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Viewpoint
Storytelling and Science

Incorporating storytelling into organizational culture.

I**N THE SPIRIT** of this Viewpoint, we begin with a story. One of the authors—Sumit Gulwani—struggled to teach his preschool-aged son—Sumay—a simple conceptual math theorem: Odd plus odd equals even. When diagrams and toys did not work, Sumit realized he had to meet Sumay where he was and not push to a level he was not ready for.[a] So, he told a story. An odd number, he began, is like a group of kids who are all paired up, except one. That person is "the lonely kid." And he is happy when they meet another odd number because he gets a friend: the other lonely kid. Now, there are no lonely kids, and that makes them an even number. The look on Sumay's face told Sumit that the concept had landed immediately. "What is odd plus even?" Sumit asked. In a sad voice, Sumay answered, "Odd, because there is no one to pair up with the lonely kid." "What is even plus even?" Sumay asked. "Even, because there is no lonely kid to begin with!" Sumit realized his son would best comprehend the abstract theorem when it was couched in a relatable narrative—in this case, one that resonated with a young child's preoccupation with socialization, friendship, and inclusion. As well, this experience happily turned out to be the seed for Sumay's love for mathematics and computing.

IMAGE BY DNAI AMPONNDANAI

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a   Which is often akin to our experiences delivering scientific presentations to nonexperts.

Sumit's experience with Sumay shows how even young children use stories to understand, interpret, and construct meaning about the world around them—and earlier evidence suggests stories are in fact fundamental to human cognitive processing.[10] Sadly, as professionals we overwhelmingly dismiss the importance of storytelling in our day-to-day work, relegating our professional discomfort of "telling stories" to something that is only for children.

Our organization, the Microsoft Developer Division (DevDiv), has undertaken a bold initiative to make storytelling a "professional competency" and incorporate the science of storytelling intentionally into our culture and operations.[4] By doing so, we have amplified our impact across the organization through increasing empathy with our customers, generating clarity with our partners, and building diverse teams.[7] Our transformative experiences within this emerging storytelling culture have inspired us to share these stories with you, stories that have deeply connected us—not just as professional researchers and engineers—but at a human level.

The Science Behind Storytelling
During the past decade, the conventional view of storytelling in technical

and professional circles has evolved from a "soft skill" to a must-have competency, as the need to influence people has become more important in a world of information overload and remote connections. In organizations, research has found storytelling can act as a springboard to ignite unified action.[3] High-tech corporations have used stories as a medium for sharing culture, to "identify heroes and villains, attitudes and values, beliefs, and practices of the organization."[6] And in software engineering, crafting stories together with stakeholders builds a common vision of a system— "a good story is much more powerful than any UML diagram can ever be."[12]

Stories are powerful because they are universal, mirror human thought, define who we are, and build and preserve a group's sense of community.[11] We now know from neurology and psychology that humans think in narrative structures.[10] Researchers seeking to identify the dynamics of the storytelling process have noted increased brain activity in people reading stories, as compared to those reading raw data or facts, with accelerated neural activity in regions associated with emotion, memory, and sensory stimulation.[9]

These insights reveal a set of essential factors—people, problems, places—which must be present for a story to work. These play out upon a universal narrative structure, often called the "dramatic arc," which maps the journey of a relatable character through an experience of struggle or challenge. Humans are born with a mastery of this arc (no one need explain storytelling to a toddler),[1] and it fortunately provides a basis for building and presenting story-rich communications that connect all of us.

Using Stories to Build Connections

Even brilliant practitioners run the risk of cultivating isolated islands of excellence, missing out on the greater impact they might enjoy if they were connected to a broader world of stakeholders. Here are just a few ways storytelling can build these connections:

Connecting with customers. Connecting with the people we aim to serve can help us identify highly relevant problems. Sumit experienced this first-hand in a chance encounter that ultimately led to a career-defining achievement. On a transcontinental flight, he met a woman who, upon learning he worked for Microsoft, sought his help on a problem that had long been frustrating her. Opening Microsoft Excel on her laptop, she pointed to a column of names that were listed in the format: "First-Name, Last-Name." She asked, "How do I reformat this so that the last names are listed first instead of the first names?" Stumped by this simple request and unfamiliar with the Excel programming model, Sumit had to excuse himself out of the situation. Returning home, Sumit scoured Excel help forums to find a solution for her and noticed that people engaging experts for programming help often communicated their intent with just a few input/output examples. It was an ah-ha moment that inspired Sumit to conceive a programming-by-examples technology for automating string transformations such as these, leading to his invention of the popular Flash Fill feature in Excel.[5]

Connecting with partners. There is a common tension in technology-focused organizations between engineers who strive to minimize uncertainty and researchers who embrace it. This tension can either stifle innovation or inspire it. The difference is often determined by how well the parties trust each other and share a sense of com-

> **Humans are optimized for pattern recognition, and the dramatic arc is a metapattern of narrative structure, beneath which are many familiar story forms and personality types called archetypes.**

mon purpose. Here, storytelling can play a pivotal role, as it uniquely generates empathy and tribalism.

For instance, co-author Titus Barik recently conducted a study on pain points in computational notebooks.[2] He could have presented his insights in a traditional way, for example, a thematic analysis or conventional tabular reporting. But he knew his product team colleagues lacked the bandwidth (or, perhaps, interest) to readily digest turgid academic prose. So Titus turned to stories told by participants who had been recorded as part of the study. He shared selected clips of users as they expressed their frustrations and needs. This engaged his audience emotionally to the people in the recordings—and to one another. A key product manager, after watching the clip, immediately remarked, flustered: "That was excruciatingly painful to watch. This is an absolute nightmare for our users!" They were now motivated, across functional and organizational boundaries, to take action and resolve the storylines.

Connecting with hiring and funding committees. Students will become the next generation of practitioners and researchers. Every year, employers struggle to hire the best candidates, and multitalented candidates struggle to find career paths that resonate with their ambitions. Today, many organizations, even for roles beyond research, now value candidates who can showcase not just their technical skills, but also their storytelling skills.

When Titus first applied to Microsoft, he had difficulty differentiating himself from other new researchers, many of whom had, on paper, very similar technical accomplishments. Rather than presenting only the technical minutiae of his own work, Titus shared a series of stories about others, centering his talk through the voices and videos of participants who used his prototypes and tools, and even asking the audience to share their own interesting stories around his research topic. Through these stories, it became apparent the way Titus could add value to the organization was as an interpreter, bridging multiple disciplines and roles to help teams obtain resources and funding.

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Storytelling Guidelines

In working with thousands of engineers and other technical professionals at Microsoft, we have developed a set of principles that have proven effective in advancing storytelling skills. Here, we highlight some of the most important.

Cultivate empathy. Compelling stories are just as much about the storyteller as the story being told. To engage and influence, storytellers should be keenly attuned to their audience's dispositions, values, and needs. This involves more than merely recognizing circumstances; it requires understanding people's lives at a subjective level. The knowledge gained helps guide the presenter to deliver the story in terms that resonate and foster a sense of common experience. Both Sumit's story of the woman in the airplane, and Titus' stories of computational notebook users persuade us to "walk a mile in someone's shoes." Effective storytellers can harvest this power of stories over statistics, taking otherwise impersonal numbers and calculations and bringing these essential elements of empathy into central focus.[8]

Find relevant archetypes and metaphors. Humans are optimized for pattern recognition, and the dramatic arc is a metapattern of narrative structure, beneath which are many familiar story forms and personality types called archetypes. People universally recognize a set of familiar dramatic struggles—odysseys, tragedies, love affairs, to name a few—which resonate with daily human challenges. Likewise, a well-chosen metaphor can quickly create a concrete association to an otherwise abstract concept. A dry data analysis, for example, can be made far more engaging when presented as a mystery to be solved or a hero to be rescued—such as our story to help our computational notebook users escape their "absolute nightmare."

Identify and integrate the human connection. Stories generate interest by conferring subjective meaning upon objective content. Meaning is imbued by highlighting human factors (for example, personal, physical, or sociological circumstances) surrounding an inanimate subject. A simple technique is to explore ways in which human activities intersect with or influence the topic or work being presented. This can take the form of a story about user pain/resolution, an ah-ha moment that sparked an idea, or a backstory about a research or development effort.

While "automating string processing in spreadsheets using input-output examples" would have come across as incomprehensible jargon to Sumay who had often wondered, "Dad, what have you invented as a scientist?"—Sumit found a surreal moment last year. When Sumay's remote-school teacher communicated credentials to digital applications by emailing an example of how to derive them from students names and IDs, Sumit showed him how Flash Fill could solve that challenge too!

Use sensory-rich experiences. Virtually any presentation or artifact can be enhanced by experiences rich in physicality, motion, and sensation, as the human brain tends to mirror what is experienced. We have found in our own presentations, for example, the immediacy of "live" demonstrations for a tool or feature—and the thrill of being able to see the storyteller perform right in front of them—brings substantially more audience engagement than a prerecorded video. When Sumit recently presented new innovations in Flash Fill to leadership, he took a very unconventional approach. Sumit wore a t-shirt with an image of an Excel spreadsheet (from a viral tweet poking fun at Excel), using the first version of Flash Fill shipped more than a decade previously. After much laughter from the leadership team, Sumit then showed new innovations in Flash Fill that properly

Peer-reviewed Resources for Engaging Students

EngageCSEdu provides faculty-contributed, peer-reviewed course materials (Open Educational Resources) for all levels of introductory computer science instruction.

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handled the tweet's date and time scenarios, and demonstrated in a very memorable way the importance of continued investment in both research and product.[5]

Make it a practice. Co-author Mario Juarez worked closely with Microsoft DevDiv leadership to develop a variety of skill-building efforts worthy of consideration:

▸ Storytelling workshops, augmented with personalized coaching and featuring deep dives into topics such as "Storytelling with Data" and "Movie Making" for technical presentations;

▸ Internal TED Talk-style presentations, where we first ask team members to watch online TED Talks, after which team members work with a coach to author highly polished talks of their own and deliver them in special events;

▸ A Storytelling Mentors group, which matches skilled presenters with individuals who are eager to advance their skills, providing personalized tutorials and training to grow the competency; and

▸ Participation in academic venues emphasizing nontraditional and creative approaches to communicating about science, such as Onward! essays, which uniquely explore specific topics, and the <Programming> conference, which focuses on programming experiences across multiple perspectives. For small teams, consider starting with informal weekly presentations, even for non-technical topics. When we first started our storytelling journey, we asked different team members to share stories about any topic they were interested in: something fascinating they read in the news, their favorite vacations, or even one of their treasured childhood tales. As participants become more comfortable with storytelling—and with each other—the organization will naturally grow its storytelling culture.

Conclusion

One day Sumay enthusiastically, but tediously, enumerated all the 40 solutions to his second-grade math challenge: Find all tuples (a,b,c,d) where $a \times b = c \times d$ and a,b,c,d are distinct digits. Sumit teased him, "You know what, a computer could have done it for you, all you have to do is to tell the computer

what to do." Sumay's eyes lit up and thus began his programming journey. When Sumay shared this story with his teacher, she got inspired to connect the math and programming curriculum in the classroom. Stories allow us to take everyday, ordinary experiences and transform them into something memorable and remarkable that can inspire action.

Within organizations, our stories reveal the warm shadings of discovery, empathy, and invention in a way that purely technical reports and objective data cannot. Storytelling plays an increasingly important role as a necessary professional competency to not only to elevate research contributions in the broader machinery of technological innovation—but also to nurture the appropriate environment for conducting impactful research in the first place by bringing together diverse stakeholders. 🄲

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