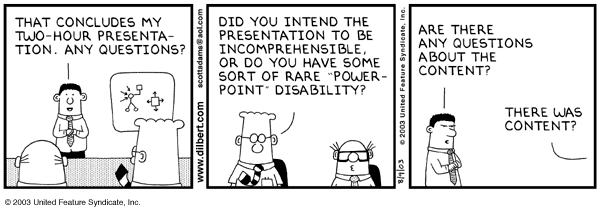
We can all probably remember the anticipation of our first oral presentation—the sweaty palms, butterflies in the stomach, and the pressure of trying to remember all the points to be made. Then there is the fear associated with standing up in front of peers or teachers and presenting ideas to have them openly criticized. According to a 1973 London Times survey, Americans are more afraid of speaking in front of groups than dying. Perhaps this is due to the fact that although people know they will die someday, the danger associated with giving a presentation is more imminent and a greater concern. Somewhere in the capstone design experience, it is likely that you will have to make an oral presentation. Examples are the project proposal, a mid-term design review, and the final presentation. The ability to communicate your ideas is important beyond your academic career, since practicing engineers are often required to make oral presentations. Further, your overall ability to communicate influences how others will accept your ideas and act upon them—those who communicate clearly are held in high regard by their peers and tend to advance more quickly. The good news is that there is help to overcome the fear of oral presentations. With practice and adherence to some basic principles, one can become a competent, if not excellent, communicator.

Learning Objectives

By the end of this chapter, the reader should:

* Understand how people evaluate oral presentations.
* Understand common elements of a technical presentation.
* Be able to assemble an effective presentation.

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**Figure 12.1** PowerPoint disability. (Dilbert © United Feature Syndicate. Reprinted by permission.)

* 1. How People Evaluate Presentations

It is informative to understand how your audience responds to and evaluates oral presentations. Listening to a presentation is strongly associated with what is referred to as right-brain activity. Right-brain activity is dominated by emotion and intuition, while left-brain activity is associated with logical thinking and reason. This is an oversimplified model of the brain, but the point is that emotion and intuition are important elements that people rely on when evaluating a presentation.

There are three elements, known as the “three V’s,” that constitute a presentation: the verbal, the vocal, and the visual. Verbal is what the speaker says—the actual words and content that come out of the speaker’s mouth. Vocal is indicative of how it is said, and includes pitch, enthusiasm, inflection, and intonation. Visual is what the audience sees—the speaker’s appearance, eye contact, posture, facial expressions, and gestures. All three factors go into the evaluation of speakers, but what is the relative importance of each? The results of a 1964 UCLA study by Dr. Albert Mehrabian (who has bachelors and masters degrees in engineering and a Ph.D. in psychology) indicates that the impact of the three elements is 7% verbal, 38% vocal, and 55% visual. That seems disappointing because we would like to think that the content of the presentation is most important. Realize that the numbers come from a simplified study and it is likely that that the percentages would be different for a highly technical audience. The point is that content is important, but the other elements can’t be ignored. If the visual and vocal aspects of the presentation are poor, it will be perceived negatively and make it difficult for the audience to accept and pay attention to the information presented.

Here is another consideration to think about the next time you make a presentation or meet somebody. In the first seven seconds of meeting someone, people typically form a great number of subconscious opinions about the person they meet [Bai81]. This includes the person’s income level, education level, competence, character, trustworthiness, personality, confidence, intelligence, work ethic, and dependability. Based on what factors are the opinions made? They include appearance, dress, posture, and speech patterns.

* 1. Preparing the Presentation

In order to make an effective presentation, the presenter must understand the subject matter (substance counts), understand the needs of the audience, and prepare the presentation. The remainder of this section provides guidance for preparing the presentation.

### Analyze the Audience

An oral presentation is for the benefit of the audience, not the presenter. It is necessary to analyze and understand the audience’s needs and prepare the presentation to meet them. For example, a presentation for engineering professors would likely be different from one for your family and friends. Analyzing the audience is no different than the process that one goes through when writing a document. Some questions to ask in this process are [Bai81]:

* What are they interested in?
* What do they want from your talk?
* What does the audience already know about my subject?
* What don't they know?
* What is the attitude of the audience towards me and my subject?
* What are the values of the audience?
* What do you want them to know or learn?

Understanding the needs of the audience and putting their interests first establishes credibility so that they are more willing to accept the content of the presentation.

Before creating the presentation, identify the main points that the audience should take away from it. A rule of thumb is to identify three main points for a talk, as people tend to forget more than that. Although it is not a strict rule, keep the number of points in that range, say two to five. Once the points are identified, organize the presentation to support them.

### Organize the Presentation

Just like a story, a presentation has an introduction, a body, and a conclusion. This is encapsulated in the often-heard wisdom for presentations to “tell them what you are going to tell them” (the introduction), “tell it to them” (the body), and “tell them what you just told them” (the conclusion).

The introduction is absolutely critical—if the audience does not understand the presentation from the outset, they will tune out. Einstein’s advice that nothing should be explained in such a way that it cannot be understood by an intelligent 12 year old is particularly relevant here. Take time to explain the problem in simple terms. Part of an effective introduction is obtaining the interest of the audience. There are many ways to accomplish this, and examples include the use of rhetorical questions or the narration of an experience that the audience can relate to. This should have to do in some way with the information being presented. Overall, the objective is to motivate the audience by describing what is being presented and why it is important. After giving motivation of the problem, an overview of the talk can be provided. The overview should be relevant to the problem at hand, not a generic one that can apply to virtually any presentation.

Structure the body of the presentation to support the main points. This is done by having a group of two to four related slides that support each of the main points. The first slide of the group provides some key ideas, followed by the remaining slides that go into more detail on the particular point. Don't make the talk unnecessarily technical or use a lot of jargon. This does not mean that it should not have technical content, but that judgment should be exercised in presenting the right amount of detail. The level of technical detail depends upon the education and experience of the audience. If it is necessary to use jargon or acronyms, make sure that they are defined for the audience. Consider alternative ways of explaining things. The use of analogies is particularly powerful when explaining complex and abstract material. One strategy is to increase the level of complexity as the talk proceeds. That way, much of the early material will be understandable to the majority of the audience, while the latter more complex material may only be understood by a small fraction. Everybody will then leave the presentation with some understanding of the content.

In a typical engineering classroom lecture, the professor usually goes through many steps in defining and deriving equations. Realize that the goals of a classroom lecture are very different from that of an oral presentation. When working with equations, don't derive or give too many intermediate steps, unless that is the point of the presentation. Provide assumptions, selected intermediate equations, and the important results. Audiences generally assume you have done your homework and derived the equations properly. There is a tendency to present equations, vaguely refer to them, and then move on. Equations should be presented for a reason, so talk about them and describe their significance. Every equation has its own story; it is the presenter’s job to tell it. The same is also true of graphs and plots.

The conclusion provides the opportunity to summarize and emphasize the main points of the presentation. Again, tell them what you told them by reviewing the important points and conclusions. That way if somebody was lost during the presentation, they can understand the importance of the work. If there are recommendations to be made for future action, address them here. The conclusion is also an opportunity to explain the next steps for the project.

### Lay Out the Slides

Below are pointers for the layout of the slide content.

* *Use a large font*. This ensures that information on the slides can easily be seen by the audience. 24 point or greater font is typically sufficient.
* *Have a goal of five-to-seven bullet points per page*. Avoid the tendency to cram as much information as possible on a page, which is often done so that the presenter does not neglect any material. Avoid this, and use five to seven bullet points to guide the discussion. Presentation software packages, such as Microsoft PowerPoint™, allow you to introduce bullet items one at a time, which help to keep the discussion on track.
* *Avoid fancy graphics and special effects that add no value*. Presentation packages allow the addition of fancy features, such as spiraling text and sound effects. They add little to the presentation and when overused distract from the content. The content and material are what matter the most, not fancy formatting and special effects. To quote Edward Tuft, professor emeritus at Yale,

*Power Corrupts, PowerPoint Corrupts Absolutely.*

His point is that fancy graphics and features are used far too much with PowerPoint presentation software, and that this overpowers both the content and the audience. [Tuf03].

* *Group slides together to make a major point*. Make the first slide the general one with key statements. The following ones should have more detailed information supporting the point.
* *Do not create a canned talk or speech*. That is acceptable in some fields, but not in engineering and science where a more extemporaneous style is the norm. Let the bullet points and other material on the slides serve as guides for what to say. Avoid the use of cue cards and do not just read directly from the slides for the presentation.

### Meet the Time Constraints

Make sure that the presentation falls within the time constraints—the audience will be alienated if it is far too short or too long. The tendency is to exceed the time limit since there is so much information that the presenter wants to convey. You may be abruptly cut off and not be able to conclude the presentation if the time limit is exceeded. Think about this—how would you describe all that you know about electrical or computer engineering in ten minutes? It is challenging, but if you only had ten minutes you would probably give a brief overview of the major accomplishments made in the field. Accept that all of the information can’t be conveyed in the given time and use it carefully to highlight the important material.

A heuristic is to take the length of the allotted time in minutes and divide it by two. That provides an estimate of the number of slides to prepare. Once the presentation is prepared, practice to see if it can be presented reasonably in the time allotted. Practice the talk in front of your teammates, boyfriend, girlfriend, mother, or pet rock. Be careful not to over-prepare to the point of sounded scripted. Practice the talk the night before the presentation and only do a brief review of the material right before the talk. Be sure to allow time for the question and answer session that usually occurs at the end of a presentation.

### Prepare for the Question and Answer Session

One of the biggest fears of presenters is the dreaded question and answer session. This is where the audience gets to ask questions and possibly expose the presenter for what they don’t know. For example, the questioner may ask “*Are you familiar with the work of Johnson and Smith from 1984 in which they proposed exactly the same idea as yours?"*

How do you prepare for this? You must be knowledgeable about the subject, but you don’t need to have the answers to every possible question. It is good practice to rephrase questions that are asked for the benefit of you, the audience, and the questioner. Rephrasing the question ensures that you are answering the correct question (how many times have you been annoyed when a teacher answered the wrong question?) and provides time to think and formulate a response. It demonstrates to the questioner that you understand their question and are able to present it in a different format. If the questioner is hostile, make sure that you rephrase the question in a positive light. Rephrasing is also a courtesy for the other members of the audience who may have not heard or understood the question.

Most questions are made in good faith as the questioner is trying to clarify a point or learn more. Sometimes, questioning can become hostile or aggressive. If this happens, make sure not to respond in kind or put the questioner down. The presenter has the position of power and becomes a bully if they do this. Be sure to maintain eye contact with the questioner, smile, and remain relaxed in your responses. If you can’t answer the question, admit it and don’t try to come up with a phony answer. If the questioner is persistent, offer to discuss it in more detail with them after the presentation.

* 1. Project Application: Design Presentations

Examples of the three presentations that you may make during the design process are listed in Table 12.1. It is a guide of points to consider preparing presentations and should be adjusted to meet particular needs of the situation. The checklist in Table 12.2 is provided to aid in preparing for presentations.

**Table 12.1** Guide for preparing design presentations. The chapters associated with the points are identified.

|  |  |
| --- | --- |
| **Presentation** | **Points to Consider in Preparing the Presentation** |
| Project Proposal | *Introduction.*Provide an overview of the project and address the need, motivation, goals, and objectives. The audience is probably not familiar with the concept and it is important to describe the problem in simple and concise terms (Chapter 2).  *Problem Analysis.*Indicate what the current state-of-the-art in the field is regarding the technology. If it is a new product concept, identify similar products that are available and what is unique about this one. If it is a research-oriented project, include the basic theory and address current status of work in this area (Chapter 2).  *Requirements Specifications.* Address the engineering requirements and provide a justification for their selection. Describe the standards and constraints that apply to the problem (Chapter 3).  *Preliminary Design Options.* Depending upon progress, some preliminary options for the design may have been developed and can be presented here (Chapter 4). |
| Design Review | *Introduction.*Provide a brief overview of the motivation for the project.  *Requirements.* Recap the critical requirements that have to be met.  *The Proposed Design.*Present the high-level design. Explain how it works and how the pieces fit together. Include design details of the sub-components and systems. Address how the proposed design meets the engineering requirements. Identify the alternatives investigated (Chapters 4, 5, and 6).  *Preliminary Test Results*. Include test and prototype results (Chapter 7).  *Project Plan.* By this point (if not earlier), a project plan should be in place, so consider presenting a summary of the plan (schedule, responsibilities, and cost) (Chapter 10). |
| Final Presentation | *Introduction.* Provide an overview or motivation for the project.  *The Final Design.* Describe the final design implementation. A good way to organize is to provide a high-level overview of the design and describe how it operates. Then, provide detail and a description for each of the successive hardware/software subsystems (Chapters 5 and 6).  *Testing & Results.* Describe/demonstrate the key tests and results that show the functionality of the design. Provide demonstrations if appropriate. Indicate how the final realization did or did not meet the requirements (Chapter 7).  *Conclusions.* Summarize conclusions about the project and provide recommendations for further work. Indicate lessons learned. |

**Table 12.2** Checklist and self-assessment for oral presentation preparation. Score the elements as 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4= Agree, 5 = Strongly Agree.

|  |  |
| --- | --- |
| **Organization** | **Score** |
| The background and needs of the audience were analyzed. |  |
| The main points of the presentation are identified. |  |
| The motivation is clear and would be understandable to an intelligent 12 year old. |  |
| An overview of the presentation is provided. It is relevant to the presentation, not a generic one that can be used in any presentation. |  |
| The body is organized to support the main points. |  |
| The conclusion summarizes the main points and future work. |  |
| **Visual Aids** |  |
| The fonts and graphics are large enough to be seen by the audience. |  |
| The equations are of the right number and level. The presenters are prepared to discuss any equations presented. |  |
| The slides are arranged to support the main points. |  |
| The presentation does not contain unnecessary graphics and special effects. |  |
| **Presentation Delivery** |  |
| The presentation has been rehearsed. It meets the time constraints and there is sufficient time for questions and answers. |  |
| Voice projection is loud enough so that the audience can hear the presenters. |  |
| All members participate in the presentation and have reasonably equal responsibilities. (If one team member always presents the introduction and another the technical material, it is a sign that not all members are participating equally on the project). |  |
| The presenters do not rely on cue cards. |  |
| The presenters are comfortable in front of an audience (Do they make good eye contact with the audience? Do the presenters move around the room or do they stand stiffly behind a podium?) |  |
| All presenters are knowledgeable on the subject and prepared to answer questions. |  |
| The presentation software was tested on the platform to make sure it works. |  |
| The presenters are dressed properly for the occasion. |  |

* 1. Summary and Further Reading

During the design process and your professional career, you will need to communicate ideas effectively. One of the most common ways to do this is via an oral presentation. Visual, verbal, and vocal aspects impact the effectiveness of an oral presentation. Although the verbal aspect, or content, is important, the visual and vocal delivery aspects heavily influence the audience’s perception and cannot be overlooked. In preparing the presentation, the needs and background of the audience should be taken into consideration and the main points to be conveyed identified. Creating the presentation is much like telling a story—there should be an introduction, a body, and a conclusion that are organized to support the main points. The slides should be grouped to support these points. Concepts should be explained as simply and clearly as possible. Increasing the complexity as the presentation proceeds will allow the presentation to reach all members of the audience to some extent. Practicing the presentation is especially important for novice presenters, and tips were provided for meeting the time constraints and preparing for question sessions.

There are many excellent resources and articles available regarding oral presentations. A concise and humorous article geared for new speakers in the technical fields is *Advice to Beginning Physics Speakers* by James Garland [Gar91]. The IEEE Transactions on Professional Communications journal addresses many aspects of communications including oral presentations. Mindtools ([www.mindtools.com](http://www.mindtools.com)) has a section on communication skills that includes a preparation checklist on presentation, delivery, appearance, and visual aids. *A Good Speech is Worth a Thousand Words* by Bert Decker [Dec84] addresses right and left brain thinking as well as the three V’s of giving a presentation. The article *How to Overcome Errors in Public Speaking* by John Baird [Bai81] addresses how to analyze the audience, the judgments that are made when meeting a person, the introduction, and conclusion. Other resources used in the preparation of this chapter include: *The Engineering Presentation—Some Ideas on How to Approach and Present It* [Ros93], *Handling a Hostile Audience—With Your Eyes* [Car89], and *How to Speak so that Facts Come Alive* [Ste89]. Many of the references are compiled in the book Writing and Speaking in the Technology Professions: A Practical Guide edited by David Beer [Bee03].

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