

Barriers to effective communication

During a workshop on graphs I was once running at a meeting of the American Astronomical Society, we were discussing a figure provided by one of the participants and proposing more effective ways to display her data. She was enthused by the suggestions the other participants and I were offering. “This is great advice,” she beamed, “so much clearer indeed than my original display.” But then her face fell. “Of course,” she went on after a brief pause, “I can’t use something like this for a conference talk.” I was taken aback. “Why not?” I asked. “Well,” she ventured, “conference talks are supposed to be, um, you know...” Although she never completed her sentence, we all guessed she meant *conventional*, *cryptic*, or even *boring*.

The above story is unfortunately typical. Although convinced of the soundness of my recommendations, many participants in my sessions on presentations, research papers, or graphs feel they will not be allowed to implement these in practice. Beside “nobody else does it in this way,” the classic assertions to justify resistance to change include “it is not compatible with our template” and “my group leader won’t let me do so.” While such utterances are sometimes no more than excuses for laziness or low self-confidence, the barriers are often real.

In 20 years of running sessions on scientific communication in four languages and on five continents, I have focused—and successfully so—on sharpening the skills of individuals. Now I find my next challenge is working on attitude, not skills. The trouble is, what must be changed is not just the attitude of the participants but that of their leaders, their institution, and their community. Exposing in this booklet three barriers to effective communication is part of my efforts to get there.

If you are a researcher and you believe there is a better way to give talks, write papers, or graph data than what you see around you, be a rebel for a good cause. Do not let traditions stand in your way: research is not about fostering mediocrity. Do not let templates cramp your style: your priority is to give a superb talk. Do not let group leaders, editors, colleagues, or any other people bully you: stand up to them—respectfully, constructively—by bringing the debate to the rational plane. Question habits. Identify ends before discussing means. Yes, you may have to compromise in order to reach some goals, such as having a paper accepted. But if you decide in advance (without even trying) that you will lose, you will be proven right.

If you lead a group, be open-minded not only about science, but also about communication. Yes, you are more experienced; surely you must have done some things right if you ended up group leader. Still, your own conventional practice is perhaps not the only one that works, nor is it necessarily the best one. Dare to question it. Listen to others. See yourself as a guide for budding scientific minds, not as a guardian of traditions. Lead these young minds on the path to independent thinking, not to conformism. Let them do things differently from you whenever they have legitimate reasons for wanting to do so.

If you want to be the best you can be, break through barriers. Be a maverick: think for yourself and stand up for your ideas, yet listen to what others have to say in order to think better. If you take my advice toward more effective communication, do it not because I said so but because you believe it works. And if the cause I defend in this booklet seems worthy to you, join the crusade and spread the ideas. Let's change the world!

Traditions, templates, and group leaders

Before reading the abstract, most readers first flip through a research paper to form a global view of it. As they do so, they are often attracted by figures: they look at a figure and start to read its caption. This figure and (the beginning of) its caption are thus the first—and possibly the only—opportunity for the authors to convey a message to the readers about their data. Alas, most captions fail to do so: they describe the *what* without stating the *so what*.

A poor caption, needlessly redundant with the figure

A more effective caption, stating the authors' point as a sentence

Most readers cannot tell from the diagram alone if the match should here be regarded as accurate.

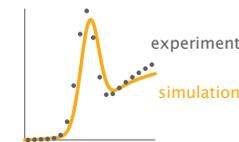


Fig. 5 Comparison between simulation and experiment

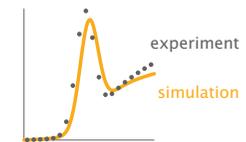


Fig. 5 Our simulation matches the experimental data accurately.

As an alternative, a sentence caption allows authors to state their point. Although few, if any, *guidelines to authors* restrict captions, there is no tradition of phrasing captions as full sentences in most fields. As a result, authors typically refrain from doing so, graphic artists design formats for minimal captions (such as setting captions in boldface or centered), and group leaders, editors, and referees comment negatively on such phrasing. And bad habits live on.

“Nobody else does it in this way”

I'M NOT HAPPY WITH THIS GRAPH:
THE TRENDS DO NOT STAND OUT.

*IT'S AN EVOLUTION, ISN'T IT? HOW ABOUT USING
LINES INSTEAD OF MULTIPLE BARS — LIKE THIS?*

AH YES, LINES INDEED REVEAL TRENDS BETTER, BUT...

BUT WHAT?

WELL, IT'S NEVER DONE THAT WAY IN PUBLICATIONS.

*OF COURSE IT IS. I CAN SHOW YOU LOTS
OF EXAMPLES FROM PUBLISHED PAPERS.*

I MEAN, IT'S NEVER DONE THAT WAY IN THE JOURNAL
TO WHICH I PLAN TO SUBMIT THIS MANUSCRIPT.

SO WHAT? THERE IS A FIRST TIME FOR EVERYTHING.

YES, BUT... READERS ARE NOT USED TO SEEING DATA
PRESENTED LIKE THIS. THEY MIGHT NOT FIGURE IT OUT.

*ARE YOU KIDDING ME? IT'S JUST A LINE PLOT.
DID YOU HAVE ANY TROUBLE INTERPRETING IT?*

OF COURSE NOT, BUT... THE JOURNAL EDITOR
IS NEVER GOING TO ACCEPT A GRAPH LIKE THIS.

HOW DO YOU KNOW? DID YOU EVER TRY?

NO, BUT...

THAT'S A LOT OF "BUT!"

WELL, YES, BUT... UM, NEVER MIND.

SO WHAT ARE YOU GONNA DO?

I THINK I'M GONNA KEEP MY GRAPH AS IT IS. BESIDES,
IT MAKES MY DATA LOOK SO MUCH MORE IMPRESSIVE.

When I ask researchers attending my workshops to evaluate, out of the presentations they attended at a recent conference, what fraction they actually understood, the answer is usually in the range 10–25%. And when I ask how many of these talks held their attention from start to finish, the typical answer is, “perhaps one.” Given the high cost of attending a conference—in terms not only of registration, flights, and accommodations but also of time invested—one could hope for a better return.

Sadly, the disappointing quality of most conference sessions is a situation the research world all too willingly puts up with. In such circumstances, businesspeople would more readily complain about the big fat waste of their time, perhaps even demand their money back. Yet mild-mannered researchers seem to accept poor oral presentations as a necessary evil. When a speaker asks them for feedback, they typically go for a noncommittal *not bad*, possibly in an effort to avoid raising expectations about their own speaking performance.

What is worse: low presentation standards negatively affect the learning process of the budding researchers attending their first conference. These young people logically regard current practice as the norm and hence strive to emulate it in their attempt to fit in. Whenever they do not understand, they are prompt to assume the fault is theirs: surely, everyone else understands, while they simply lack the background or the brains. For their first talk, they try hard—consciously or not—to be as dull, dry, and dreary as their peers have been. The same applies, of course, to journal articles, with young authors writing, for example, overly self-centered abstracts merely because they have been exposed to so many of them.

Although not all traditions are harmful, unquestioned ones easily lead to myths. Three such widespread but false beliefs, often invoked to justify an urge to imitate, impress, or resist change, form strong obstacles to improving communication.

Myth 1 **When in Rome, do as the Romans do**

What others do is a strong driver of behavior in social species, and successful communication does require social acceptance. Still, acceptance does not require imitation: it requires respect. Avoiding what is socially unacceptable is certainly part of it, but acting differently can be perfectly acceptable if respectful. Where Romans go wrong, do not do as they do: do what's right.

Myth 2 **If you keep it simple, nobody will be impressed**

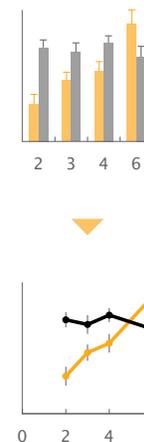
Clearly, we have little to gain from insulting the intelligence of our audience; and, yes, a given content could be too basic. Still, making things too complicated in an effort to impress is hardly more respectful and works on naive audiences only. Researchers are often more impressed with (and grateful to) colleagues able to explain complex matters in simple ways.

Myth 3 **The format people are used to is necessarily better for them**

Changing from one purely conventional format to another, equally arbitrary one indeed requires some getting used to and is thus suboptimal. Moving to something more effective and, especially, more intuitive for the audience, in contrast, is all benefit. Even if the change were to require some learning, it could still be justified if it brings a clear long-term advantage.

The three myths in action

Many research fields seem to use but a narrow set of graph types to display quantitative data. Sadly, even when they understand that the type they use is suboptimal or that different research questions usually suggest different graphical representations, many researchers resist the common-sense advice to try alternative graph types. Somehow, they fear social exclusion (*my manuscript would be rejected*), disappointment (*but then you can see immediately how few data points I have*), or sheer bewilderment (*my readers are not used to viewing data like this*). These fears are unjustified a priori: yes, you might receive a comment from journal editors or referees about an unconventional graph, but it is unlikely to be sufficient grounds for manuscript rejection; telling the truth about the data is what graphs are all about; and researchers should have no trouble interpreting a novel type of graph if it is intuitive, which is what visual representations are all about.



As a specific example, researchers in life sciences traditionally use bar charts to represent evolutions. Beside using much ink for comparatively few data, such charts display the error bars on one side only (quantitatively sufficient, but visually not intuitive) and do a poor job of revealing trends—especially when displaying several variables or, worse, spacing values that are not equidistant evenly along the axis. Using lines is better suited to showing evolutions: by “connecting the dots,” it reveals trends elegantly and displays the rate of change (the slope). I am yet to meet life scientists having difficulty interpreting a line plot, however unusual it may be in their field.

Real-life examples

Ends vs means—Perhaps the prototypical example in academia of focusing on the means, not the ends, is teaching. Conforming to traditions dating back centuries, too many instructors consider they have done their job when they have “covered all material,” that is, when they have said everything aloud once or solved all assigned exercises on the blackboard. But have students learned? Is this pre-Gutenberg approach still a “best practice” in today’s context?

Respect—The importance of dressing up for others as an elementary sign of respect had been strongly impressed on me, so I felt compelled to wear a tie when running workshops, including at universities. I soon found out that the researchers in front of me regarded my tie as an attempt on my part to create an unwelcome distance between me and the group. Reading such comments on the evaluation sheets (the only ones I ever received on my appearance) was a shock: distance was the last thing I wanted. As a sign of respect for the participants, and in line with the atmosphere I strive to create, I now dress less formally (no tie)—but I still strive to look smart.

False constraints—Many constraints that people identify as barriers to trying something different are in fact false constraints. A frequent such excuse is the setting of the room in which people must speak or teach, which they regard as a given. Yet most suboptimal rooms can be rearranged in part or in whole. Do it yourself (come early) or ask for it if you feel you must, explaining you want to ensure a better experience for the audience, but get it done.

Following traditions blindly is a typical example of confusing the ends and the means. It strikes me as all the more wasteful when the people doing so mean well, when they try their best. Traditions are not necessarily best practices. Those that are in one context may not be in another, even if the objectives are unchanged. Thus, practices that were once the best way to achieve a given set of objectives may no longer be so today. Effectiveness being about reaching one’s purpose, it requires identifying this purpose and keeping it in mind at all times, while considering the resources available and the constraints.

One basic, overarching guide to successful communication, yet a frequent example of confusing the ends and the means, is respect for one’s audience. Respect is not about etiquette, rules, and codes; it is about something deeper. In a sense, it is about intent more than outcome. Among other things, respecting one’s audience means valuing their time, striving to enlighten rather than impress them, and listening to them. Communication formats that adhere to a field’s traditions yet are suboptimal are disrespectful of the audience’s time, not to say intelligence. True respect often requires breaches: it is about obeying the spirit of the code, not the letter of it.

Of course, departing from traditions for a good purpose—in our case, effective communication—requires discernment; originality is not a virtue in itself. Daring to act differently in a given community can thus be daunting; it involves risk, though often not nearly as high as most people seem to think. It requires effort, too; conforming is clearly more comfortable. Yet when you contribute a socially acceptable mediocre talk or impenetrable text, have you done anything to be proud of?

Some traditions I question

My sessions on effective scientific communication are largely about challenging traditions. Here are a few examples about conference talks and papers.

Opening a talk thus: “My name is <speaker’s name> and I have chosen to talk today about <title of talk>.” At the start, attendees want to decide, in a sense, whether it is worth staying. The speaker must thus first of all create interest and establish credibility; a self-centered opening is unlikely to achieve either. (Also, name and title of talk are usually on screen.)

Going over the preview of the talk at the very start (typically after saying one’s name and the talk’s title). Attendees are not ready to assimilate such a preview until they know what the talk is all about: what was the research need, how did the speaker go about it, what is his or her main message? The preview should outline the body (just before it), not the whole talk.

Closing a talk thus: “Thank you for your attention.” Thanking attendees suggests they paid attention as a favor. If you wish to show respect, make the talk interesting for them: get their attention, motivate them, adapt to them. Make them want to thank you.

Writing a highly specialized abstract for a paper (more technical than the introduction of the paper). Usually, the abstract is read by everyone, including the least expert readers, whereas the paper itself is read by more expert readers, who want details. While short, abstracts should not be overly technical; they should focus on the motivation and outcome.

The myths of scientific writing

When I discuss a piece of writing with a participant in an individual tutorial, I might point to a sentence I do not quite understand and ask candidly what he or she means by it. At that point—it never fails—the participant looks at the sentence, looks at me, looks at the sentence again, and heaves a big sigh. After admitting that it is not a very good sentence indeed, he or she goes something like this: “Look, what I am trying to say here is <clear statement>, but I don’t know how to say this”—at which point, of course, I merely reply, “well, you’ve just said it.”

A tenacious yet often subconscious myth created by traditions suggests that scientific prose requires a specific, unique writing style: “scientific language.” Group leaders are even known to criticize papers that “do not sound scientific enough,” as if credibility depended on obfuscation. If colleagues are grateful when you explain your research straightforwardly to them, why would you need to write differently, except to polish an imperfect use of the language?

Myths sometimes generate countermyths, focusing just as much on the means rather than on the ends. Should research be reported in the passive voice? Certainly not when it makes for heavier sentences or omits an agent that matters, as in *it is believed*. (Who believes this? The authors? The community at large? Readers will likely want to know.) Should you write every sentence in the active voice, then? Of course not: the passive has legitimate uses, too, in particular to place the topic in subject position. Absolutes are convenient, but are seldom tenable.

*You deplore the low quality of conference talks,
but aren’t conferences more about networking?*

Networking can admittedly be a significant benefit of conferences. Still, talks should incite networking, not hinder it by reflecting poorly on the speakers or obscuring their topics. As for other things in life, if talks are worth doing, they are worth doing well.

Are traditions necessarily a bad thing?

Ideally, traditions converge to best practices; if so, they would be a useful guide toward effectiveness. Doing things out of tradition without questioning whether the “usual way” is the most effective way to reach one’s purpose in a given context, however, is hardly a guarantee of success. Critical thinking is as useful for communication as it is for research.

*Even if your advice on communication makes sense,
the community is never going to accept the change.*

In my experience, the scientific community accepts what is different if it is manifestly more effective. Many workshop participants who took my advice and made it theirs have become successful rebels, winning awards for best paper or best presentation at conferences—a proof of community acceptance. The issue, at times, is agreeing on the purpose(s). Group leaders, for example, often push students to write their papers for specialists like themselves, thus overlooking another purpose: that of reaching less expert readers, notably newcomers to the field.

“It is not compatible with our template”

MY FRIENDS SAY THIS SLIDE IS TOO CROWDED,
BUT I REALLY WANT TO SHOW THIS GRAPH.

*HOW ABOUT REMOVING WHAT IS NOT THE GRAPH,
THEN? THE BACKGROUND, THE LOGO, THE...*

YOU CAN'T DO THAT! IT'S PART OF THE TEMPLATE!

SO WHAT?

WELL, I MUST USE THE TEMPLATE.

SAYS WHO?

I DON'T KNOW, BUT IT'S LIKE THAT.

WHERE DOES THIS TEMPLATE COME FROM, ANYWAY?

FROM OUR INTRANET.

*RIGHT. I MEANT, WHO IS THE OWNER OF IT?
WHO SHOULD WE TALK TO TO GET IT FIXED?*

I DON'T KNOW.

*WHAT'S THE WORST THAT COULD HAPPEN
IF YOU ADAPTED THE TEMPLATE A BIT?*

I'M NOT SUPPOSED TO CHANGE THE TEMPLATE.

I HEARD YOU. IT'S A HYPOTHETICAL QUESTION.

I DON'T KNOW.

THAT'S A LOT OF "I DON'T KNOW!"

YEAH... I KNOW.

SO WHAT ARE YOU GONNA DO?

I THINK I'M GONNA KEEP THE SLIDE AS IT IS.

When I ask the participants in my workshops what is wrong with most slides, their answers can usually be summed up in a single word: crowded. Slides include too much to look at, in particular too much text. Yet when I show a sample slide they sent me and I ask them what they could remove from it, they are at a loss to say—that is, until I provide a motivation: imagine you get an M&M's® candy every time you can remove an item from the slide, ideally without loss of information. Now they get in the mood and start removing needless words, bullets, lines, frames, arrows, 3D effects, and color gradients, until someone exclaims: “you can't—it's part of the template!”

Ah, the dreaded slide template, with its background image, corporate logo, slide number, copyright notice, and assorted visual noise getting in the way of simple, clear illustrations. Of all barriers to effective communication, it may be the one inspiring the most ominous feeling of dire consequences—however ill-defined these may be—should employees not use the corporate template or should corporations not create one in a desperate attempt to stand out while in fact conforming. Templates are yet another case of confusing ends and means.

Both the speakers and the organizations to which they belong should have the same priority: to ensure a superb presentation. Yes, identifying the speaker and his or her affiliation matters, but it matters infinitely more if the presentation was effective. Designing a heavily branded template that shouts the name of the organization on each slide yet clutters it in the process to the point of obscuring its message is in no one's interest—not the speaker's, not the organization's, and certainly not the audience's. Above all else, make sure your slides are clear.

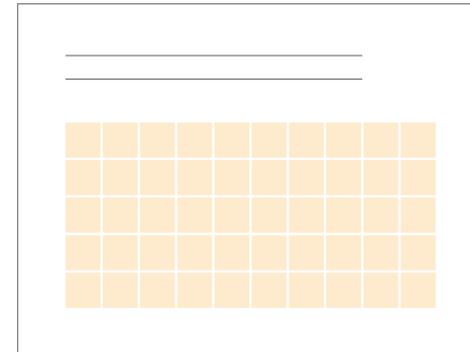
At their most effective, slides convey messages on their own, unambiguously, without distracting from the spoken content. Should audience members miss the point the speaker made, they should be able to get it by taking one look at the screen. A slide's primary purpose is just that: to get a message across. To this end, a template need include no logo, slide number, or copyright notice; in fact, it need not include anything at all (or at least anything visible) until the speaker adds content. A template is—should be—a mere placeholder for elements of content, that is, a way to ensure that similar information be displayed in a similar way across related (sets of) slides.

Admittedly, slides may have additional, secondary objectives, such as to reinforce the speaker's affiliation, provide signposts, or protect intellectual property. The challenge is to attain such legitimate ends by means that do not insert visual noise or needlessly reduce the slide's already limited available area.

Many conventional template elements are in fact of little use *during* the presentation: they are included in case the slides get distributed as such, whether before or after the session. Perhaps this is a habit we must challenge. Should we make our slides available? They were designed to accompany a talk, not to serve as written document. If our attendees need one, why not write a paper or handout? And if we give our support, the slides as such are impractical: they use too large a font for easy reading when printed full-page or viewed full-screen. A more audience-friendly alternative is to create a handout showing six slides per page, perhaps then as a locked PDF file. This handout, not the slides, is what should carry the logo, reminders of speaker, date, and place, copyright notice, etc.

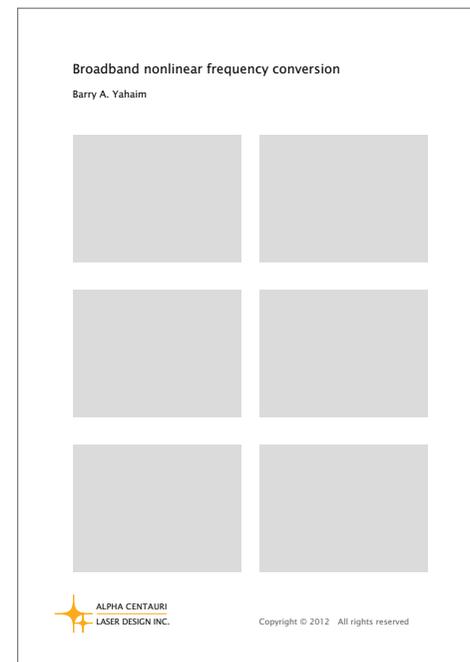
A slide template

The template specifies (invisibly) where items are—or can be—located and how they look (font, colors, etc.). Two lines for the title and a grid to guide the placement of items may be enough.



A handout template

If the slides can be read on a conference screen during the presentation, they are readable as well if printed six on a page. Such a handout affords a better overview than a mere string of slides and can carry branding and any other desirable item without cluttering the slides in themselves. It need not even include all slides shown (or be limited to slides shown). A handout template can make for a neat support.



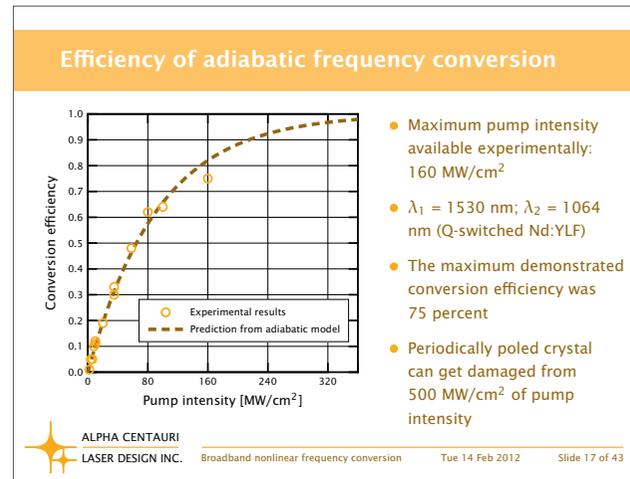
A conventional template

The title area, providing space for just a few words, encourages speakers to state *what* is on the slide, rather than express the slide's *so what* (its message). Because of the color band, the title is not inviting to read: it looks like it is not really part of the slide.

Having to fit it in a well-delimited rectangular area, the speaker resorts to a conventional all-in format for the graph, with little or no freedom to point out the features of interest with call-outs. The display is furthermore suboptimal with its separate legend, a vertical label, a less-than-intuitive horizontal scale, too many values along the vertical scale, a needless grid, hollow data markers, and a dashed data line.

Logo(s)—undoubtedly a prime branding element—need not appear on every slide. A logo takes space, is one more thing in the audience's field of vision, and may be seen as exaggerated repetition, a bit like a speaker repeating his or her name all the time. (Admittedly, the audience might no longer notice the logo after a few slides; but then, why include it?) Logos can more usefully appear on the title slide and on a final slide: those correspond to moments when attendees care about the speaker's affiliation.

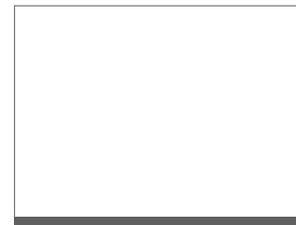
Repeating the title of the presentation or possibly the speaker's name in a footer has marginal benefit at events with parallel sessions, namely to reassure audience members that they are in the right room. To be useful at all, such elements must be legible, so the ratio of benefit to space used is low. Posting the session's program on the door is more efficient.



Space is always at a premium for effective slides, yet so many templates are wasteful with it. Here, for example, the white space above the title band seems to serve no functional or aesthetic purpose, yet it sacrifices 5% of the slide's total area already.

Conventional templates induce speakers to display whatever they have to convey in bulleted-list format, thus masking the logical relationships among items and discouraging connections with visual elements. The bulleted items included here lack parallelism in both content (they do not make up a true list) and form (some items are sentences, some are not). In any case, the bullets themselves are unnecessary.

Whether to include the slide number is a difficult, often emotional debate. Clearly, numbered slides are easy to refer to (*Could you go back to slide 17?*), so including slide numbers is useful when the slides are numerous and may be discussed at some length, as may be the case for a dissertation oral defense, or when attendees must advance slides themselves, as sometimes happens in Web-mediated sessions. Still, numbers are not neutral. Beside using space and often interfering visually with other elements on the slide (notably graphs), slide numbers seem to be used mostly for checking up on the speaker (*Did he not skip slide 16?*), perhaps all the more so when the total number of slides is indicated as well (*26 more slides to go: she'll never be done on time*). When included, the slide number is best segregated from the remainder—as if it were outside the slide. The zone thus created might be used for navigation.



Possibly a structure reminder | Slide number

A better template

The title area, allowing two lines of text if needed (up to 12–15 words), allows the speaker to convey a message (the *so what*), stated as a full sentence. The generous margins around it help this message stand out visually, with no need for a line or frame to separate it from the remainder area of the slide.

The revised graph gives prominence to the data, with scales limited to the few values of interest here. Horizontally, it has been extended to the damage threshold, to display the range of pump intensity available with a conversion close to 100% (which is what this slide's message is about). The text items are now directly connected to the graph's features.

The logo, footer, and other incidental information have been omitted altogether. The logo can appear on the title slide, together with the speaker's name and the date (and of course the presentation's title). It can also come, perhaps on its own, on a final slide shown on the screen during questions and answers.

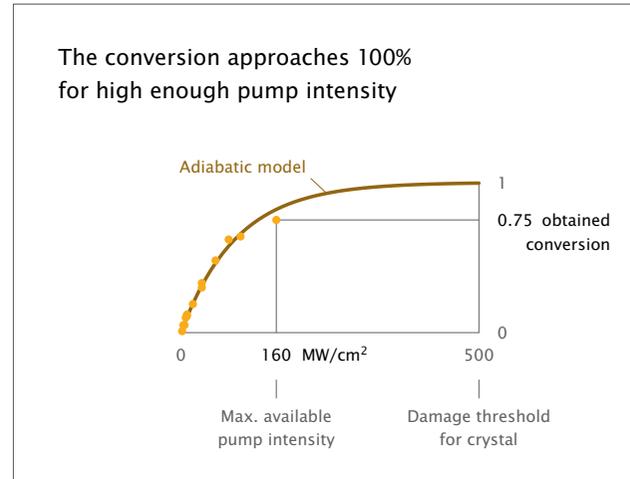
**Broadband nonlinear
frequency conversion**

Barry A. Yahaim
Tue 14 Feb 2012



A title slide, shown before the speaker begins (and visible until the next slide becomes relevant)

A final slide, on the screen during questions



Even without logo or other pre-existing elements, slides can still show a uniform, corporate identity through the template's use of fonts, colors, layout, and other properties applied to actual slide content.



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LASER DESIGN INC.

Noise, losses, and templates

In communication, nothing is neutral: the audience is liable to see everything and to hear everything. Any visual or auditive element that does not help convey the intended message (the signal) will thus distract the audience away from it; hence, it is noise. Effective slides exhibit a high signal-to-noise ratio.

Even with cleaned-up slides and a polished delivery, speakers cannot hope for a lossless environment. At a conference, for example, audience members are typically exposed to three or four talks an hour, eight hours a day, several days in a row; they are several time zones away from home, likely sleep-deprived, and possibly underfed; and they are often non-native listeners of the language used in the talk. They can thus hardly be expected to get every word that every speaker is saying. Beyond maximizing the signal-to-noise ratio, an effective way to deal with such losses is to use some form of redundancy, for example by creating slides that get the message across on their own—just like the spoken discourse.

Effective slide templates help speakers avoid noise and fight the consequences of noise, namely losses. When designing a template (or a slide), question anything you plan to include: if it does not directly contribute to conveying the message, ask yourself whether its potential benefit in terms of branding, navigation, or other is worth the area it is taking up. Speakers indeed need all the space they can get—in the title area, to write a highly legible sentence, and everywhere else, to work visually, not verbally. The default template should not be a bulleted list.

“My group leader won’t let me do so”

LOOK AT WHAT YOU WROTE HERE: “Using finite elements, we simulated the impact of a lower K on the performance of the AES structure!” THAT WON’T DO AT ALL.

WHAT’S WRONG WITH THAT SENTENCE?

IT DOESN’T SOUND SCIENTIFIC ENOUGH.

UH? WHAT DO YOU MEAN?

IT SOUNDS AS IF THE ONLY THING WE DID WAS SIMULATE THE IMPACT OF A LOWER K ON THE PERFORMANCE OF THE AES STRUCTURE USING FINITE ELEMENTS.

UM... THAT IS THE ONLY THING WE DID, ISN’T IT?

WHAT I’M SAYING IS, DON’T MAKE IT SOUND THAT WAY.

SO... WHAT DO YOU PROPOSE, THEN?

HERE: “In this paper, the results of a comprehensive simulation campaign based on the finite-element analysis method of modeling and aiming at determining the potential impact on the performance of the AES structure of imposing a lower value for the parameter K are presented and discussed!” SO MUCH MORE IMPRESSIVE.

I DON’T KNOW. THIS SENTENCE DOES NOT EVEN CLARIFY WHO CARRIED OUT THE SIMULATIONS?

OF COURSE NOT: SCIENTIFIC WRITING IS SUPPOSED TO BE OBJECTIVE. PLUS, IT’S OBVIOUS WHO DID IT.

IT’S OBVIOUS FOR YOU: YOU SUPERVISED THIS WORK. BUT TO ANY OTHER READER, IT IS AT BEST UNCERTAIN: WE COULD BE DISCUSSING SOMEONE ELSE’S RESULTS, AS IN A REVIEW PAPER. SHOULDN’T WE CLARIFY IT?

NOW LOOK, THIS HAS GONE ON LONG ENOUGH. I HAVE A LOT MORE EXPERIENCE THAN YOU HAVE AT THESE THINGS, AND I’VE PUBLISHED IN THIS JOURNAL BEFORE. BESIDES, I’M IN CHARGE HERE AND I’M TELLING YOU TO CHANGE THAT SENTENCE. OK?

After participating in one of my training programs on graphs, a doctoral student tried an alternative representation to show his own experimental data. To reveal the evolution over time, he used lines instead of bars; and instead of a default scale, he indicated, beside a zero line, the start and end data values. He was pleased with this simpler, clearer, more useful graph; his group leader, in contrast, was not. “That is not the way to show data,” she said. His attempt at a rational discussion was soon cut short by an argument of authority on her part: “change everything to the way you presented the data before,” she said, “or show me a highly cited publication that uses your way of presenting data”—clearly a chicken-and-egg issue.

Obviously, group leaders, editors, referees, jury members, etc. have a right to their own opinion, even if different from mine. The problem is, they just have no opinion of their own, really: they follow a dogma—and one that is all the harder to dispute because the authority that laid it down is at best ill-defined and at worst nonexistent. Mislead perhaps by their success at fitting in—however mediocly—they embrace traditions and, like high priests of scientific communication, they feel they must, in turn, initiate novices into the mysterious ways and sacred language of research, making sure these novices abide by every rule, complete every rite, respect every taboo. Like many in an authority position, they are most peremptory when least sure of themselves: “That’s how we do it, period”

Not all leaders are as narrow-minded about communication, of course, and even strongly dogmatic ones usually mean well. Simply, they have formed an inaccurate model of what works or why it worked, and they do not see what they are missing.

All the same, dogmatic arguments are unexpected in people whose lofty purpose in life is precisely to be imaginative—able to think for themselves, challenge false beliefs, and come up with inventive, original, groundbreaking ideas or solutions. Researchers can be so rigorous and so creative in their work, yet so disorganized or so conformist in their communication. Those same people who make fierce referees, willing and able to criticize the work of their peers without mercy in an effort to defend what they regard as the truth, will follow like sheep the bad speaking, writing, or graphing practices of their field or their organization in an incomprehensible attempt to “fit in.”

Inflexible directives from PhD advisors are similarly surprising. Yes, PhD students need to be led, but above all else they must be led on the path to independence. Though PhD criteria vary, the idea is that candidates must prove their ability to conduct research, if not on their own, at least of their own initiative. How can they develop the competences required to get there if they are never allowed to try a new approach and to learn from their successes and failures? How else do you foster open-mindedness, good judgment, and independent thinking?

Mind you, leading a young mind on the path to independence does not mean abdicating one’s responsibility as group leader. Young researchers have much to learn from experienced ones and should thus listen. Yet they should be given the freedom to challenge traditions, templates, and group leaders’ advice. I am a firm believer in peer review for reporting on research, but if peer review means that authors do not dare to submit what might be a (somewhat) original graphical representation to their peers for review, there is something definitely wrong.

Fear, guilt, and conformism

The pressure to conform can likely be traced back to authority figures in our education, be it at home, school, or other (“parents, professors, preachers”). Most of these were in fact never trained for the job; naturally, they tend to do to the next generation what the previous one did to them. Frequently, too, they use fear and guilt as strong drivers of learning; unfortunately, these are poor drivers of innovation.

Parents usually value learning by imitation as long as children copy their behaviors, not other people’s. On the one hand, they may quench critical thinking (*Don’t ask why; just do as I say*); on the other hand, they also scold children for their lack of judgment or of independent thinking (*If he jumped off a cliff, would you jump off a cliff, too?*). They often start the you-will-understand-when-you-get-older notion that makes even PhD students blame themselves when they do not understand a lecture or a paper.

Professors perpetuate the feeling of guilt by blaming students for not knowing. Many doctoral students still regard every question after a talk as an exam: they assume the person asking knows the answer and is checking whether the speaker does as well. They find it unbearable to have to say *I don’t know*.

PhD advisors, jury members, editors, and all others who decide sovereignly on matters of life or death (or so it feels) to PhD students further instill a sense of fearful deference. The safest strategy is hence to avoid challenging the authority figures at all cost; some students cannot imagine standing up to them.

Are all group leaders really like you describe here?

What I present here is a bit of a caricature indeed. Still, it is how workshop participants often describe their group leader to me. Any leader who bothers to read this booklet is probably more open-minded.

Why do you base your approach on common sense and not (as a researcher) on empirical research?

Communication, like other social-science themes, suffers from a high number of confounding factors: it is difficult to prove anything with general validity. Striking yet poorly understood research outcomes quickly get elevated to absolute truths by people outside the field, giving rise to myths (an example being the magical number seven plus or minus two). Common sense and own experience are typically a more robust foundation to anchor best practices.

What about my responsibility as group leader to stimulate the scientific output of my group?

Surely, a productive research group is a worthy aim, but maximizing scientific output must not be done at the expense of other worthy aims—not the least of which is fostering the individual development of your group members. If you force them to write in a traditional way against their better judgment just because you believe it increases the probability of the paper being accepted—worse, if you rewrite large portions of their draft manuscript yourself—you are not providing much opportunity to learn.

Paradoxically perhaps, whenever I get to train group leaders on scientific communication, even in short sessions (indeed, few have the time or the humbleness to attend longer ones), I have little or no difficulty convincing them of the absurdity of some traditions and of the soundness of other approaches. There might be initial doubts, as when someone exclaims, “I see your point, but I once heard from a journal editor that...,” but such sorting out of conflicting advice is in fact beneficial. And yes, there will be the odd group leader who takes advice from no one and had decided in advance he would disagree, but the other participants say the session was an eye-opener.

What, then, is the secret of my success with group leaders? In a word (two, actually): common sense. Researchers being rational minds, let us elevate the debate to the rational plane: no more *no one else does it so*, no more *that's against the rule*, no more *because I'm the boss and I say so, that's why*; instead, let us identify clearly the ends we want to reach, then devise the best ways to reach these on the basis of sound judgment.

Admittedly, group leaders and other workshop participants are also influenced by the context: the reason for attending a session (to learn), the approach I follow in my workshops (making them say it rather than saying it myself), perhaps my expertise. Group leaders may not be in the same mood when discussing a paper or talk with members of their group. Still, I keep dreaming of researchers who dare to stand up for what they believe in—respectfully, constructively. I keep dreaming of group leaders, editors, and referees who listen—actively, open-mindedly. I believe the world would then be a better place, and I intend to pursue my crusade toward it.

Notes and references

This booklet was written with researchers in mind, but its observations and recommendations apply broadly to anyone giving talks, writing documents, or graphing data—and to his or her supervisor—at least when content is more important than form. Similarly, the comments about templates for slides could be extended to document templates at large.

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An engineer from the Louvain School of Engineering and PhD in applied physics from Stanford University, Jean-luc Doumont now devotes his time and energy to training engineers, scientists, business people, and other rational minds in effective communication, pedagogy, statistical thinking, and related themes.

With his rational background, Jean-luc approaches communication in an original, engineering-like way that contrasts sharply with the tradition of the field, rooted in the humanities. He is thus well received by students and professionals in search of a method they can apply with the same rigor they have come to value in every other aspect of their occupations.

An articulate, entertaining, and thought-provoking speaker, Jean-luc successfully reaches a wide range of audiences around the world, in English, French, Dutch, and Spanish—as a trainer or invited speaker at an array of companies, top-ranked universities, research laboratories, and international conferences.

A sequel and companion to the critically acclaimed *Trees, maps, and theorems*, Jean-luc's hallmark book about "effective communication for rational minds," this booklet exposes attitude barriers that prevent otherwise knowledgeable and skilled individuals from giving effective talks, writing effective papers, or creating effective graphs. A touch iconoclastic yet always constructive, it dares to discuss taboos, debunk myths, and denounce traditions, templates embodying them, and the caricatural group leader as guardian of traditional but suboptimal practices of scientific communication. Written in an attempt to change the world, it is meant to be shared broadly within the many research communities and beyond.



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