

Storytelling—The Missing Art in Engineering Presentations

It happened again. I had just finished sitting through the presentation and defense of a student's Ph.D. proposal, and it simply couldn't be described as a success. Why?! The student had prepared well, followed the basic rules for a good presentation, spoken clearly, and kept within the allotted time; yet something was missing. The fact that something was missing was even clearer as members of the committee struggled to find the significance of the completed and proposed work. Having first-hand knowledge of this student's work, I knew that it was well done and that he had made useful contributions to his field. Plots and tables showing the effectiveness of his approach were included in the presentation. One might expect him to have received congratulatory pats on the back instead of skepticism and doubt.

This student fell victim to a common problem in engineering and perhaps in other disciplines as well. He forgot the story that made his research exciting, and in his desire to impress, turned the presentation into a series of plots, equations, and facts that left the audience nearly comatose. That "something missing" was the storytelling.

WHY STORYTELLING?

The human brain is not a computer. Although it might simplify education if we could simply dump all necessary raw facts directly into a person's brain, that is still the stuff of science fiction. Throughout the ages, people have taught their children and others using stories. Stories convey not only information but experience and wisdom, and they excite sympathetic reactions

within the listeners that enable them to apply the learned concepts to other situations. Our brains are simply better equipped to understand and retain narrative and information in context than to retain bare facts.

Technical topics, however, may seem to defy a narrative or "storytelling" approach. For example, precision is often paramount, and such precision may best be represented in terms of equations, plots, and tables of data. Do not despair, you too can enchant your

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audiences with gripping tales of multi-dimensional analysis and measurement techniques.

STORYTELLING IN ENGINEERING?

"But I only have 20 minutes to present my paper! How can I fit in a plot, character development, and a battle of good versus evil, and still have time to get to my results?"

Let me assure you, it is possible. A good story must have plot, characters, and dramatic appeal; and this goes for stories in engineering as well. Instead of villains, we have problems—they could be noise, theoretical limits, or practical limitations. To set up the drama, we can relate failed attempts to solve a problem or potential benefits from being the first

to find a solution. Acting the role of the protagonist is our newly developed method or mathematical approach. And, for a plot, we can relate the saga and suspense of seeking a solution through forests of data and impenetrable mathematics.

Now, before you simply turn all your presentations into fairy tales, let us look a little more into these concepts. First, when talking about presentations and storytelling in the same breath, most people think of stories that are included within a presentation. These stories can introduce, punctuate, clarify, or emphasize points of a presentation or lecture. As an undergraduate student taking thermodynamics, I had resigned myself to a dreary semester of looking up thermodynamic properties of select substances in countless tables. Then one day, we had a guest lecturer who explained how a coal-fired power plant works—it essentially has a flame 12 stories high! Suddenly, heat transfer became much more interesting.

This type of storytelling, also known as "sharing real-life experiences," is extremely valuable, but it is not what we are talking about in this discussion on storytelling. So, let us go on to see how we can make a compelling story out of a simple technical presentation itself.

HOW TO TURN PRESENTATIONS INTO STORIES

"Effective storytelling is a fine and beautiful art. A well-developed and presented story can cut across age barriers and will hold the interest and reach its listeners. Stories will be remembered long after other orations" [1].

It is easier to be a comedian if you find humor in the vicissitudes of life. Likewise, stories spring up from a well of

fascination with life and your surroundings. The key is to convey that fascination to those around you. This takes practice and attention and you will need to develop your own style. But to get you started, here are eight suggestions to help you enliven your presentations and make them memorable and effective:

- Share the love.
- Know your audience.
- Pay attention to the big picture.
- Learn the history.
- Try to explain it to a nontechnical friend.
- Follow a pattern of tension and resolution.
- Practice.
- Don't overdo it.

SHARE THE LOVE

This is all about conveying your “fascination” for your topic. Why are you involved in this work? What makes it interesting to you? I hope that answers to those questions spring readily to mind, otherwise you may have more problems than just making a good presentation. If answers to these questions do not come easily, then you may need to think more about them as you are actually doing the work. It will make your work more rewarding and productive.

Now, once you remember why you love your topic, you are ready for the next step, which is to share your love of your topic or material with the audience. Ask yourself—what might other people find interesting? Give this some thought. I have endured more than one presentation in which I know the presenter has a love for his or her topic but did not share that with the audience. Perhaps this was for one of several reasons: one, they were afraid that others would not find it interesting and so did not even try; two, they were unaware that their audience wouldn't automatically feel the same way they did; or three, they were under the impression that technical presentations should be dry. Technical presentations should not be dry. They should be interesting and compelling, and the presenter should exhibit enthusiasm for the topic. It also

helps substantially if you know how to connect with your audience.

KNOW YOUR AUDIENCE

“Know your audience” is a proverb in public speaking. What does it mean to know your audience? To begin with, you should know what the audience wants from your presentation. Whether you give them what they want may be a different discussion (they may want free sports cars), but you should try to understand their expectations as a starting point. Then, estimate their ability to understand your presentation, their level of endurance, and how your topic relates to their primary interests. The single thing that often sets apart an excellent teacher from a poor teacher is the ability to understand and connect with the audience.

Before your presentation, learn what you can about your audience. Visit with

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audience members, if possible, beforehand. During the presentation, observe what resonates with the audience and what does not, then adapt accordingly. This will take practice, but the effort made in learning these skills will pay off for the rest of your life.

PAY ATTENTION TO THE BIG PICTURE

A good novel will have a main plot and it may have many subplots, but it will not have random unrelated points. Some things just do not contribute to good stories or good presentations. Isolated details fall into that category. When deciding if something should be included in a presentation, ask yourself how it contributes to the overall story. If it is important, then it should be properly incorporated into your story. If it does not contribute, then leave it out.

Consider, for example, how you might discuss a detail in the simplification of a mathematical expression. When replacing e^{κ} with $1 + \kappa$ you probably had a good reason; but you must ask yourself how it contributes to the main message or big picture. We will assume that it is important and that it does contribute because if it was not important, then you would not have included it in your presentation. Since it is important, then it is worth presenting properly.

How do you present details properly? You first explain the context or motivation that makes the detail relevant to the rest of the story. Only after presenting the motivation should you share the detail—it will then fit nicely into the narrative in the place prepared for it. Back to our e^{κ} approximation, you might ask yourself why you made the approximation and why the audience would care. How did that change affect the larger system? You might explain that no closed-form solution to the original equation is known but that by approximating $e^{\kappa} \approx 1 + \kappa$ it is possible to generate a closed form solution. Then you could explain that the approximation is significant for them to remember because it limits the range over which the approximate solution is valid; thereby limiting the scope of the solution.

A good rule of thumb for keeping the big picture in mind is to provide context or motivation before presenting details so that the audience can easily understand the significance and relative importance of each point that you make. If a detail is not worth that effort, then it is likely not worthwhile including in your presentation.

LEARN THE HISTORY

When looking at the “big picture,” it is often helpful to zoom out even further than just your own work. Are you the first person to look at this topic? If so, then either you are a genius of the first order or you picked a topic no one cares about. If you are not the first person to look at the topic (as is more common), then be prepared to set the background

for your work by discussing the successes and shortcomings of those who went before. Build it up so that now you will be presenting the culminating chapter in the great saga that began with those pioneers in your field. Your audience will naturally be more interested in your efforts, and it will make it that much easier for them to understand its significance. As any sports fan knows, a game is much more interesting to watch when you know the teams and players and their struggles and triumphs.

TRY TO EXPLAIN IT TO A NONTECHNICAL FRIEND

Once you have the big picture and the backstory, it is time to test it out on a willing subject. This is not a practice run of your presentation but more like an elevator pitch. (An elevator pitch is a short but compelling overview on some topic that could presumably be given in the brief time during which two people are together in an elevator.) The goal is to explain your subject so that a non-technically inclined friend finds it interesting and is not lost among details or esoteric terms. If you succeed, then you have likely established the overall story. If you did not succeed, it is time to reevaluate your approach and then try again (hopefully your friend is patient).

FOLLOW A PATTERN OF TENSION AND RESOLUTION

A good comedian never reveals the punch line until the joke is set up. Similarly, do not show results until you have audience in a state of anticipation. (This is closely related to the method for including details discussed above.) In practice, this means that when giving a presentation, your audience should be eager for the next slide. Consider these two examples:

- 1) "Next we used a nearest-neighbor approach to remove measurement noise on the critical axis. The plot is on the next slide."
- 2) "Now that we had discovered how to capture the data, we needed to find

a way to minimize the error on the critical axis while leaving all other dimensions unchanged. However, no one has ever been able to do so. The difficulty is that.... After trying the usual approaches, we realized that by plotting the data versus the nearest-neighbor density, it might be possible to remove the effects of most of the measurement error. The plot on the next slide shows the average error before and after processing using this approach. If we were successful, the plot would look like"

This example is a bit long winded because it combines several examples of how to build anticipation. There are many variations on this theme. The main thing is to bring the listeners along with you as you recreate the tension and thrill associated with finding a new approach or uncovering new truths. I still remember clearly a concept taught in one of my graduate classes. Prof. Monty Hayes was discussing methods of estimating the spectrum of a signal. What made it memorable was the historical walk through the topic with enough discussion of the advantages and disadvantages of each newly discovered method that the students could make the intuitive leap to anticipate the next discovery. This recreated the thrill of discovery for each listener and created a deeper interest in and for the subject matter.

PRACTICE

A good joke can be made or destroyed by the delivery—the timing, level of detail, and phrasing are essential. A presentation can also sink or swim on delivery. Practice is essential for identifying and correcting awkward parts of your presentation. Furthermore, to implement some of the suggestions in this article, such as following a pattern of tension and release, you must know what slide comes next at each point. Without practice, it becomes much more difficult to have a smooth and natural flow that

interweaves your story and the supporting slides.

DON'T OVERDO IT

Warning—As when using spices in cooking, these techniques should always be used with judgment and moderation. Remember that the purpose of a technical presentation is to convey certain material, not to entertain. Although it may be possible to do both, care must be taken to avoid giving a presentation with plenty of style but insufficient substance. The use of storytelling techniques as described in this article should be subtle tweaks to your presentation style and may not be all used at once.

These suggestions are likely to improve your technical presentations, but they cannot be used as a substitute for good basic skills. See, for example, "Effective Communication: Excellence in a Technical Presentation" by Wayne Padgett and Mark Yoder [2].

THE END OF THE STORY

Back to the student at the beginning of the story. (Sidenote: several of my students have read this article, and they each think that the person at the beginning is them. Although the events are real, I am specifically not writing this with any one person in mind.) By the time of his next presentation he had learned the basic concepts of storytelling, and his presentation was accompanied by congratulations and pats on the back.

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