

12 On promoting linguistics literacy: Bringing language science to the English classroom

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In schools in the United States as well as in teacher education programs, knowledge about language, when it is considered seriously at all, is generally pursued only insofar as it is believed to be a tool for achieving some other curricular goal – better language use in, say, reading or writing. However, from another perspective, one that we hold, the formal study of language is self-justified. Given this view, there is intrinsic value in attempting to understand something as intriguing and difficult to explain and as central to human nature as one's tacit knowledge of language, in developing **linguistics literacy**: scientific literacy about the faculty of mind referred to by linguists as “mental grammar.”

We realize that it is unusual to talk about promoting linguistics literacy in American schools, for the United States is close to unique among the world's nations in neglecting the study of its dominant languages, not to mention the study of other languages and language in general. In Iceland, by way of contrast, the national language is not only studied extensively in schools, but also celebrated on November 16th, *Dagur íslenzkrar tungu* (Icelandic Language Day), a day on which there are nationwide conferences on the language and an award given to the person or people who have served the language in a special way during the previous year.

The pursuit of knowledge about language for its own sake, however, need not be only an end in itself in schools: The goals of linguistics in education can be more broadly conceived.

Background

Over the years, we (a *we* which began as an *I*, became dual, and later trial) have developed a rationale for the study of mental grammar (see Honda and O'Neil 1993 and Honda 1994, for example), focused on triggering the ‘science-forming faculty’, the human need to inquire and create and explain (see Chomsky 2000: 82–83 and 2003: *passim* for more discussion). Toward this end, we have designed a series of problem sets that enable a teacher and a class of students to construct a connected story about language through the close investigation of English and other languages. These problem sets motivate

students to approach language descriptively and analytically, with the primary goal being not to make them better readers or writers, but to give them a scientific way to think about language – a means of expression that some students require and that all students should be exposed to in their schooling.

Our work proceeds on the belief and from the evidence that the study of mental grammar can develop in students an understanding of the nature of scientific inquiry (Honda 1994), as well as an appreciation of the complexity, diversity, and universal features of human languages. Working in English classrooms and science classrooms, in public schools and independent schools, with 4th-graders through adults, we have observed time and again that this domain of inquiry is captivating and that the phenomena are conceptually accessible to investigation and explanation of some depth.

Often in American schools, students are introduced to science in domains where they lack domain-specific knowledge and/or where the problems of science seem quite unproblematic from a common-sense point of view. In such situations, very little inquiry can be conceptually motivated in an accessible or meaningful way. In contrast, by examining their own (and others') knowledge of language, students from the upper-elementary grades on can very quickly uncover some intriguing problems, not to mention surprises, about why, for example, regular nouns in English have three slightly different sounding but rule-related plural endings or why you can't contract *want to* to *wanna* whenever you wanna.

From our perspective then, the English classroom is an underused laboratory for the pursuit of serious scientific inquiry, where students can enjoy the challenge of formulating and testing hypotheses about language, and in turn pose questions that ask teachers to learn more about theories of language and about how children think and learn. While teachers of mathematics and science are often asked to support the goals of reading and writing classes, the goals of math and science classes rarely find their way into the English or language arts classroom. The study of English, and of language in general, is not traditionally associated with the investigation and explanation of data, but we believe that the scientific study of language has an important place in the schools, be it in science, social studies, or language arts classes. That we focus our attention in this paper on the latter type of class is because of our current work with Pippin's students.

Linguistics literacy as science literacy

Promoting linguistics literacy in schools and in teacher education can be viewed in the context of the goals of the American Association for the Advancement of Science's (AAAS) Project 2061, a long-term initiative to advance literacy in science, mathematics, and technology before the next appearance of Halley's comet. Consider the following remarks taken from the Project 2061 *Benchmarks*

On-line (AAAS 1993), in which we selectively substitute *linguistics*, *linguists*, and *linguistic* for *science*, *scientists*, and *scientific*:

- The study of [linguistics] as an intellectual and social endeavor – the application of human intelligence to figuring out how the world works – should have a prominent place in any curriculum that has science literacy as one of its aims.
- When people know how [linguists] go about their work and reach scientific conclusions, and what the limitations of such conclusions are, they are more likely to react thoughtfully to scientific claims [about language] and less likely to reject them out of hand or accept them uncritically.
- Once people gain a good sense of how [linguistics] operates – along with a basic inventory of key [linguistic] concepts as a basis for learning more later – they can follow the [linguistics] story as it plays out during their lifetimes.
- The images that many people have of science and how it works are often distorted. The myths and stereotypes that young people have about science are not dispelled when ... teaching focuses narrowly on the laws, concepts, and theories of science. Hence, the study of [linguistics] as a way of knowing needs to be made explicit in the curriculum.

We turn now to explicating some of these points, drawing on our work with primary and secondary students, as well as with teachers. We then provide a detailed account of 5th-graders tackling a problem of English morphophonology and pursuing related phenomena and issues in Pippin's classroom.

Linguistics as an intellectual and social endeavor

Begin with the notion that linguistics is “an intellectual and social endeavor ... [of] figuring out how the world works.” That it is an intellectual endeavor is clear enough, but what does it mean to say that linguistics is a social endeavor?

In our work with students, we emphasize the collaborative nature of linguistic inquiry, understanding that collective work on a phenomenon generally results in a better explanation than working alone.

Take, as an example of this emphasis, a class of 5th-graders working in small groups on a phonology problem set, attempting to explain New England /r/-lessness and intrusive /r/. Why do speakers of this variety of English pronounce the words *water* and *law* differently in phrases such as the following?

- (1) *a puddle of watah next to the rug ~ a puddle of water on the rug*
- (2) *the lawr of the land ~ the law from above*

On first exposure to the data, there are competing explanations of the phenomenon – some parsimonious, others not; some covering all the data, others only partially covering the data; and so on. Discussion of the alternatives within and among groups of students generally narrows the set of hypotheses to the best of them and from there, perhaps, to the best hypothesis. Discussion of the problem set also reveals a range of ideas about language that students bring to class, like the odd notion that skill in trilling /r/'s might not permit one to

understand the rules of /r/-dropping, or the suggestion that the phenomenon might have something to do with a similar pattern in British English. Taking all ideas seriously and examining them with care is an important part of the group endeavor.

With classes of students who come from diverse language backgrounds, linguistic inquiry is often social in another way – through the cooperation between native speakers of a language or dialect and those who are not native speakers. For example, examining the constraint on the contraction in English of *want to* to *wanna* in normal speech requires rather subtle judgments about the well-formedness of sentences like the following (* indicating that a sentence is not well-formed; *? indicating ambiguity about the well-formedness of a sentence):

- (3) *Who do you wanna talk to?*
- (4) **Who do you wanna go?*
- (5) **?Who do you wanna visit?*

Judgments such as these may not be available to someone whose first language is a language other than English. But by working together, combining their strengths, and using what they have learned from earlier problem sets (about the movement of *wh*-question words in the formation of English *wh*-questions, for example), all students, regardless of what their first language is, have the opportunity to construct and evaluate an explanation of the phenomenon.

Linguistics as a way of figuring out how the world works

“Figuring out how the world works” is usually taken to refer to the world outside the body and if inside the body, then below the neck, thus restricting discussion to what is often considered to be the physical world. However, as Chomsky never tires of pointing out (Chomsky 1993: 45, for example), unless we are angels, we are part of the physical world – our minds and brains included. Thus mental grammar should be investigated as a part of nature, using the methods of scientific inquiry.

In our experience, we have found that younger students (4th-graders through 7th-graders) are far less infected than older students and adults by the strictures of prescriptive grammar or by mind–body dualism (but see Bloom and Weisberg 2007 on the latter). They do not resist the notion that there is a linguistics, a science of language and of mind, and they are open to engaging in the “[s]erious inquiry [that] begins when we are willing to be surprised by simple phenomena of nature, such as the fact that an apple falls from a tree, or a phrase means what it does” (Chomsky 1993: 25). In Pippin’s classroom, for example, 5th-graders express wonder and delight when they discover that they somehow know that *wanna* is well-formed in sentence (3) above but not in sentence (4) and that there can be disagreement over the well-formedness of sentence (5).

observations ... usually leads to ... making more observations to resolve the differences" (AAAS 1993). The 5th-graders we have worked with certainly are drawn toward resolving the differences rather than accepting a stalemate. For example, a problem set on Armenian noun pluralization prompted one student to ask, "Could both theories be right?" (that is, one that attributes the *-ner* ~ *-er* alternation of the plural morpheme to the number of syllables preceding the suffix; the other to whether there is a vowel or consonant preceding the suffix) – as the following data suggest:

(8)	<i>gadou</i>	'cat'	<i>gadou-ner</i>	'cats'
(9)	<i>tas</i>	'lesson'	<i>tas-er</i>	'lessons'
(10)	<i>kirk</i>	'book'	<i>kirk-er</i>	'books'
(11)	<i>shovga</i>	'market'	<i>shovga-ner</i>	'markets'

To which another student responded, "From the data so far ... yes." Not content with such a conclusion, the students cried out, "More data! More data!" And then, "More analysis! More analysis!"

To this end, we emphasize that it is important to carefully work out the forms of possible counterexamples to every hypothesis. For example, counterexamples to the alternative hypothesis in explanation of *wanna*-contraction would be sentences in which contraction is possible despite the fact that the 'want-er' and the 'do-er' are not the same, and sentences in which contraction is not possible although the 'want-er' and the 'do-er' are the same. Are these examples of the latter sort?

- (12) *They want themselves to win.*
 (13) *Who do you want not to win?*

Do sentences (12) and (13) require that the hypothesis be reformulated? And if so, is the reformulated hypothesis parsimonious vis-à-vis the competing hypothesis (that *wanna* contraction is blocked by a *wh*-copy)? Furthermore, does the competing *wh*-copy hypothesis still hold in the light of these data? If not, can it be generalized to account for (12) and (13)?

Addressing misconceptions about language

Consider further this *Benchmarks On-line* statement: "When people know how [linguists] go about their work and reach scientific conclusions, and what the limitations of such conclusions are, they are more likely to react thoughtfully to scientific claims [about language] and less likely to reject them out of hand or accept them uncritically." We proceed in our work with this fervent hope, for current public discussion about language is particularly vulnerable to uninformed opinion and this extends to discussion of language in schools. For example, the latest press release or sound bite

reporting that a dog or a chimpanzee or a parrot has the language ability of a three-year-old is often accepted uncritically. Even a passing understanding of the depth and extent of the linguistic capacities of infants and young children would quickly dispel many common misconceptions about knowledge of language and its growth in the individual. As work in other areas of science education demonstrates, students are not blank slates upon which teachers impress new concepts (Bloom and Weisberg 2007). In promoting linguistics literacy, we anticipate common misconceptions and try to develop in students far more than a passing understanding of the nature of language and its acquisition.

Although much of our work with students comes in the form of problem sets about language, examining language acquisition does not lend itself very easily to this approach. Thus we turn to video clips of acquisition studies of perception, comprehension, and elicited production in order to illustrate different research methods and research results. Through the videos and discussion of them, students can “meet” some of the linguists who study children’s language acquisition, as well as learn something about current research – part of “the [linguistics] story as it is play[ing] out in their lifetimes,” to quote the third bulleted remark above from *Benchmarks On-line*.

There are, of course, more serious and more harmful misconceptions about language than believing that an animal’s response to words demonstrates knowledge of language. The level of linguistics illiteracy revealed in the discussion of the Oakland, California Ebonics controversy that arose at the end of 1996 showed how far short of its goal of erasing language prejudice linguistics education had fallen. We should add, however, that much of the reaction was barely disguised racism based in willful misunderstanding. (See O’Neil 1998b for a discussion.)

The battle against language prejudice is a constant and ongoing struggle; thus confronting it remains a central goal of our work – particularly in teacher education, a goal that we try to reach in part by examining varieties of English, such as New England English (previously mentioned). To many educated people – and even to native speakers of the dialect, New England /r/-less-ness and intrusive /r/ seem uneducated or arbitrary, even willful errors (the result of a “lazy” tongue or a “rough” attitude) – something to be ridiculed. For example, in a recent *New York Times* article, a person is said to speak “in a Boston working-class accent thicker than the sludge at the bottom of a can of baked beans” (Newman 2004: D1, 5). However, as the rule-governed nature of the phenomenon is uncovered, language prejudice is revealed as the ignorance it is. Then the embarrassment about speaking this variety of English can disappear and self-confidence replace it. As Gina, an education student, exclaimed in Honda and O’Neil’s linguistics class one day, “So that’s why I say *Ginar* and *Petah*, but not *Gina* and *Peter*!”

Images of science and scientists

Now move to “the [distorted] images that many people have of science and how it works” and to “the myths and stereotypes that young people have about science.” To this we add the stereotypes that most people have about who does science and under what conditions. By studying the achievements of linguistics, students can learn that scientific work is not limited to laboratories and to men in white coats. By actually **doing** linguistics, rather than “focus[ing] narrowly on the laws, concepts, and theories of [linguistics],” students can come to understand that linguistics is not static, but an evolving endeavor.

Science is “a way of knowing,” something not exhausted by the standard topics in primary or secondary science textbooks or by the names of departments in a college’s faculty of science. In our work, we try to show that linguistics involves forming questions about the languages we know and seeking their answers, though it is not simply that; nor is it simply problem solving. For it is only insofar as a measure of progress is made in accounting for mental grammar – in depth of understanding as opposed to breadth of description – that the pursuit of answers to coherent questions about language becomes linguistics.

Since language is a uniquely human endowment, one that is rich and complex, we fully acknowledge that the study of language can be approached in many different ways, all of them interesting and valid. However, in our collaborative work in schools and with teachers, we choose to focus on mental grammar, on the knowledge of the structure of language that a person has when she or he knows a particular language – the approach to language least represented in American education.

Linguistic inquiry enables students to understand the wonder and the complexity of things that they didn’t know they knew, both about language and about their ability to appreciate and engage in scientific work. The study of language can also, we hope, bring about a better public understanding of language in order to combat the language prejudices that prevail in the United States about language variation.

We turn now to Pippin’s 5th-grade English classroom to demonstrate how linguistics literacy can grow in the course of doing a linguistics problem set, one of a series of problem sets that students do across the year. Here we present an example of the work that we have been doing for the past eight years in independent and public school settings in Seattle.

The pleasures of morphophonology

An ideal educational environment is one in which the teacher and student are equally engaged in the topic at hand. In many English classrooms, this can happen through shared inquiry into a text and in the process of writing. While

literature study and rhetoric (writing) are important parts of the English curriculum, we repeat here the idea that an overlooked area is the study of language itself – a satisfying inquiry in its own right.

The linguistics problem sets that we have developed are presented to students in two thematic blocks: morphophonology and syntax. In this account, we focus on a morphophonological problem set, that of noun pluralization in English, and we discuss how students' investigation of this phenomenon motivates further problem sets about related phenomena.

Listening to students

Students respond to the linguistics problem sets in predictable ways, to be sure, but each class also extends the conversation in its own way. We listen carefully to their ideas and help students build their theories with the knowledge they have – linguistics from the bottom-up. The problems are introduced as conversations, and in keeping with the notion that inquiry is a social endeavor, everyone's ideas are included in the class's note-taking efforts and preserved by both teacher and student. Importantly, when students see everyone's ideas written on an overhead or on the chalkboard or hear their comments on a digital recording, they can use this information to build on one another's theories. (The teacher too can use this information to write meaningful assessments of students.)

We encourage cooperation in each class and across the grade. In small groups, some students are more likely to wrestle aloud with their ideas. Partners help each other come to some sort of workable solution, and then present it to their peers – very much like the way most science is done. In one independent school we worked at, 5th-graders traveled to specialist teachers for all of their classes, so we saw three different groups of 5th-graders in the course of the day. We shared the discoveries of each class across the grade, and students learned that there are multiple paths to take in the inquiry process.

Problem set: Plural noun formation in English

We begin by asking the class for a rule governing the formation of plural nouns in English, and the first response is always the basic spelling rule, "Add s." At this point, the notion of inflection in general is introduced. Contrasting English with other, more inflection-rich, languages is another direction in which to take this conversation. At some point, however, someone will mention that the add-s rule does not work for all words, and so a discussion of regular and irregular plurals follows. We talk briefly about language change and other sources of irregularity, but explain that scientists often set recalcitrant data aside, returning to it later, in order not to miss the more general point: in this case, the default rule

for plurals. Of course, students also bring up spelling differences, but we direct them to the **sounds** of the plurals and generally they discover the three different regular plural endings (/s/, /z/, and /iz/) on their own. But if they don't, we help them along. For example, when students have difficulty distinguishing word-final /s/~/z/, as in *rocks* and *bugs*, we put the plurals in a phrase or a sentence with a vowel following; as one student discovered in Honda and O'Neil's earlier work in schools (1993), this brings out the voicing contrast:

- (14) *rocks on the floor ~ bugs on the floor*
 (15) *There are goats and horses and cows on the farm.*

We elicit more plurals from the class for a categorization exercise, and add to it with a list of our own if necessary in order to get a full array of data:

- (16)

<i>graph</i>	<i>myth</i>	<i>wish</i>	<i>lunch</i>
<i>shape</i>	<i>rib</i>	<i>room</i>	<i>star</i>
<i>tree</i>	<i>dove</i>	<i>cloud</i>	<i>law</i>
etc.			

Phonology 101

Solving this problem requires that students think about the sounds of language. The categorization of words into plural forms proceeds easily enough, but arriving at a hypothesis that governs this distribution requires a vocabulary for discussing speech sounds. So, early in the school year, the class gets a primer in phonology. We challenge the students to find all of the phonemes in English, talk about how speech sounds are produced, and then we introduce distinctive-feature analysis. It is easy for students to see how switches like [voice] and [strident] can be turned on and off, but they remain blissfully ignorant of less intuitively accessible articulator names like [Tongue blade]. Of course, many forget the terms used to describe sounds by the time we encounter this problem set, but they have no difficulty coming up with their own names for the features, a fact also noted by Fabb (1985). Whooshies [strident], teeth blowing sounds [strident], ongoing sounds [continuant], and vibrating sounds [voice] are just some of the terms devised in this phonology-from-the-bottom-up approach.

Hypothesis formation

Most students build an initial hypothesis that looks something like this:

- (17)

/z/	– follows a [+ voice] sound
/s/	– follows a [- voice] sound
/iz/	– follows some sort of sound that they define using a whole host of terms.

Others represent their ideas in a decision tree, such as the one in Figure 12.1. The order in which rules or decisions fall is important, and if they haven't come

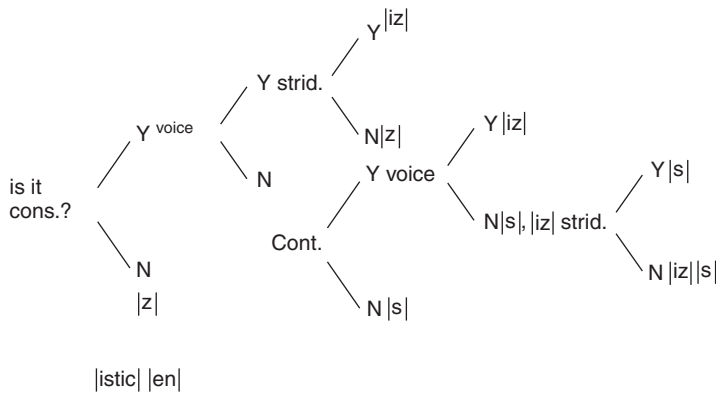


Figure 12.1 A decision tree for English noun pluralization

to it on their own, we prompt students to put them into a parsimonious order so that, for example, /z/ is not assigned as the form of the plural morpheme for a word such as *fuse*, which ends in the [+voice] sound which happens to be /z/, a member of the category “some sort of sound.”

To simplify matters and give them a label for the category, we tell the class that the final sound of the singular form that they have assigned /iz/ to is informally called by linguists a sibilant and is articulated by the [Tongue blade] in a manner that is [+strident]. In this way, students realize that a revised hypothesis requires that we first pick out the way the words associated with /iz/ end and then move on to [± voice] elements. Students then define the conditions that counterexamples to the hypothesis would have to meet, and, finding none, everyone feels good about their work – until we remind them that in the beginning we said that forming the plural in English meant adding /s/, a matter to which we return later in this paper.

Presenting students with the following set of hypotheses (adapted from Halle and Clements 1983: 69) also helps them return to their initial view of the matter and to think about it in a different way:

- (18) Which of the following statements best matches your hypothesis about the unconscious knowledge English speakers have about plural noun formation? Why?
- Hypothesis A:* Speakers of English memorize the plural form for every noun they come across.
- Hypothesis B:* Speakers of English learn the plural forms on the basis of spelling. For example, they learn that nouns that end with the letter *b* are pluralized by suffixing /z/.
- Hypothesis C:* Speakers of English know that the final sound (not the letter) of the singular noun determines the pronunciation of the plural suffix.
- Hypothesis D:* Speakers of English know that some feature or characteristic of the final sound of the singular noun determines the pronunciation of the plural suffix.

Student versus expert

Inquiry science in the schools can be plagued by one of two problems. On one hand, there are classrooms where all ideas are accepted, but students sometimes end up with ideas that are at odds with an informed perspective. They never get to see the expert view of things. On the other hand, there is also a tendency to disregard the work of students because it doesn't come close enough to the expert view, leaving many students dissatisfied when their work doesn't match teacher expectations. Rather than erring on the side of student or scholar, it is possible to fuse both views (Zahorik 1997). Working on the plural problem, students feel good about achieving some sort of satisfactory conclusion, later getting exposed to an expert hypothesis, in which (it turns out) the default form of the plural noun morpheme **is** /s/:

- (19) A morphological rule first:
 1. Add /s/ to form a plural noun. *bus/s/* *cat/s/* *dog/s/*
 Then two **ordered** phonological rules:
 2.a Insert /i/ between sibilants. *bus/is/* *cat/s/* *dog/s/*
 2.b Voice /s/ after voiced sounds. *bus/iz/* *cat/s/* *dog/z/*

The connected story about language

As mentioned above, while working through the plural noun problem, some students are likely to discover that there are categories of irregulars. It is useful at that point to initiate an investigation into these patterns. They learn that some plural forms, like *deer*, *children* and *oxen* are absolute exceptions, but find that we can generalize about the morphophonology of partial irregulars like *life*, *knife* and *house* (in which, for the plural form, the final consonant of the singular is changed from a voiceless to a voiced sound, but then the form follows the rules given above). Language change, which left these forms behind as 'fossils', reminders of when the language was different from what it is now, can also be brought up in discussion of the irregular forms.

Moreover, later, when students discover that English past-tense formation is also governed by an underlying morpheme that undergoes similar phonological adjustments, they feel a great deal of pride in working at the edge of the frontier of 'morphophonology' and use the term with abandon.

From English, we proceed to other plural problem sets: Nicaraguan English offers noun pluralization with a dose of syntax and semantics; Spanish gives students access to a language with a set of phonemes that overlaps that of English; and languages like Armenian and Mandarin Chinese offer even more opportunities for cross-linguistic connections. Examining how nouns are pluralized in other languages gives students a sense of the range of the typological possibilities as well as the limits on these possibilities. Comparing English to

other languages is especially rewarding when students have another language at home, for it piques their interest in these languages. Students have even on occasion asked to create problem sets on their own and have done so with the help of family members.

Learning general principles of language like voicing assimilation is refreshing to students and often leads naturally to questions about the acquisition of language. In fact connecting these problems with language acquisition is a major goal of this work (Honda and O'Neil 2007). Often 5th-graders have younger siblings who overgeneralize rules like those for plural formation or adhere to familiar patterns of phonological development like dropping the /s/ in consonant clusters. At this point, we introduce them to the research that has been conducted on these phenomena (such as the seminal work of Jean Berko-Gleason), test them with the famous wug test (Berko 1958), and even have them take the wug test home to try out with younger siblings.

Student comments

The 5th-graders' written (and sometimes misspelled) comments about the problem sets offer some insight into how they view their work and what they have learned from the experience:

- "The linguistics problem sets taught me to look more closely at the way people talk, and not just take it for granted."
- "In all honesty linguistics problem sets aren't top on my list but I did learn that the way we speak is based on sound and not spelling."
- "I have learned very interesting stuff about the unwritten rules of speaking English from the Linguistics problem sets. I find this extremely interesting because I never noticed any pattern of when I say "wanna" or /s/ instead of /z/ [in plural nouns]."
- "From the linguistics problems sets I learned that every day things in life that we say can turn into a great problem to solve. I think it is useful to learn it even if you won't use it. I also learned the right way to write a hypothesis."
- "I also learned how to write a good, parsimonious hypothesis but most of all how to try and understand something that is commonly used in my daily life."
- "The linguistics problem sets are great for not only getting a solution in whatever you are studying in the problem, but also the hypothesis ... are unpredictable. These problems ... will help me in my life as a linguist."

Conclusion

In English classes, we think of students as writers and readers. Why not as linguists? By promoting linguistics literacy, we can. Through linguistic inquiry, students come to discover how very difficult it is to make explicit their unconscious knowledge of language, and also, how very satisfying it can be to do this. Explaining the nature of linguistic knowledge requires students to develop and hone methods of scientific inquiry: posing questions, collecting and analyzing

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data, formulating testable hypotheses, testing hypotheses by searching for confirming and disconfirming evidence, and revising or rejecting hypotheses.

Meredith Olson, a science teacher at one of the schools where we've worked, had this to say about her teaching philosophy:

Inquiry science, by its very nature breeds a tolerance for divergent views and just treatment for all. Inquiry discussion requires that we not simply wait our turn for others to finish their reporting, but it requires that we listen with care and graft their findings on ours until a rational and considered theory emerges. Inquiry instruction inculcates the humane, rational, thoughtful, considerate mindset we hope to nurture in all citizens.

Though these remarks reflect her experience in the science classroom, incorporating this spirit of discovery into the English classroom is possible and can yield the same positive attributes, something larger than linguistics literacy.

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