Wayne T. Padgett
and Mark A. Yoder

Effective Communication:
Excellence in a Technical Presentation

"DSP Education" introduces a cycle on "Effective Communication." This cycle includes articles on technical presentations, technical writing, technical management, and preparation for entrepreneurship. We invite you to send suggestions for new topics, and/or authors, and general feedback by e-mailing SPM_columns_forums@yahoo.com

You've just given a very clear lecture on the latest in video coding, and as you wrap up, you look out at the audience and only one out of ten are still looking up. Most of your audience has "left the room," at least mentally. What does it take to keep their attention? We want to help you identify specific ways to improve your technical presentation skills so that you and your audience can increase the benefits derived from your presentations. This can be accomplished by observing just a few simple rules in every presentation.

A technical presentation may range in length from a two-minute poster talk or "elevator speech" to a 50-minute (or longer) lecture. The purposes for such presentations vary from motivating interest in your work to developing the listeners' ability to solve certain kinds of problems, or even to solicit investments of time or money in a technical project. In every case, you must hold the audience's attention and deliver the desired content efficiently. Your effort to organize your material will save your listeners effort in comprehending—so you can do some of the "heavy lifting" for them and be a more effective presenter.

CONTEXT
No matter how ingenious you are, neither you nor the world around you will gain maximum benefit from your efforts if you communicate your ideas poorly. Technical communication is a critical component in the lives of both academics and industry professionals, yet often very talented people have neglected this key part of their work. Nikola Tesla was a genius who was responsible for many impressive inventions, but when he died, he had failed to explain his grandest plans to anyone and now no one knows what he might have created with his unorthodox theories. The best ideas do not always win support because they are not always the best communicated. In academia, the need for effective communication could not be more obvious. We can all remember an example of an ineffective educator: Could all of physics possibly be as dull as Mr. Jones made it seem? Certainly not, but delivery is crucial.

The technical presentation has existed with little change in format for at least as long as the university has existed. Certainly, the ability to rapidly produce paper copies and the use of the overhead projector have produced substantial changes in the delivery of technical information. More recently, there have been significant changes associated with computing technology, so that the video projector has replaced the overhead projector as well as the chalkboard or white board for many functions. In the past, transcription was the only cost-effective way to share information. Now, technology has reduced the cost of sharing information to nearly zero, so the focus should shift from "How do I transfer information to my audience's notes?" to "How do I engage my audience so they will understand this better?" The

recent introduction of tablet PCs can allow presenters to add hand-drawn annotations to their materials during a talk, and with the right infrastructure, can even allow the audience to respond with handwritten questions or sketches that can all become part of the presentation material.

BASIC PRINCIPLES
Every presentation contains just a few key messages that, above all else, the audience should retain. In a very short presentation, there may be little room to say anything beyond these key messages or points. In a long presentation, there is the danger of burying the key messages in supporting information, so a critical task is to clearly identify major points for the audience. Another critical task is to get and hold your audience's attention. Several types of technical presentations and templates for their contents are shown in the "Common Types of Technical Presentations and Their Structure" sidebar. The following sections look at each type of presentation.

ELEVATOR SPEECH
An elevator speech is a very short talk intended to introduce you and your idea to someone who may not know you and may even be indifferent to your ideas. You have only a few moments before the listener's willingness to listen may be exhausted, so make sure you only say what your listener needs to hear to determine whether further interest is warranted. Everything about an elevator speech (a similar template applies to a poster talk for a conference) needs to be compact and to-the-point. The introduction should generally be little more than your name and affiliation. Your affiliation may help to clarify

your later statements, so think about what your affiliation is likely to mean to your listener. When giving an elevator speech about a technical topic, you will likely be describing the solution to a problem.

There are two main rules to keep in mind when giving an elevator speech.

1) You must introduce the problem quickly and compellingly. Be specific and concrete rather than general and abstract.

■ Specific: "I've been working on a multirate system that misses real-time deadlines."

■ General: "I've been studying the problem of filter design for multirate systems with an emphasis on minimizing filter order."

2) You must describe the solution or result.

■ For example: "I've found a way to dramatically reduce the effective filter order by operating the filter at the lowest of the two sample rates."

Of course, your goal is to spark enough interest in your listener to gain an opportunity to discuss your work further.

CONFERENCE TALK

In a conference talk, you have more time (10–20 minutes) and the ability to use visual aids. The introduction can be more detailed, and it should be, since you will usually have more of the audience's attention during the early part of your talk. In the introduction, you need to introduce yourself, briefly describe your topic, and explain why it is important. If you can't explain why your topic is important in one or two sentences, you probably shouldn't be talking about it in front of an audience. The rest of the talk fits into the memorable structural form of "Tell'em what you're going to tell'em. Tell'em. Tell'em what you told'em." This is simply a shorthand notation to emphasize that the use of a summary, a body, and a conclusion is to keep the main points in focus. In a short talk, the summary may simply be a list of the main points of the talk, or the titles of the most important slides. The summary prepares the listeners to

recognize the important points as you cover them, and it helps you communicate the organization of your presentation. Here is a place where visual aids can help. You can keep your summary

> **EVERY PRESENTATION CONTAINS JUST A FEW KEY MESSAGES THAT, ABOVE ALL ELSE, THE AUDIENCE SHOULD RETAIN.**

on the screen in front of your audience while you talk. That way they can see the structure of your talk while it's being presented.

In a short talk, there is a temptation to try to explain the entire topic, but your goal should be to deliver your main points clearly. You will be able to offer some support for these points, but not much detail. If you offer too many main points, you will only confuse your audience, and nothing will be memorable. In a ten-minute talk on video coding, you will not have time for much deep technical detail, so rather than try to explain details hurriedly, you should describe your main idea and its impact. Leave the details for a longer talk or refer listeners to a paper.

Especially in a short talk, you should strive to use visual communication heavily. Your visual elements should be more than words or bullet points. Use graphs, signal flow graphs, frequency response plots, and spectrograms that "say" what you want to communicate. Visual elements are easy to talk about and explain, but be sure to tell the audience what you see in your graphs—don't assume they already know. Your audience can benefit from both hearing and seeing your message at the same time. Your conclusion should summarize the entire talk. Once you have explained your main points, your audience may be lost in the supporting details, so you need to reiterate the importance of the problem and your main points concerning the solution you have presented.

SHORT LECTURE

A short lecture in the 25-minute range allows much more time for supporting detail. The advantage is that it may be possible to demonstrate an example solution. The disadvantage is that there is even more opportunity for the listener to lose track of the organization of the presentation (the main points) and stop paying attention to the speaker entirely. A common rule of thumb is that an audience will begin to lose attention in even an interesting topic after about 10–15 minutes of similar activity. In a 25-minute presentation, this means that you must find a way to restart the "attention clock" before the end of the presentation.

Common ways to break up a presentation might include a demonstration, an interactive activity (ask for input from the audience), or almost any kind of break from the consistent flow of the presentation. The ideal type of diversion is one that enhances understanding, like asking the audience to solve a simple problem based on what has already been presented.

COMMON TYPES OF TECHNICAL PRESENTATIONS AND THEIR STRUCTURE

Elevator Speech (1–2 min)
■ Introduction
■ Problem statement
■ Solution/conclusion

Conference Talk (10 min)
■ Intro/Motivation
■ Summary
■ 2–3 main points
■ Graphical/visual support
■ Conclusion

Short Lecture (25 min)
■ Intro/motivation
■ Summary   → module
■ 1–2 main points
■ Graphical/visual support
■ Diversion/Interaction/Demo
■ 1–2 main points
■ Graphical/visual support
■ Conclusion

Full Lecture (50 min)
■ Same as a short lecture, but more main points and more diversions (more modules).

FULL LECTURE

In a full 50-minute (or more) lecture, we recommend designing a longer lecture as a series of miniature lectures or modules. Each module should contain

- its own short summary of its main points
- the body of material with graphical support
- some kind of interactive element to break up the pace of the lecture.

A module should contain no more than 10–15 minutes of passive lecture time. If you run out of ideas for interactive elements, a one-minute stretch break will often work and is usually appreciated. Physical activity is a great change of pace in a presentation.

THE AUDIENCE

Be aware of your listeners' preparation and provide the information they need to understand your presentation. Obviously, this can be difficult when you have a broad audience with a wide range of levels of background knowledge. It may be difficult to avoid dragging some listeners through a tedious review so that others will not be lost in unexplained terminology. However, a

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COMMON ERRORS

- DON'T include too much information for the time allotted.
- DON'T forget to focus on the main points.
- DON'T include too much detail.
- DON'T forget to consider your audience.
- DON'T use too much text per point.
- DON'T include too many points per slide.
- DON'T try to use too many slides.
- DON'T try to use too many equations without careful explanation.
- DON'T use graphics or text too small to read.
- DON'T run out of time or go overtime.
- DON'T speak in a monotone and never move.
- DON'T fail to test A/V equipment before the talk.

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well-thought-out review can be useful even to an expert by making complicated ideas seem simpler. A few minutes of careful thought about what background information your audience may need can make a huge difference in your effectiveness.

> **YOUR JOB AS PRESENTER IS TO DO THE HEAVY LIFTING OF ORGANIZING AND SUMMARIZING YOUR MATERIAL.**

A powerful illustration of how presenters often misunderstand their audience is described in [1]. In a simple game [2], "presenters" were asked to tap out simple melodies like "Happy Birthday" for "listeners." Because the presenters already knew the song and imagined themselves hearing the melody, they estimated that 50% of their listeners could guess the song correctly, but the listeners were depending only on the taps, and the actual rate of correct recognition was only 2.5%. Therefore, consider that our ideas sound simpler to us than they do to those who don't yet understand [2].

A little planning and organization go a long way in communicating respect for your audience. Nothing says "I don't care" like an unprepared speaker. Preparation can consist of evaluating the interests and needs of the audience (and tailoring the talk to those needs), preparing figures and examples that illustrate key points, identifying related stories or jokes that will draw attention to your topic, and preparing interactive elements. In a video coding presentation, interactive elements could include asking the audience to list a few example video coding schemes, asking them to explain a key concept like motion estimation to a neighbor, or taking a survey on how many have noticed coding artifacts in Web-based video. The shorter the presentation, the more critical it is to practice it, preferably for an audience.

Opportunities to use interactive elements to break up the presentation

may be reduced when you are limited to a recorded presentation or other medium that is not face-to-face. In these situations, it is still desirable to break the presentation up into 10- to 15-minute segments with a change of pace in between. These breaks could be for a demonstration, or you could ask the listener to pause the video and work a simple example. The use of humor or a story can also be a good break. Ideally, the humor should be somehow relevant to your topic, or a story should give the listener an opportunity to "mentally rehearse" [1] the process you are explaining.

THE TIMING

The timing of a talk depends largely on the time available, the attention span of the audience, and the length of each topic, example, or explanation. To further complicate matters, audience interaction is notoriously unpredictable. A lecture to one section of a class may end early, while the same lecture to another section goes unfinished because of a seemingly simple question that goes to the core of some subtle issue. Therefore, the presenter must be acutely aware of both the time available and the audience's attention level. Letting a presentation end mid-sentence with "the bell" is a poor way to build rapport with your listeners. Often you must improvise a very short interactive component to break up a lecture, or decide to end a section early to preserve time to restate the main points of the presentation.

Whatever you do, please don't be the lout who drones on into the next time slot, oblivious to all others in the room. If you do so, you might as well be giving a presentation on your lack of consideration for others. When in doubt, summarize and end a little early.

COMMON ERRORS

If you could be a fly on the wall in virtually any conference room, classroom, or auditorium in the world, you wouldn't need to wait long to see a poor presentation. This is true despite the fact that most people know what it takes to

give a good presentation and even want to. But it takes work to prepare an effective presentation, and it takes putting yourself into the audience's shoes. As the author of [2] found with her musical tapping game, this is harder than it sounds. The "Common Errors" sidebar lists many of the biggest pitfalls. Most errors happen because the presenter has unrealistic expectations of the audience, and the result can be painful and frustrating to listen to.

BEST PRACTICES

The best way to prepare a great presentation is to *prepare*. Your job as presenter is to do the heavy lifting of organizing and summarizing your material. You need to locate great examples, illustrations, jokes, and stories so that it will be easy for your audience to grasp the ideas you present. You need to plan to make it easy for your audience to pay attention and to understand. Due to limited space, we haven't talked much about framing your content with examples and stories to make it more memorable, or "sticky." The authors of [1] do this nicely and you should consider their recommendations summarized in the "Making Ideas Stick" sidebar. Technical material is a challenge for most people to comprehend—that's a hard enough task, so get the effort of paying attention out of their

way. The easier you make it for your audience to follow your presentation, the more they will take home, and that's your goal. Consider using the best practices listed in the "Best Practices" sidebar.

CONCLUSIONS

In a time-limited talk, there is a limit to how much support one can present for a key point. As the length of the talk increases, more support can be given for each point, but then more effort must be expended in making the organization of the points clear. Also, in a longer talk, more effort must be expended in accommodating the listeners' attention span.

A little planning and organization go a long way in communicating to your audience. Keep your main points clear and manage the attention span of your audience. Use the techniques described in [1] for making even technical content more memorable. Your investment in the effort to produce a good presentation helps make it effortless for your audience to listen and understand. If you do the heavy lifting, it will make listening to your presentation a walk in the park instead of a work out.

THE AUTHORS

Wayne T. Padgett (Wayne.Padgett@Rose-Hulman.edu) is an associate professor of electrical and computer engineering (ECE) with Rose-Hulman Institute of Technology, on leave at Texas Instruments at this writing.

Mark A. Yoder (Mark.Yoder@Rose-Hulman.edu) is a professor of ECE with Rose-Hulman Institute of Technology.

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