Teaching & Learning Guide for: Sound symbolism and theoretical phonology[*]

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Author's Introduction

I grew up in a linguistics department with a strong emphasis on generative linguistics, *but* I was at the same time very interested in sound symbolism. I use "but", because I felt at that time that sound symbolism had never been considered an interesting topic worthy of serious investigation in generative linguistics. At one point much later, I had my paper rejected by a theoretical linguistics journal because, the editor said, sound symbolism is not a topic that readers of the journal would enjoy reading, which was probably true. As I was reading through that decision letter from the editor, however, I was still convinced that studying sound symbolism was important even for generative phonological theories, but at the same time I realized that I needed to make my arguments clearer about why that is the case. Since then I have kept asking myself what it means to explore sound symbolic patterns from the perspective of theoretical phonology. In this Language and Linguistic Compass article, I tried my best to flesh out my thoughts on this question and reached the conclusion that studying sound symbolism can indeed be informative for theoretical phonologists. I also concluded that theoretical phonology has much to offer for studies of sound symbolism, which is currently conducted mainly by psychologists, cognitive scientists, and cognitive linguists. I strongly hope that this paper is just the beginning, and that there will be more active mutual communication between theoretical phonologists and those researchers who work on sound symbolism.

Author Recommends:

1. Sapir, E. (1929). A study in phonetic symbolism. *Journal of Experimental Psychology*, 12, 225–239.

   This paper reports a classic, very oft-cited experiment on sound symbolism, which inspired the experimental studies on sound symbolism in the modern era. It shows, for example, that English speakers associate [mil] with "a small table" and [mal] with "a big table." It also discusses possible phonetic grounding of these sound symbolic associations, both in terms of articulation and acoustics. It is a must-read for anybody who is interested in running

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experiments on sound symbolism. Inspired by this work, many follow-up studies have shown that size is one semantic dimension that is clearly signaled via sound symbolism across many different languages. This association is sometimes visible in existing lexical items, and very often manifests itself in nonce word experiments.

2. Ohala, J. J. (1994). The frequency code underlies the sound symbolic use of voice pitch. In Hinton, L., Nichols, J., & Ohala, J. J., (eds), *Sound symbolism*, 325–347. Cambridge University Press, Cambridge.

This paper proposes a general mechanism that underlies several sound symbolic associations in natural languages, a hypothesis that is sometimes referred to as the Frequency Code Hypothesis. Physics tells us that sounds with high frequency energy are generated by a small vibrating object or in a small resonating chamber. The hypothesis states that based on this physical relationship, people—and demonstrably some animals too—associate high frequency sounds with small objects. This hypothesis is even extended to explaining why we smile in the way we usually smile; i.e., with an "[i]-face". By using a vowel that has high second formant frequency, which represents smallness per the frequency code, we express a lack of animosity. This article is recommended for anybody who wants to study sound symbolic patterns from the perspective of phonetic science.

3. Ramachandran, V. S. & Hubbard, E. M. (2001). Synesthesia–a window into perception, thought, and language. *Journal of Consciousness Studies*, 8(12), 3–34.

This paper is arguably the one which resurrected interest in sound symbolism in modern psychology and cognitive science, in which research on sound symbolism is now increasingly flourishing in the twenty-first century. Like Sapir (1929) discussed above, this paper is very often cited by studies on sound symbolism. The example that they used to illustrate sound symbolism is now known as the "*bouba-kiki* effect," in which the nonce word *bouba* is associated with a round/curvy object, whereas the nonce word *kiki* is associated with an angular/spikey object. This is a modern demonstration of the classic "maluma-takete effect" written about decades earlier by Wolfgang Köhler (1929; 1947) in his book "*Gestalt psychology*." Together with Köhler's work and other follow-up studies, this paper has established that in addition to size, shape is another semantic property that can be signaled very frequently by way of sound symbolism. The paper discusses sound symbolism within a wider context of general synesthetic cross-modal correspondence. See also the paper Spence (2011) introduced below.

4. Spence, C. (2011). Crossmodal correspondences: A tutorial review. *Attention, Perception & Psychophysics*, 73(4), 971–995.

This paper discusses sound symbolism within the larger context of studies of synesthetic cross-modal perception, in which sensation in one modality influences sensation in another modality. Much research in the past has

examined each modality as if each functions independently of the other (although there has been a well-known exception; i.e. the McGurk effect). This article summarizes evidence that this is not how our perceptual system works, and reviews experiments which have explored how precisely such multi-sensory cross-modal perceptions may arise. This paper helps us put the studies of sound symbolism in a broader perspective of cognitive science, including neuroscience. Spence's lab website has links to many papers that report case studies conducted in this spirit, and the list of studies supporting his general thesis is ever growing. See the ***Online Resources*** section below.

5. Dingemanse, M., Damian, B. E., Lupyan, G., Christiansen, M. H., & Monaghan, P. (2015). Arbitrariness, iconicity and systematicity in language. *Trends in Cognitive Sciences*, 19(10), 603–615.

   This is a recent informative overview article on sound symbolism, which discusses the relevance of sound symbolism for real languages as well as the broader question of the arbitrariness of language. This article is written from a perspective that is different from my paper. In a sense this paper by Dingemanse et al. (2015) is complementary to what I write, albeit with some overlap. It is useful to read this paper to get a broader understanding of why (non-generative) linguists and psychologists study sound symbolism. There are several other overview articles on sound symbolism that I recommend, for which see the ***Suggested Readings*** section.

6. Imai, M. & Kita, S. (2014). The sound symbolism bootstrapping hypothesis for language acquisition and language evolution. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 369(1651).

   Anybody who is interested in psycholinguistics would find this article interesting and informative, as it reviews the role of sound symbolism in speech processing, and more importantly, in language acquisition. The sound symbolism bootstrapping hypothesis that is proposed in this paper has been an influential one within the general studies of sound symbolism, so anybody who is seriously considering conducting research on sound symbolism should at least be familiar with the hypothesis. The paper touches upon other issues, such as the role of sound symbolism in language evolution, a topic that is attracting increasing interests in the contemporary sound symbolism research.

7. Alderete, J. & Kochetov, A. (2017). Integrating sound symbolism with core grammar: The case of expressive palatalization. *Language*, 93, 731–766.

   If you are a theoretical phonologist, I recommend that you start with this article, perhaps after reading my overview article. This paper by Alderete & Kochetov is actually one major source of inspiration of my own Linguistics and Language Compass paper. The paper argues that sound symbolism should be integrated with core phonological grammar. Their empirical observation is that some alternations—what they call "expressive palatalization—cannot be motivated by purely phonological considerations, and they should instead be attributed to sound symbolic principles. The authors propose a set of

Optimality Theoretic constraints to model the patterns of expressive palatalization. It also contains some discussion on why sound symbolism was not actively studied in the generative tradition.

8. Kawahara, S., Noto, A., and Kumagai, G. (2018). Sound symbolic patterns in Pokémon names. *Phonetica*, 75(3), 219–244.

    This paper analyzes the set of existing Pokémon names in Japanese from the perspectives of sound symbolism. This paper has been followed up on by various studies, both corpus-based and experimental. This general research paradigm, which uses Pokémon names to explore the nature of sound symbolism, is now referred to as "Pokémonastics."[1] See the ***Online Resource*** section for a website that summarizes these follow-up studies. The languages that have been studied from this perspective now include, in addition to Japanese, Brazilian Portuguese, Cantonese, English, Korean, Mandarin, and Russian. Students generally like this project, and the project materials are also useful when it comes to explaining to non-linguists what we do; in fact, I was interviewed about this project by several popular magazines and newspapers in Japan.

9. MacKenzie, L. (2018). What's in a name? Teaching linguistics using onomastic data. *Language [Teaching Linguistics]*, 94: e1–e18.

    This paper reports on a very concrete example of how to teach linguistics by using onomastics (general studies of names), including sound symbolism, in undergraduate linguistics education. Teaching introductory linguistics can be challenging, but for some students at least, using the onomastic data helps. The paper illustrates how we can teach various linguistic concepts and observations using onomastics. I personally very much agree with this view; see Kawahara (2019) below which illustrates how I teach phonetics using sound symbolism.

10. Kawahara, S. (2019). Teaching phonetics through sound symbolism. *Proceedings of ISAPh*. Online publication.

    Teaching phonetics can be challenging as well, especially when it comes to acoustic phonetics, which requires some background in mathematics and physics. Some students are also overwhelmed by the large set of new terminologies that phoneticians and phonologists use (like "labials", "sonorants" and "voiced obstruents"). My experience is that using sound symbolism helps lower the psychological boundary of such students and can make phonetics "fun" to study. See the first sample syllabus below. This paper is based on an introductory phonetics book that I wrote in 2017 (*Introducing Phonetics through Sound Symbolism*), although, unfortunately, it is written in Japanese.

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[1] While Kawahara et al. (2018), originally circulated in 2017, started this general research project, Stephanie Shih came up with this name, "Pokémonastics."

1. https://sites.google.com/site/akitambo/Home/biblio

This is a very impressive and rather comprehensive website by Kimi Akita that lists major studies on sound symbolism up until 2010. It is extremely useful when you need to know what has been written on a particular topic within the studies of sound symbolism.

2. https://www.psy.ox.ac.uk/research/crossmodal-research-laboratory

This is a website maintained by Charles Spence's lab. It is amazing to see how our different sensory systems can influence other sensory systems.

3. http://user.keio.ac.jp/~kawahara/research.html

This website contains a list of papers that are conducted under the rubric of the Pokémonastics project. It also shows some popular science magazine articles which featured an article on this project. The website is maintained by the author and is constantly updated.

4. http://talkthetalkpodcast.com/329-pokemonikers/

Stephanie Shih is featured in this radio show to talk about the Pokémonastics research. This podcast may help you think about how you can reach out to the general public to explain your research.

5. http://user.keio.ac.jp/~kawahara/hitsuji2017.html

This is a supplementary website for a book that I wrote in Japanese (*Introducing Phonetics through Sound Symbolism*). The first section of this website summarizes studies on sound symbolism conducted by undergraduate and graduate students, most of whom were inspired by the content of that book. The webpage is written in Japanese, but you can click on links to see many sample works conducted by students. Some of them are written up as full-fledged papers, while others are poster presentations.

6. http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.01.0172

You can read Cratylus on this website (see also the ***Suggested Readings*** section for the information regarding a printed version). Cratylus is one of the dialogues written by Plato, and in there, three people (Hermogenes, Cratylus, and Socrates) discuss whether sound-meaning connections are arbitrary social conventions or instead may have inherent systematic relationships. Socrates and Cratylus take the second position; Socrates even discusses the phonetic grounding of some sound symbolic

patterns (see, for example, section 427 of the book), and it is amazing how insightful (some of) these discussions are, even from the perspective of modern phonetics.

Suggested Readings

In addition to those that are introduced in the ***Author Recommends*** section, here are some more classics (Hinton et al 1994; Hockett 1959; Plato; Saussure 1916) and overview articles (Lockwood & Dingemanse 2015; Perniss et al. 2010; Sidhu & Pexman 2018) for those who are interested in pursuing sound symbolism in further depths. If you are interested in sign languages, Perniss et al. (2010) discuss the role of iconicity in sign languages. Westbury et al. (2018) offer an extended discussion of which semantic dimensions can be signaled by sound symbolism, and how. If you are interested in the potential role of distinctive features in sound symbolism, it is interesting to compare D'Onofrio (2014) and Monaghan & Fletcher (2019). One topic that I only briefly touched upon in my own paper is studies on ideophones, which are certainly more sound symbolic (i.e. iconic) than other prosaic words, for which see Akita (2019) and Dingemanse (2018). Klink (2000) reports an application of sound symbolism on marketing research.

Akita, K. (2019). Ideophones. In M. Aronoff (ed.), *Oxford bibliographies in linguistics*. New York: Oxford University Press.

Dingemanse, M. (2018). Redrawing the margins of language: Lessons from research on ideophones. *Glossa* 3(1) 4, doi:org/10.5334/gjgl.444.

D'Onofrio, A. (2014). Phonetic detail and dimensionality in sound-shape correspondences: Refining the *bouba-kiki* paradigm. *Language and speech*, 57(3), 367-393.

Hinton, L., Nichols, J., & Ohala, J. J. (1994). *Sound symbolism*. Cambridge University Press, Cambridge.

Hokett, C. (1959). Animal "languages" and human language. *Human Biology*, 31, 32–39.

Klink, R. R. (2000) Creating brand names with meaning: The use of sound symbolism. *Marketing Letters*, 11(1), 5–20.

Lockwood, G. & Dingemanse, M. (2015). Iconicity in the lab: A review of behavioral, developmental, and neuroimaging research into sound-symbolism. *Frontiers in Psychology*, doi: 10.3389/fpsyg.2015.01246.

Monaghan, P. & Fletcher, M. (2019) Do sound symbolism effects for written words relate to individual phonemes or to phoneme features? *Language and Cognition,* 11(2), 235-255.

Perniss, P., Thompson, R. L. & Vigiliocco, G. (2010). Iconicity as a general property of language: Evidence from spoken and signed languages. *Frontiers in Psychology*, doi:10.3389/fpsyg.2010.00227.

Plato: Complete Works. Hackett (1997). [Cratylus is contained in this volume]

Saussure, F. de (1916). *Cours de linguistique générale*. Payot, Paris. [English translation by R. Harris is available.]

Sidhu, D. & Pexman, P. M. (2018) Five mechanisms of sound symbolic association. *Psychonomic Bulletin & Review*, 25(5), 1619–1643.

Westbury, C., Hollis, G. Sidhu, D. M., & Pexman, P. M. (2018) Weighing up the evidence for sound symbolism: Distributional properties predict cue strength. *Journal of mMemory and Language*, *99*, 122-150.

Sample Syllabi

The first sample syllabus reflects what I regularly teach as an introductory undergraduate phonetics courses at several universities in Japan. The second syllabus is for a graduate seminar, which I wish I could teach but have actually never taught (because my institute does not have a graduate program).

1. Introduction to phonetics through sound symbolism (undergraduate intro)

In this course, we will cover basic concepts in phonetic science, which consist of three subbranches: (1) articulatory phonetics (how we produce sounds), (2) acoustics phonetics (how our speech is transmitted through air as air pressure changes) and (3) perceptual phonetics (how we perceive those pressure changes as actual speech sounds). We will begin the course by discussing patterns of *sound symbolism*. For example, given two nonsense words, *mil* and *mal*, which word do you think is a better word for "a big table"? You did not know either of these words, but you can at least to some extent guess their meanings. You will learn that this intuition that you have may have roots in the articulatory and/or acoustic properties of the sounds at issue.

My previous teaching experience tells me that some students find phonetics hard to learn, and I see two major reasons. One is that you will be introduced with many new terminologies, such as "labial consonants", "sonorants", "voiced obstruents", etc. You may wonder why you need to remember all these terms. Patterns of sound symbolism will show you that these concepts are indeed useful and necessary when we analyze our speech behavior, and they will also tell you *why* they are important tools. The second aspect that makes phonetics challenging is that studying acoustic phonetics requires some background in mathematics and physics. But sound symbolism can help here again. You will be able to get an intuitive understanding of some of these physical principles by studying some sound symbolic patterns.

The materials to be used in this section of the course include "fun" materials like Pokémon characters' names. The Pokémon corpus is also useful in learning some basic statistical techniques for data exploration, because each Pokémon character has quantitative attributes, such as weight, height and strengths. As we inspect the

Pokémon data, you will be able to learn, for example, why and when log-transformation can be useful in data analyses. In short, you're going to learn basic concepts in phonetic science, together with some basic statistical skills, through sound symbolism, using fun materials like Pokémon.

2. Sound symbolism and theoretical linguistics (graduate seminar)[2]

In this seminar, we will explore how the examination of sound symbolic patterns may bear upon some important issues in formal phonological theories. Traditionally, sound symbolism has been thought to reside outside the realm of linguistic knowledge, and hence sound symbolism was not a topic that was actively explored by theoretical linguists. Some recent work has argued, however, that sound symbolism may be part of the core phonological knowledge, and is worth serious attention from the perspective of formal phonological theory.

Some linguists may disagree with this research strategy, and this is good; explicit discussion of reasons why sound symbolism should not be used for phonological argumentation is useful for considering what the domain of phonological inquiry should be, and why we think so. What really is the scope of linguistic/phonological knowledge, and what kind of evidence can be brought to bear upon that knowledge? If sound symbolism is external to the core grammar, do they interface at all? If so, how? How does sound symbolism compare with other types of "external evidence," such as rhymes, text-settings, metrics and language games?

We will see that formal phonologists and researchers on sound symbolism address similar questions. For instance:

(1) Is the knowledge that lies behind phonological and sound symbolic patterns stochastic/probabilistic or categorical?

(2) Are phonological and sound symbolic effects cumulative? If so, what would be the best way to characterize their quantitative aspects (e.g. linear or sigmoid; sublinear, linear or super-linear)? Which stochastic models of grammar are best suited to account for the patterns?

(3) Do phonological and sound symbolic patterns have their bases in phonetic considerations?

(4) If so, should we explore articulatory explanations or acoustic/perceptual explanations, or both? Do we need to pick one over the other?

(5) What is the set of vocabularies that should be used to state generalizations in phonology and sound symbolism? What are the atoms of representations? Distinctive features? If so, should distinctive features be based on articulation or acoustics, or both?

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(6) Like phonological patterns, do we observe positional asymmetries in sound symbolic patterns? If so, what should be the explanation of such positional asymmetries? Should the explanations be synchronic or diachronic?

(7) What are the universal and language-specific aspects of phonological and sound symbolic knowledge?

(8) Is phonological/sound symbolic knowledge domain-specific or can it be reduced to domain-general mechanisms?

(9) What are some experimental methodologies that can be used to explore phonological and sound symbolic knowledge? What are the pros and cons of different approaches?

(10) What types of evidence can be used for phonological argumentation? For example, some researchers use metrics, text setting and rhymes, while others are more reluctant to accept such "external evidence." Where should we draw a line? And why?

Regardless of whether sound symbolism is relevant to phonological inquiry, these questions concern the fundamental architecture of what phonological grammar looks like, and what sorts of methodology should be deployed to explore its nature.

Sound symbolism is currently explored by researchers from various disciplines, including psychologists, cognitive scientists, and marketing researchers. Sound symbolism has been argued to play a non-trivial role in speech processing, language acquisition, and language evolution. Familiarizing yourself with the relevant literature on sound symbolism will help you broaden your horizon and put your research about theoretical linguistics in a broader perspective.

Focus Questions

Recommended for advanced undergraduate students and graduate students

> 1. If you are a formal phonologist, would you consider sound symbolism as a topic that is worthy of investigation? If so, why? If not, why not? Have you read a paper which uses metrics/text settings/rhymes/language games as evidence for a certain phonological theory? Is studying sound symbolism fundamentally different from studying these "external" patterns? Would you consider sound symbolic knowledge as a part of core linguistic knowledge (i.e. competence)?

> If you are in favor of studying sound symbolism and need to convince those people who think otherwise, how would you do it? To the extent that we observe non-trivial parallels between phonological patterns and sound symbolic patterns, should phonological theory explain sound symbolic patterns; if not, what should?

If you are against using sound symbolism for phonological argumentation, flesh out your reasons why you think that way. Be more concrete than just saying "that's just performance," unless you have a good theory of performance at hand already. Discuss with your colleagues.

Two recommended readings to think more about these issues are provided below. The paper by de Lacy (2009) takes a very conservative approach, and admits a very strictly limited set of data for phonological argumentation. Ohala (1986), on the other hand, accepts a much wider range of data. Read and discuss.

de Lacy, P. (2009). Phonological evidence. In S. Parker (ed.), *Phonological Argumentation: Essays on Evidence and Motivation*, 43–77. London: Equinox.

Ohala, J. J. (1986). Consumer's guide to evidence in phonology. *Phonology*, 3, 3–26.

2. Why do you think sound symbolism has very rarely been considered as a major topic of investigation within theoretical phonology (at least until recently)? Generative linguists traditionally rely on speakers' intuitions regarding grammatical judgments; it seems clear from the body of research that speakers also have clear intuitions about sound symbolic associations as well. What, then, is the difference between well-formedness judgments regarding surface phonotactics and those regarding sound symbolic patterns?

What is the exact definition of phonological knowledge that formal phonologists have been trying to model? Would that definition include sound symbolism? If sound symbolism is a part of phonological knowledge, what are some issues within theoretical theory that can be addressed by studying sound symbolism?

3. If you are a linguistics major student, how would you explain what theoretical linguistics is to your friends and/or family members who know nothing about theoretical linguistics. My experience is that it helps to use examples from sound symbolism, like some generalizations found in the Pokémon names, first identified by Kawahara et al (2018). People also like the [mil]/[mal] example discovered by Sapir (1929), and are generally amazed that they have these intuitions. See also MacKenzie (2018) and Kawahara (2019). (These papers were all discussed in the ***Author Recommends*** section.) What other examples do you think would be helpful? Also listen to the podcast featuring Stephanie Shih about Pokémonastics research (see the ***Online Materials*** section).

4. While linguistics sometimes considers itself as a "branch of psychology," my honest opinion is that, with some exceptions, theoretical linguists do not necessarily communicate well with psychologists. Do you agree or disagree? How does studying sound symbolism potentially help remedy this situation?

5. Do you ever wonder if your research should have actual applications that would benefit the society? Do you want your research to have broader impacts that go beyond your research community? Would studying sound symbolism be helpful in this regard? Read Klink (2000) cited in the **Suggested Readings** section and discuss.

Learning Exercise

Recommended for undergraduate students, introductory or advanced.

1. Pick any anime or game series you like (e.g. Disney, Pokémon, or PreCure). Create a corpus of the character names in that series; there are usually Wikipedia pages that are quite helpful. Can you identify any sound symbolic pattern in action? Or, you can take a top-down approach: pick a sound symbolic association discussed in the literature and examine whether that pattern holds in your corpus as well.

See Entry #5 of **Online Materials**, and Kawahara (2019) introduced in the **Author Recommends** section for various case studies of this kind. See the paper below also for a very simple study on sound symbolism:

Kawahara, S. (2019). What's in a PreCure name*? ICU Working Papers in Linguistics 7: Festschrift for Professor Tomoyuki Yoshida on his 60th birthday*: 15-22.

2. Have you ever had an opportunity to talk to babies who have not started speaking yet? Carefully observe yourself how you speak to them. Do you use a different pitch? If so how? Can you explain the change in your pitch in terms of the frequency code (See Ohala 1994 in the **Author Recommends** section)? Would you want to sound "large" or "small" when speaking to babies?

In addition to changes in your pitch, do you use specific words to babies? Might such words be more iconic than "usual" words? Does it make sense to use iconic words if you are speaking to somebody who still does not know your language?

Recommended reading related to this exercise is Fernald & Morikawa (1993). Also read Imai & Kita (2004) in the *Author Recommends* section.

Fernald, A. & Morikawa, H. (1993). Common themes and cultural variations in Japanese and American mothers' speech to infants. *Child Development*, 64, 637–656.

3. Research on sound symbolism has shown that female names may be judged to be more attractive if they contain sonorants and stressed back vowels, while male names may be judged to be more attractive if they contain obstruents and front vowels. How attractive is your name? Ask your parents how they chose your name. Who has the most attractive name in your class?

(Don't take this exercise too seriously. The choice of your names is affected by very many factors.)

Recommended readings for this exercise:

Perfors, A (2004) What's in a name?: The effect of sound symbolism on perception of facial attractiveness. In: Forbus, K., Gentner, D., Regier, T. (eds), *26th Annual Conference of the Cognitive Science Society*. Chicago, IL: Psychology Press.

Sidhu, D. M. & Pexman, P. M. (2019) The sound symbolism of names. *Current Directions in Psychological Science*, 1–5.

Sidhu, D. M., Deschamps, K., Bourdage, J. S. & Pexman, P. M. (2019) Does the name say it all? Investigating phoneme-personality sound symbolism in first names. *Journal of Experimental Psychology: General,* 148(9), 1595–1614.

4. Imagine yourself being on a job market for a non-academic position. Imagine that during your job interview, you are asked to explain what you studied in your major. Can you think of "fun" examples from the sound symbolism research?

5. Pick a paper on sound symbolism. Does it discuss the phonetic grounding of the sound symbolic association identified in the paper? Does it make sense? Would phonetic science be helpful to provide deeper insights into the pattern?