Learning Objectives

So that you can guide students in improving their professional communication skills and develop more persuasive presentations, upon reading this chapter you should be able to

- Identify common challenges to successful communication in different kinds of presentations
- Describe how to map a process for designing effective presentations
- Describe strategies for identifying the most critical information to communicate to stakeholders
- Outline ways students can identify likely responses to their presentations so that they can anticipate and address those questions
- Evaluate how using different media may enable students to achieve their presentational goals more efficiently
INTRODUCTION

Typically, the student design project culminates with a formal presentation and written documentation given to the instructor and clients or other stakeholders of the project. This is the opportunity for the students to demonstrate what they have learned and achieved in the course of their project, and showcase their skill in distilling this knowledge so that they provide the essential, relevant information in a concise, coherent, and persuasive manner.

Although the final presentation is the dominant focus when students think about communication, throughout the engineering design process, there are multiple opportunities to communicate with various stakeholders who have a vested interest in particular design processes and outcomes. Chapter 7 describes active information gathering techniques that enable presenters to obtain relevant design information. This chapter on effective communication with stakeholders discusses how to convert stakeholder information as well as other parts of the design process into talking points within an effective presentation.

These opportunities enable designers to listen for and be responsive to stakeholders’ real interests and not simply what they state that they need. These opportunities involve information and opinion seeking for the necessary details to fulfill criteria for design specifications, to acquire resources for prototype development, to assess the quality of prototypes, and to sustain the viability of deliverables. In short, the steps for effective communication with stakeholders begin long before designers face their final presentations. However, it is in these final presentations that designers want to persuade stakeholders to accept particular solutions. The satisfactory outcomes of such presentations are not simply agreement about implementations, but also maintenance of good working relationships among key stakeholders and mutual respect for different types of knowledge that each brings to bear upon the design solution.

In this chapter we define communication as the ability to articulate—through speech, written texts, and graphic representations—different stakeholder interests and design considerations for team deliberations and public presentations. To achieve good communication in general and persuasive ability in particular, it is necessary to recognize what is needed and competently perform the spoken, written, and/or graphic presentations. Competent presentations take into account the diversity among stakeholders and variety of formats, including one on one, team based, in person, and virtual. It is also necessary to recognize that for different design phases and stakeholders, different levels of technical detail are preferable. Finally, there are specific argument formats that typically are effective in persuading other team members and external stakeholders as to the efficacy of design decisions and solutions.

COMMON CHALLENGES FOR STUDENTS

In this section we identify several common challenges to successful communication in presentations. When presenters can identify which challenges are applicable to their specific presentational goals and contexts, they are able to focus their attention on what they need to work on the most. Doing so enables them to make good use of their time as they work toward effective presentations.

The first challenge is to realize that not everyone understands the big picture of the de-
sign project. Another way of phrasing this challenge is: What is the story that presenters want to tell? What do presenters want audience members to know, feel, and/or do at the conclusion of the presentation? Often students focus on the details or aspects that are most salient to them at the time and tend to not step back and translate the big picture story for their particular audience (Dannels, 2002, 2009; see also Gallo, 2009). This first challenge is particularly difficult because it requires flexibility in thought and ease with presenting both macro and micro issues involved in the design process and proposed solutions.

One way to work on this first challenge is to provide a short history of the project. When did the project begin? What was the motivation for the project? (For example, what device, tool, or process is the client currently using?) What goal or end are you trying to achieve with the project? Who are the stakeholders? What is the context of the project? Why and how was the design team assembled? Supplying this information at the beginning of the presentation provides the audience with the context that is often needed to understand the design criteria and justifications provided in the remainder of the presentation.

A second challenge is knowing the audience for the presentation as well as what kinds of arguments and information are relevant to that audience. For example, a presentation to end users would focus more on characteristics of the design solution as related to their needs, whereas a design review presentation to clients would include more technical design solutions and explain why certain design decisions were made. In knowing who the audience likely will be and what their vested interests are, the presenters can address exactly what key points audience members would want to know. Some might want to know how the proposed design solution would work, or how much it would cost to develop a feasible prototype. Others might be concerned about training personnel and safety issues. When audience members are operating in a business model, financials become more relevant than when audience members primarily work for nonprofits, where values and client service are priorities. In a business or entrepreneurship setting, it often is important to present a detailed budget and to anticipate questions about line items. The consequences of budget projections would be prominent in these audience members’ minds. If the team cannot argue that there is a benefit (or decreased cost), then the design solution would not be acceptable to some audience members. In sum, knowing the audience helps the team to not only construct a presentation that meets audience members’ informational needs but also anticipate audience members’ responses.

A third challenge is to construct a presentation that would be considered well organized by audience members. Although an introduction-body-conclusion format works well for informational presentations, there are other structures that are advantageous if the goal is persuading audience members to change their thinking or behavior. One such format is a problem-solution format in which presenters first sell audience members on their version of what the problem is and provide evidence that supports their particular problem statement(s) (Beebe, Beebe, & Ivy, 2008). Once audience members understand and buy into identification of the problem, then possible solutions are presented along with the extent to which each solution satisfies the problem specifications. Once alternatives are eliminated, then audience members should readily agree to the proposed solution. Of importance to the organization of the presentation is that presenters know what kind of format would be both easy
to follow by audience members and fulfill the presentational goals.

The fourth challenge is demonstrating credibility or trustworthiness. The response to this challenge begins early in the design process when the team does an assessment of what knowledge, skills, and abilities (KSA; see Hartenian, 2003) are essential to project problem identification and solutions. Periodically, the team will consider other needed KSAs and determine how such individual competencies are shared to improve team effectiveness (Delamare Le Deist & Winterton, 2005; Littlepage, Perdue, & Fuller, 2012).

When KSAs are presented to audience members, these audience members will understand how the team was composed. Moreover, the KSAs operate as areas on which team members can build credibility as they present the research they had conducted and the specialists with whom they consulted. The challenge is not simply listing KSAs but showing how team members’ KSAs were used to design an optimal solution.

Presenters’ credibility is greatly enhanced when they can speak firsthand about conversations they have had with clients, potential users of the design product, and others who have vested interest in the solution. A challenge during presentations that involve technical and engineering personnel is to relay points with enough technical detail for some audience members without losing others who are more interested in other aspects of the presentation.

A final consideration for the challenge of demonstrating credibility is presenters’ response to questions by audience members. An ability to provide further explanation to questions is very important and can be practiced so that students are well prepared. It is also important to respond appropriately to questions for which they do not know the answers.

Sometimes, when presenters do not know the answers, they might make up answers instead of saying “I don’t know.” Therefore, demonstrating credibility also means admitting that there are design aspects that team members did not consider and/or questions to which they do not know the answers, but can explore further.

In sum, design presentations involve a number of challenges. However, some of the most common challenges are telling the story, knowing the audience, organizing the presentation effectively, and displaying credibility without losing audience members who do not share the same level or kind of KSAs. In short, when presenters provide insight into how and by what criteria decisions are made—with documentation—and involve the stakeholders, then they are presenting with integrity.

**PERSUASION WITH INTEGRITY THROUGHOUT THE DESIGN PROCESS**

Because persuasion occurs throughout design processes, the groundwork for selling solutions has been laid from the very first connections among team members and stakeholders. The goal is not simply to develop a presentation that encourages decision makers to accept a particular solution, a common definition of persuasion, but also to create knowledge with all stakeholders throughout the design process so that the solution under discussion is neither a surprise nor unworkable. Furthermore, persuasion typically involves attempts to enable stakeholders to exercise choice among various ways of thinking, knowing, and feeling about information and design features such that their behaviors in approving or modifying design solutions are accomplished. These characteristics of persuasion mean that persuasion is a process
involving information literacy and the understanding of human nature. These features also mean that informed choices, rather than coercion or unethical arguments, can produce the best solutions at any point in the design process. Although these characteristics make sense for effective persuasion and design, without exception we hear our engineering design students voicing frustrations that they “can’t get other team members to do what they want,” thus failing to recognize the process-oriented nature of persuasion and the need to know the interests, knowledge levels, disciplinary concerns, and emotional connections to the project that team members (and other stakeholders) hold.

Although stakeholders may change during the course of a project, designers can anticipate and prepare for the unique challenges and opportunities in selling solutions to different stakeholders by mapping out the design process with both the necessary communication and technical knowledge running parallel.

**IDENTIFY CRITICAL INFORMATION TO COMMUNICATE**

Many different categories of criteria are considered when developing a design solution: functional performance, form, aesthetic, economic, environmental, ethical, health and safety, inclusiveness, manufacturability, political, social, sustainability, and usability. In determining what information is critical to communicate, seasoned designers recognize that in design and any kind of persuasive activity there are conflicts because choices made at every step are not made without some trade-offs between different criteria, and that individual audiences and disciplines prioritize them differently. Some interests are fairly predictable. For instance, engineers are interested in safety and human costs, compared to the features and aesthetics that might be of interest to industrial designers and architects, or the feasibility of design and cost factors that might gain building and construction specialists’ notice. These are general disciplinary or occupational patterns that designers can anticipate as priorities for their audiences.

Sometimes designers or others involved in persuasion fail to realize that people have different priorities because of their interests, jobs, and values. Researchers, such as Paul Leonardi (2011; see also Barley, Leonardi, & Bailey, 2012) as well as Carrie Dossick and Gina Neff (2011), have examined how members of multidisciplinary engineering design teams work together to persuade each other and different stakeholders about their viewpoints concerning design outcome or deliverables. These authors examine multiple phases in engineering design as well as the communication among different stakeholders with varied interests in the deliverables. They recognize not only that engineering design and multidisciplinary collaborations in general are messy because certain disciplinary interests or logics, such as safety for engineers, sometimes override other concerns, but also that problem definition and criteria for alternative and prototype design become complicated when there are diverse vested interests and disciplinary jargon. As a result, a substantial amount of time needs to be budgeted to work through (sometimes) unpredictable communication with stakeholders. Another important consideration for effective design solutions and their presentation is that clarity is not simply a written or oral feature in language choices and presentational format but also requires the selection of material objects. These material objects may include sketches, YouTube presentations, graphs, charts,
computer-aided design (CAD), software code, and prototypes.

There also may be incidents reported in the news that raise awareness or concerns relative to the project design. The function of persuasion in these disciplinary and newsworthy cases might be to encourage different stakeholders to negotiate and reframe the evaluation of certain criteria over others at particular design phases. In the presentation where the final design deliverable is submitted for stakeholder approval, discussions about such considerations and their negotiation should be reported. Acknowledging the shifts in decision-making criteria throughout the design process enables audience members to revisit their previous concerns and how presenters have incorporated this feedback into their solutions. In these ways, designers legitimize stakeholders’ disciplinary, newsworthy, or other concerns and focus attention on the processes that led to the solution.

**PACKAGE CRITICAL INFORMATION FOR SUCCESSFUL PRESENTATIONS**

To determine critical information to communicate, especially in design review presentations where the goal is to secure stakeholder support for design decisions and process, designers can be guided by some standard criteria. Design evaluators typically look for (a) problems and context, (b) design fixation, (c) measurable ways to meet design specifications, and (d) specificity and verifiability.

First, when persuading others, evaluators want to know about the problems and context in which deliverables are going to be used. Those making decisions want to know that designers understand not only who the potential users of the design solution are but also how that solution fits within these stakeholders’ and anticipated users’ lives. By indicating that they are well aware of the problems driving particular designs, designers communicate depth and breadth of knowledge. Therefore, presentations should include the following:

1. When did project begin (overall timeline)?
2. What was the motivation for the project? (For example, what device, tool, or process is the client/user currently using?)
3. What is the project goal or end?
4. Who are the stakeholders?
5. What is the context of the project?

For instance, during one design team presentation, the members did not provide enough contextual information or their vision for the ways that their design solution would meet po-

**Smart Goals**

Ideally, designers present their project goals in ways that their evaluators can readily assess whether or not the project is appropriate. There are many ways to construct presentations, but SMART (specific, measurable, attainable, realistic, and timely) project and customer requirements and specifications provide some ready criteria. These criteria ask designers to respond to anticipated questions in areas already covered: What did designers consider, whom did they involve, and how did they make decisions? What assumptions are being made? From where did the requirement come? How will designers know when they have met the specifications and requirements? Have the specifications and requirements been met? The responses to these questions provide insight into decision making and design process and are critical for evaluators to appropriately assess the design solution. These anticipated questions also increase the chances that designers will obtain appropriate feedback for their goals.
tential users’ needs. Design evaluators provided detailed feedback for a high action soccer game in which players’ kicking skills needed to be further developed through exercises and equipment. What the team failed to convey to their evaluators was that the soccer-assist project was developed for children with special needs who required modifications in standard exercises, equipment, and so forth. As a result, the designers missed an opportunity to obtain useful and appropriate feedback about their processes. However, they did learn a lesson in framing their project vision and mission at the outset of their presentation. They learned how to present the problems that they were facing through detailed scenarios and video-recorded segments. In short, they showed design evaluators how the problems and context required that they learn more about the capabilities of their potential users.

Second, design evaluators look for instances of design fixation, a process by which engineering design team members become committed to a particular design solution to the extent that they may no longer listen to and process information that contradicts or expands their original solution. Design fixation is more common among novice designers rather than experts, who are better versed in the fluidity of design processes and knowledge creation (Crismond & Adams, 2012; Cross, 2000; Gero, 2011).

When evaluators see that designers want to focus solely on solutions rather than the problems, they become suspicious. Focusing on solutions might indicate that designers are hiding or are unaware of problems. These quick fix solutions may indicate that designers simply want to sell their solutions or that they are engaged in design fixation. Designer evaluators might ask directly or imply that they have concerns: In whose interests were particular solutions designed? Why does critical thinking seem to be missing from the design processes? Why do the data not match the rest of the presentation (i.e., lying with data or constructing claims based on little or no data)? How have designers assessed risk? Once designers’ credibility has been questioned, it is difficult to rebuild trust. As mentioned earlier, insight into the decision making throughout the process and at particular times or milestones can lessen evaluators’ concerns (e.g., Buzzanell, in press).

Third, evaluators want to learn how design team members are able to meet design challenges, that is, to be presented with measurable ways to meet design criteria. As noted above, designers need to present data indicating thorough analysis of the context and problem so that the design solution seems not only reasonable but optimal. In linking data with solutions, designers address the following:

1. Feasibility (that they have or know where to locate technical capacities to fulfill the solution)
2. Desirability (that there is a human need or desire for the solution)

Assessing and Communicating Risk

DFMEA (design for failure mode effects analysis) is a useful tool for identifying potential sources of failure; evaluating the occurrence, severity, and ability to detect the risk; and anticipating likely outcomes of the design solution and previously unanticipated considerations that might prove detrimental to users. These risk considerations and evaluations speak to design processes in general as well as to issues that should be raised or considered when communicating solutions. Designers need to present information that indicates that they have considered risk. This information may include materials that add credibility to the design process itself—photos, sketches, modeling, and simulations for prediction of different outcomes—as well as to the information presented and source credibility.
3. Viability (that the solution is economically possible and sustainable) (Brown, 2009)

Presenting measurable ways to meet design specifications also indicates that the designers understand the process and admit times when their decision-making phases required that they obtain additional feedback or they took a wrong turn. Such detailed information requires that individual and team documentation be specific and verifiable—that is, include enough detail, data, and sources such that design evaluators feel as though they can readily check into the truth of claims and solutions.

Fourth, although specificity and verifiability seem fairly obvious ways to build credibility for selling solutions (see Rosenthal, 1971), they are more difficult than they first seem. Not only do these processes require documentation at every design phase that can be readily accessible for information support in the selling-your-solutions presentations, but also they require that presenters be perceived as credible or trustworthy and ethical.

How do designers know if design evaluators or other stakeholders will see the quality of their information and themselves as specific and verifiable? As mentioned earlier in this chapter as well as in earlier chapters in this handbook, these qualities result from an analysis of stakeholders to figure out what they need to assess information as specific and verifiable. For the soccer-assist project we described under the problems and context criterion for effective presentations that designers might expect (and should verify) that community members—business owners contributing funds, parents of children with special needs, and others—would be less interested in the detailed reports about the engineering principles underlying potential design solutions than about how their own or neighbors’ children might use safe equipment. They may be less interested in a technical article in an academic journal that they have never heard of than in a summary of key issues relevant to the the soccer-assist project design solution that comes from the same journal, published within the current year, and deemed highly credible because of designers’ commentary that it is the premier academic journal in the area and one on which sports, physical, and occupational therapists rely. Key stakeholders would learn about the solution details that meet specifications and the prestige and usefulness of sources from which such decisions resulted. They would know what to look for and where such information could be obtained—meaning that they are more likely to accept solutions being presented without checking into these details because they believe such information is trustworthy.

For engineering and other technical or specialized audiences, further details including schematics, technical jargon, and additional academic sources enhance perceptions that designers did their homework and can be trusted to accurately portray the bases on which solutions are derived. Specificity and verifiability also refer to presenters’ credibility. Stakeholders want to know why and how designers are interested in and might have conflicts of interest with particular problems and solutions, including self-references indicating personal interest, experience, or loyalties in an area. Prestige references or referral to well-regarded sources (e.g., academic journals ranked best in quality, business or disciplinary newsletters held in high esteem, people whom stakeholders know and trust) aid designers in selling their solutions. For the soccer-assist project, designers who have played soccer, worked with or have children with special needs in their friendship and family circles, or who have focused their career on designing for individuals with spe-
cial needs would have more credibility with their statements about such interests and background inserted at appropriate times during presentations. These self-references and prestige references need not be detailed but they are powerful.

**KNOW HOW THE AUDIENCE VIEWS YOUR PRESENTATIONS**

The sections we have covered thus far in this chapter have focused on understanding and managing design evaluators’ interpretations, informational needs, and expectations. In a nutshell, they require that designers persuade others to a particular understanding of the problem and to a solution that meets design criteria specified in the previous section.

Persuading others is dependent not only on the designers, or sources of problem and solution presentations, but also on those who evaluate and must live with design solutions. As a result, it is insufficient to learn techniques for persuading others without learning how messages might be processed.

In general, people process both habitually, using *heuristics*, and mindfully, using more active cognitive processing. Heuristics, or heuristic principles, “represent relatively simple decision procedures requiring little information processing” (O’Keefe, 2002, p. 148). Varieties of heuristic principles include credibility, liking, and consensus. We actually have talked about heuristics when we mentioned that specificity and verifiability in information and provided by designers can enhance the chances that design evaluators and other stakeholders will accept solutions rather than digging for more information or questioning feasibility, desirability, or viability. For credibility, highly trustworthy and effective presenters are those who provide enough information, tailored to audience interests and knowledge, delineating assumptions and risks, and embedded within the context. Such credible presentations are enhanced if design evaluators like or respect the presenters (known as the *liking heuristic*) and if designers can state truthfully that others have reviewed and approved the solution (known as the *consensus heuristic*). These heuristics do not mean that presenters need to be friends with design evaluators or detail every single approval step, but that presenters seem approachable, eager to explain their processes, and willing to answer questions and/or admit that they are human (i.e., perhaps have not considered every possible angle or question).

In addition, we assume that presentations of self, design processes, solutions, and context would be truthful and enthusiastic. We also assume that arguments and evidence would be well organized, data rich, and results oriented (see Dannels, 2002). Overall, then, effective presentations frame desirable interpretations of information and construct the knowledge structures in which design evaluators can make decisions about the content and presenters themselves. Persuasion can come about through these peripheral processes.

Rarely, however, are design solutions processed habitually with such simple decision rules or principles. The chances of heuristic processing happening are increased when designers have sought information and opinions throughout their design processes—meaning that when they are selling their solution, they have already countered objections and have utilized and credited their previous sources for their information. At these times, evaluators may use peripheral or heuristic processing because they are unmotivated to engage more actively (i.e., to them, design criteria have been met by the solution).
More likely, designs are reviewed mindfully, meaning that design evaluators fall somewhere between heuristic or peripheral processing and more active cognitive processing in order to process the information (see Gass & Seiter, 2009; O’Keefe, 2002). Active cognitive processing occurs when audience members do not simply accept solutions but ask questions, incorporate their own information, assess solutions critically, and generate their own alternatives and optimal solutions. Given that new evaluators and stakeholders may enter the design process at any point, it is useful to always be prepared for active or central processing. To prepare for active cognitive processing, designers should engage in one or more trial runs of the presentation. During this trial run, high-quality arguments—specific and verifiable—should be offered with precise definitions and support. Not all of the information for which designers prepare will be used for the actual presentation. The detailed criteria, sources, and findings about contexts and problems would be available in a separate presentation section (after the closing and question-answer phase of the presentation) or in a different PowerPoint presentation and other documentation (see Schoeneborn, in press). Practice during trial runs and preparation of supporting materials are particularly valuable for face-to-face and online design critiques in which stakeholders often provide feedback based both on the relationship that they have developed with the designers and on particular questions or recommendations that they would like to pose (Dannels, 2009, 2011).

The point is that these answers to questions and objections to the solution that is being offered are available for review. It comes down to a tradeoff—presenting just enough information in a readily accessible format without going overboard and without underestimating evaluators’ questions and concerns.

**USE MEDIA EFFECTIVELY**

Media and material objects enable designers to distill information from multiple sources and communicate it appropriately, ethically, and credibly. A segment from a video depicting rural village life in Ghana can provide more information about the context, major stakeholders, problems, and specifications than can an elaborate speech. Likewise, engineers on multidisciplinary teams use material objects, such as sketches, drawings, photos, CAD models, and so forth, to explain what they mean quickly and easily. In using any media, the criteria for inclusion are as follows: How can incorporation of these media or objects move design evaluators toward accepting the solution being presented? Do these media or objects help build support for feasibility, desirability, and viability? Are there potential questions about the media or objects that presenters cannot answer or that divert attention from the primary presentation goal—namely, selling a solution? Finally, do the media or objects add to clarity, elaborate on key points, or bolster presenters’ credibility in some way? For instance, Skype with partners from a Ghanaian water energy education initiative or capturing their voices and videos ahead of time can do more to indicate designers’ commitment and credibility as well as the context than all the words in the world!

**SUMMARY**

In this chapter we presented some key considerations in constructing effective design presentations and in anticipating audience members’
responses. Students need to mine the information they have gathered throughout their design process, including stakeholder needs, alternative solutions considered, and the performance of the anticipated design deliverable, and distill the information that will be most important to their audiences. This will enable them to make the best use of their time with the clients so that their core message will have enough support to be persuasive without being too weighed down with details and therefore obscured. In this chapter we identified common challenges, presentation design processes, strategies to identify and use critical information, and ways to anticipate stakeholders’ interests and concerns.

Although the final presentation is frequently the culminating activity in a design project, much daily engineering and multidisciplinary teamwork is done in interpersonal and group experiences (Darling & Dannels, 2003). Throughout their projects, students should be encouraged to communicate frequently with clients and other stakeholders in order to create a shared understanding of the desired outcomes so that the final presentation is not a shock to either side, but rather the final step in a logical conversation.

**SELECTED EXERCISES**

**Exercise 13.1**

Break students into their design teams and have them identify the most critical information to communicate to each of the stakeholders of their design project. Ask them to anticipate questions the different stakeholders may have and how the design team might respond. Have each design team share strategies for meeting the information needs of their stakeholders.

**Exercise 13.2**

Break students into their design teams and have them brainstorm different media that would enable them to meet their presentation goals and encourage design evaluators and participants in the presentation to engage with the materials.

**Exercise 13.3**

Have students map a process for designing effective presentations, perhaps treating the presentation as a mini-design process itself. Have students describe common challenges in putting together an effective presentation.

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