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TOOLS OF THE TRADE

Communicating Developmental Science to Nonscientists, or How to Write Something Even Your Family Will Want to Read

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ABSTRACT

Developmental psychologists are increasingly writing articles, columns, books, and blogs for the general public, but this type of writing can be challenging. Here, I provide guidance on how to communicate scientific ideas to nonscientists, touching on what content to cover, how to organize that content, what language to use, and what tone to adopt. I highlight common shortcomings in how we package and describe our academic pursuits, and provide alternative strategies for writing about research in a clear and compelling manner.

Introduction

When a friend or a relative asks what you study, what do you say? When a colleague asks what you study, what do you say? Most likely, you provide different answers. You tell the colleague you study "the acquisition of syntactic structures" but tell a friend you study "how children learn language." Or you tell a colleague you study "infant numerical cognition" but tell a relative you study "what babies know about number." We have a nascent understanding of how to tailor our message to different audiences, changing what we say and how we say it, and this article is intended to help those interested in writing about their research for a general audience hone that understanding.

Too often when we attempt to communicate with a general audience on paper, as opposed to in person, our ability to tailor our message flies out the window. We default to academese, or the jargon-filled, abstraction-prone talk of academics. Jargon and abstraction can be useful when communicating with those in the know, but they are unintelligible to everyone else, and we recognize, at least tacitly, that we must adopt a clearer and more compelling style of communication if we hope to get our message across.

Writing is all about decision-making—what to include, where to include it, how to express it, how much space to devote to it—and the outcome of those decisions should differ depending on the audience. Here, I outline several such decisions and considerations to keep in mind when the audience is nonscientists. My goal is not to convince you that you should write for a general audience but provide some tips on how you might do so more effectively. Personally, I have found writing for a general audience to be as demanding and fulfilling as writing for our fellow academics, but the reality is that most

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hiring committees and most tenure-and-promotion committees view nonacademic writing as service rather than scholarship. How to balance these types of activities is a personal decision, and nonacademic writing may have to take a backseat to academic writing for those early in their career.

That said, developmental psychologists are increasingly recognizing the value of disseminating developmental research beyond the classroom and the conference hall and have begun exploring additional venues of communication, such as blogs, magazines, oped columns, or trade books. Others are interested but worried about their ability to write for nonspecialists. I have dipped my toe in these waters for several years, writing blogs, magazine articles, and a book, *Scienceblind: Why Our Intuitive Theories About the World Are So Often Wrong* (Shtulman 2017). But I am no expert. I simply offer guidance on making one's writing more accessible. And this guidance is not original to me; it is borrowed from others who have written for the general public for much longer than I have and who I attempt to emulate in my own writing.

The majority of my advice comes from Steven Pinker's (2015) thorough and masterful *The Sense of Style*. Other sources of advice are Paul Bloom, Alison Gopnik, and Bruce Hood. Their writing exemplifies best practices in communicating developmental science to nonscientists, and anyone interested in undertaking the same endeavor should read their books and general-interest articles. Good writers read widely because good writing is better learned through observation than instruction. But a little instruction never hurts.

On organization: Write as if guiding a tour

When academics set pen to paper—or fingers to keys—we think of our task as making an argument. We seek to persuade our reader of some general conclusion using evidence and logic. If we view writing for the general public through the same lens, the result can be dry and heavy-handed: a class lecture transcribed on paper; a conference presentation embellished with a few extra examples.

A better approach to popular writing is to think of our task as guiding a tour. Our reader joins the tour to learn more about the local terrain, whether it be the development of memory or the function of play, and we take them from one landmark to another, directing their gaze and elaborating on what they see. The route we take is purposeful—each destination introduces ideas that are expanded or developed later in the tour—but it is also smooth. We guide our reader through a landscape of theory and data as seamlessly as we might guide them through a physical landscape of streets and buildings. We do not ask them to memorize a list of bullet points or deduce what follows from a disjointed set of premises. We simply show them something new. And as we show them one new thing after another, we lead them to a general conclusion without them realizing they are being led there.

Writing in this manner is easier than it sounds. Nearly all our social interactions involve directing others' attention—through pointing, nodding, gesturing, and the like—and adopting this practice in our writing feels natural. It feels natural to our reader as well, because it strips away the artifice of formal argumentation. Consider the practice of "road mapping" or "signposting." We are routinely advised to preview the components of our argument in our paper's introduction, highlight each component as we come to it, and then review those components for a third time in our conclusion. This practice is akin to taking a tour in

which the guide begins by reading a full list of the tour's destinations and then ends by re-reading the same list. Tour guides do not do this because what's the point? It's useful to know where we are going in general, but listing the complete itinerary, destination by destination, is unnecessary. We'll see each destination as we come to it.

A tour-oriented approach to writing bypasses another unnatural academic practice: contrasting alternatives. When we argue in favor of one position, we do so at the expense of another, providing reasons for endorsing our position and reasons for rejecting the other. We also provide reasons for the reasons: rebuttals to the objections to our position and objections to the warrants for the other position. And we engage in this practice at all stages of inquiry, contrasting alternative theories, alternative methods, alternative predictions, and alternative interpretations.

Lay readers can appreciate the need to contrast alternatives—we contrast alternatives every day, when deciding between restaurants, television shows, or shoes—but lay readers are not accustomed to using data as the adjudicator. Lay readers are also not accustomed to reasoning about multiple alternatives in parallel. Doing so poses high demands on attention and working memory and requires practice. The solution is not to avoid raising alternatives but to cover the alternatives one at a time, treating each as a separate destination on our tour. If, for instance, we want to convince our reader that theory B is superior to theory A, we are likely to lose the reader if we move between the two theories at will, establishing a running tally of their pros and cons. Rather, we should start our tour at theory A, explaining why it was once popular but has fallen out of favor, and then move to theory B, explaining why this theory is now preferred. We may not be able to cover all the warrants, objections, and rebuttals that we would cover in a scholarly article, but we can convey the general appeal of one theory over another and direct the interested reader to scholarly articles that do provide such coverage.

Transitions are also made easier when we think of writing as guiding a tour. Transitions are not a high priority in academic writing because we are making arguments and the evidence we present in support of those arguments could typically be presented in any order. We thus move from one source of evidence to another with simple seriation: "first," "second," "third," "last." But series of arbitrarily ordered facts are jarring outside a scholarly paper, and we owe our reader a smoother ride, bridging our destinations with common themes, topics, or narratives. There's no teleporting allowed on our tour.

Teleporting can happen at any level of organization—passage, paragraph, or sentence—and vigilance toward this problem will make our writing more fluid. Consider this sentence-level problem: "Infants know more than we think they do. Physical principles such as solidity may be innate." The first sentence is a general claim and the second is support for that claim, but something is off in the transition. The first sentence directs readers' attention to infants, but the second directs their attention somewhere else, to the abstract notion of a physical principle. The fix is simple: just maintain focus on infants, as in "Infants know more than we think they do. They know, for instance, that one object cannot pass through another." This correction not only makes the transition smoother, but also addresses a second problem: the curse of knowledge, or assuming that others know what we know. Developmental psychologists might know what the "principle of solidity" refers to, but those outside our field would have to guess.

On content: Fight the curse of knowledge

If we are guarded about anything when writing for a general audience, it is our use of psychology-specific terminology. Any psychologist with half-a-decent theory of mind would define, on first introduction, "change blindness," "learned helplessness," "reconstructive memory," "halo effect," "bystander effect," "visual cliff," "strange situation," or, for that matter, "curse of knowledge." These are the terms bolded in psychology textbooks and defined in an appendix—terms known to psychologists but unknown to most everyone else.

The curse of knowledge extends beyond field-specific jargon, however, and we often fail to recognize less blatant manifestations. Statistical terms, for instance, are not common parlance. "Confound," "covariate," "counterbalance," "regression," "standard deviation," "independent variable," "selection bias," "demand characteristic": they roll off the tongues of scientists but fall on deaf ears when directed toward nonscientists. Even a term as benign as "control group" has little intrinsic meaning to someone who does not run experiments. A control group, in the public's mind, is the group that doesn't get the drug in a medical experiment, but the role of a control group in a psychology experiment is anyone's guess.

Other specialized terms that escape our attention are those that describe states or properties rather than effects or paradigms: "habituate," "perseverate," "occlude," "ontogeny," "ontology," "operant," "phonemic," "syntactic," "aphasic," "proprioceptive." Psychologists use these terms so frequently in conversation with each other that we forget that other people do not use them at all. In writing a sentence like, "Piaget charted the development of object permanence by observing infants searching for occluded objects," we may pause at "object permanence," recognizing that we need to define this field-specific construct, but overlook the equally obscure "occluded." People outside our field do not say "occluded." They say "hidden."

When we discover jargon in our writing, we can apply one of two remedies: we can replace the jargon with synonyms or synonymous descriptions, or we can define the jargon and continue to use it. The first remedy is best when the jargon is easily replaced without altering our meaning, as in replacing "occluded" with "hidden." It's also useful when there is something to be gained from a fuller, nontechnical description, as in replacing "control group" with a description of what this group did and why they were included in the experiment. Discovering "control group" in our text is actually an opportunity to inform our reader of how the findings from this group render findings from the experimental group interpretable. A statement like "the control group read a passage of equal complexity but on a different topic" assumes that the reader understands why it was necessary for this group to read a passage of equal complexity, let alone read anything at all.

The second remedy for jargon—defining it—is more appropriate when the jargon appears in the text several times and is central to the research we are describing. "Syntax" might be such a term in an article on language acquisition, or "habituate" in an article on infant cognition. Be wary, though, of providing definitions that are as opaque as the terms themselves. Defining syntax as "grammar" is hardly sufficient, since most people don't really know what grammar is either. A better definition might be "rules, represented in the mind, for combining words into sentences," followed by an example—say, a sentence that follows syntactic rules but not semantic rules or vice versa. An example like "colorless green ideas sleep furiously" captures the distinction between syntax and semantics more colorfully—or less colorlessly—than any definition could.

On language: Be transparent

Writing for a general audience influences not only our informational goals, about what content to cover and how, but also our stylistic goals, about engaging and connecting with our audience. How is a particular idea best expressed? How is a particular argument best made? What limitations should be acknowledged? How much detail should be provided? The habits we develop for addressing these issues in our academic writing do not always travel well. They may grease the wheels of communication with our colleagues but jam the wheels of communication with everyone else.

Stop hedging

Hedges are acknowledgments of ambiguity or uncertainty, and academics overuse them—or as an academic would say, "all things being equal, the average academic uses proportionally more hedges than the average nonacademic tends to use." Hedges play an important role in communicating the nuances of empirical data, allowing us to note small effect sizes, flag inconsistent data, or soften controversial claims, but not all writing is about communicating empirical data. When communicating about more general topics —or when communicating about data but from a more general perspective—hedging can be a distraction.

To be fair, everyone hedges. It's a way of being polite. A blunt statement like "your presentation was too long" is made more palatable with a hedge: "your presentation was *a bit* too long" or "your presentation was *kinda* long." But academics take hedging to a whole new level. We can't just say that something happens often; we say it happens *fairly* often, *pretty* often, *somewhat* often, *sufficiently* often, or *rather* often. We can't just say that someone did well; we say they did *fairly* well, *relatively* well, *comparatively* well, *moderately* well, or *reasonably* well. And we can't just say that something is true; we say it is *apparently* true, *seemingly* true, *generally* true, *mostly* true, *virtually* true, *more or less* true, true *to some extent*, or true *to a certain degree*. All these qualifiers could be omitted without affecting our meaning *in the slightest*.

We also love to start our sentences with vacuous proclamations like "I would argue that," "it would seem that," or "it has been found that." This practice is not arbitrary; we are marking the functions of our claims. "I would argue that" marks a conjecture; "it would seem that" marks an informal observation; and "it has been found that" marks a confirmed result. It's good to be vigilant about the epistemic status of our claims, but we can be vigilant without being wordy. Deleting "it has been found that" from the beginning of a sentence does not change what the sentence is about (data) or how it functions in our argument (as support for a conclusion). What will change is the fluidity and accessibility of our prose.

We hedge to acknowledge not only the functions of our statements but also exceptions to those statements. It hurts our soul to write "three-year-olds fail the false belief task" when we know that there are caveats, so instead we write something bloated like "the majority of American children under four years of age fail to verbally attribute false beliefs to a protagonist in the standard version of the false belief task." Caveats noted! But do they matter to the point we are making? Is it important that readers acknowledge and remember those caveats? Sometimes it is, but quite often it is not. Readers should be trusted to interpret our statements as generalizations, not absolutes. Readers who

encounters the statement "three-year-olds fail the false-belief task" will not cry foul if they discover that some three-year-olds pass the task or that some versions of the task are easier to pass than others.

Just as we should not underestimate the generosity of our reader, we should not overestimate the veridicality of our writing. Writing is a model—a verbal representation of reality—and all models are wrong. They are wrong because they simplify or ignore some aspects of reality in order to capture others. A weather map, for instance, shows us current temperatures or forecasted precipitation but not both. Showing us both would make the graphic uninterpretable. Sometimes we hedge because we feel compelled to acknowledge the detail or the nuance we have knowingly glossed over. But our job as writers is not to flag nuance; it is to craft a compelling story or persuasive argument, which requires sorting the details that need be included from those that can be left out.

Strip away the packaging

When we write, our ideas typically come out the same way they went in: packaged in the parlance of scientific inquiry. We might write "a significant positive correlation exists between measures of social connectedness and subjective well-being," but what do we really mean? There are better ways to express the same idea: "Happiness increases with the size of your social network," "People with many friends are happier than those with few," "The more friends you have, the happier you are." None of these rephrasings sacrifice the accuracy or precision of the original finding, yet they are not the first phrasing to come to mind. The first is typically packaged in abstractions because we work and think in abstractions. We classify phenomena into *constructs*, operationalize constructs as *variables*, measure variables with *instruments*, use instruments to gather *data*, and analyze data with *models*. Our readers care about the phenomena; we care about all the rest.

The sentence above includes at least five abstractions: "significant," "positive correlation," "measures," "social connectedness" and "subjective well-being." "Significant" is jargon that means something completely different to us (statistically reliable) than it does to the lay reader (important or consequential). "Positive correlation" is a technical description of the nontechnical notion of two things increasing or decreasing together. Sometimes we need to talk about correlations as entities unto themselves—when, for instance, some studies find positive correlations and others find negative correlations and we want to talk about the inconsistency—but more often we can describe a correlation without referring to it as such. Developmental psychologists are particularly prone to talk about correlations between age and ability, but such trends can be described without the statistical packaging: "older children outperform younger children," "as children get older, they perform better," "performance improves with age."

Talk of correlations prompts talk of "measures," as in "measures of social connectedness and subjective well-being." We don't correlate things; we correlate measures of things. All studies involve measurement, though, and there is no need to belabor the point that we are reporting the outcome of a study. Once we establish the source of a finding—as in "a study by psychologists Mulder and Scully revealed" or "in a recent study, primatologists Simon and Garfunkel found"—we can focus on *what* was studied rather than *how*. In this same vein, the constructs "social connectedness" and "subjective well-

being" can be back-translated into the everyday phenomena they were meant to capture: friendship and happiness.

In some cases, we want to draw readers' attention to the meta-level of research practices and research decisions, to contrast different approaches to the same question or critique a particular interpretation of an empirical finding. But moving to the meta-level should be a conscious decision, not a reflex. A practice that encourages this reflex, often to our detriment, is focusing on our own research projects. There are benefits to be gained from reporting on research from an insider's perspective: humanizing science, highlighting the difficulties of conducting empirical research, tracing the logic of an investigation from start to finish. But there are also costs: the risk of boring a reader with minutia only a researcher would care about, the risk of alienating a reader with self-indulgent praise, the risk of suggesting that no one else has done research in this area worth discussing. There's a fine line between personalizing our research and lapsing into solipsism.

The humorous website *PhDComics.com* (2009) published a template for writing scholarly abstracts that well captures the self-indulgent nature of academic writing: "This paper presents a [synonym for new] method for [sciencey verb] the [noun few people have heard of]. Using [something you didn't invent], the [property] was measured to be [number] ± [number] [units]. Results show [sexy adjective] agreement with theoretical predictions and significant improvement over previous efforts by [loser] et al. The work here has profound implications for future studies of [buzzword] and may one day help solve the problem of [supreme sociological concern]".

This template not only showcases the abstract packaging that makes academic writing so deadly—"results show," "theoretical predictions," "implications for future studies"—but also captures its off-putting tone. The novelty of an approach, the superiority of a result, the quality of a colleague's work: these are the concerns of an insider. They are not the concerns of a lay reader, and they will likely alienate lay readers if addressed.

On tone: Be conversational

Striking the right tone is one of the most challenging aspects of popular writing. The general public does not want to read a stodgy dissertation, but neither do they want to read a preachy sermon, a rambling digression, or a self-congratulatory autobiography. We must respect our audience's knowledge of the topic (or lack thereof), but we must also respect their intelligence, interest, and time.

I was recently reminded of this point when a colleague asked whether I "put on a different hat" when writing for the general public. The question implied, to my mind, that writing for the general public is like writing for children—that is, writing for an audience that not only lacks knowledge of our field but also the capacity to understand it. If we assume that lay readers are less intelligent, less inquisitive, or less reflective than expert readers, we run the risk of patronizing them. We dumb-down our ideas rather than make them accessible.

Science writers who dumb-down science are obnoxious to read. They gloss over critical details of the research they are describing, on the condescension that lay readers won't be able to understand those details, and they substitute evaluative phrases like "cool finding" or "ingenious method" for objective descriptions, on the condescension that lay readers need to be told what is cool and what is ingenious. Rather than err on the side of condescension, err

on the side of trust—trust that your audience is capable of understanding the most complicated aspects of your field and interested in understanding as well.

That said, there is a difference between respecting our reader and treating them as a colleague. Communicating with our reader through printed words, rather than spoken words, lessens our vigilance toward the inscrutable habits of academese. Three paragraphs into our article or blog, we've often slipped back into the familiar habits of hedging, packaging, and jargonizing. Word processors do not recoil at opaque speech the way humans do, which is why the simplest solution to avoiding academese is to read our work aloud. Any audience will do: a roommate, a parent, a spouse, or even just ourselves. Phrases that seem coherent on paper have a way of unraveling when vocalized, and our ears will detect oddities that our eyes did not. Spoken language also has a way of re-activating theory of mind, evoking winces at our esoteric word choice or our cryptic lack of detail. If you wouldn't say it, don't write it.

In truth, the same advice applies to academic writing. The barriers that hamper communication with our colleagues are often the same barriers hampering communication with the general public: abstractions, cryptic statements, convoluted prose. Academics can parse academese, but we appreciate easy-to-read articles as much as the general public appreciates easy-to-read books, blogs, and columns. Granted, we have different communicatory needs—the need to qualify our claims, the need to define our measures, the need to honor the technical vocabulary of our field—but those considerations are constraints, not straightjackets. Much of the disfluency in academic writing stems from complacency with formal conventions and lack of imagination as to how we could express the same ideas more clearly. As fellow developmental psychologist Alison Gopnik nicely summed up the situation at a recent conference, "There is no reason that academic writing has to suck as much as it does."

Perhaps the best cure for bad academic writing is regular doses of nonacademic writing. My own academic writing has improved tremendously from such doses because I now vet it with the same care and conscientiousness as I do my nonacademic writing. My first draft of any scholarly article is still full of abstractions and jargon, but I now take more time to distill the essence of what I've written into plain English. It's not about simplifying the ideas; it's about clarifying, illustrating, and connecting them. It's also about taking scholarly conventions with a grain of salt. Using the passive voice to avoid first-person-pronouns or privileging technical descriptions over colloquial descriptions are not always good ideas. If I wouldn't say it, I won't write it.

Conclusion

Good writing is good decision-making. Every piece of writing is the product of hundreds of decisions, and the more mindful we are of those decisions, the less likely we'll default to habits that are suboptimal for the audience at hand. When writing for a general audience, it's particularly helpful to think of yourself as a tour guide, leading your reader through an unfamiliar landscape of theory and data toward a conclusion that will seem clear and obvious by the tour's end. Direct your reader's attention with purpose. Streamline your transitions. Define your terms. Erase your hedges. Unpackage your ideas. Strike a conversational tone. Use your theory of mind. Developmental science is too interesting and too important to be cloistered away in journals and conferences, and even the most

technical ideas in our field can be made accessible to nonscientists if we plan our tour with care.

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