



Chapter 7

Essay: What is Academic Language?

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When children learn science in school, they are learning both new ways of thinking about the world and new ways of using language to make meaning. This essay examines some characteristic ways in which academic styles of language are used in the sciences and some ways in which these contrast with conversational styles of language that students use in everyday situations. It also examines some factors influencing students' acquisition of academic styles of language and the implications of these for teaching.

The Importance of Academic Language

A fourth-grade class investigated the question: What makes things rust? The children put various objects, made of metal, wood, or plastic, in water. After the water evaporated, they found rust on a metal bottle cap and on a plastic plate on which the metal bottle cap had been sitting. Two children discussed this outcome:

Jill: But if we didn't put the metal things on there, it wouldn't be all rusty.

Philip: But if we didn't put the water on there, it wouldn't be all rusty.

Jill meant that if the metal bottle cap had not been put on the plastic plate, there would not have been any rust on the plate. She saw that the rust on the plate had fallen off the bottle cap. Philip meant that if water had not been put on the met-

al bottle cap, there would not have been any rust on the bottle cap.

In this example, the children mean two different things, but use similar words and phrases to

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express them. You may wonder why this similarity of language might matter, since Jill and Philip know what each other means, especially given their familiarity with the experiment. It matters because their language hides the fact that, in this situation, “all rusty” means two different things that in science are important to distinguish. Rusty metal objects “cause” things like plastic plates to “be all rusty”

by physical contact in a different way than water “causes” metal things to “be all rusty” by chemical reaction. In Jill’s statement, “all rusty” means part of the plate is covered in rust. In Philip’s statement, “all rusty” means the bottle cap has become rusted. Because the children use the same phrase (“all rusty”), the distinction between having rust (a state) and having rusted (a process) is obscured. One of the goals of science education is to help students like Jill and Philip understand differences between states—such as having rust—and processes—such as having rusted. Academic language plays an important role in this learning process.

In the example, Jill and Philip are using everyday, conversational styles of language to discuss their observations of rust. Academic styles of language differ from conversational, or what linguists call vernacular, styles—in the ways they organize meaning in the sciences. It is important for teachers to understand the distinction between these language styles and how their teaching can support children’s acquisition of academic styles of language.

Examples of Academic Language

Let us begin an examination of academic language by exploring some of the ways in which scientists use it in their professional writing. We will review three excerpts: one from a science journal, one from a popular science magazine, and one from a textbook. We will examine how academic language is used in each according to its audience and purpose.

SCIENTIFIC WRITING

Consider the two excerpts below written by the same biologist on the same topic (Myers, 1990, p. 150). The first is for a scientific journal; the second is for a popular science magazine read by non-scientists—such as National Geographic or Natural History. These examples reflect two major styles within professional scientific writing, each of which uses distinct kinds of language.

1. Experiments show that Heliconius butterflies are less likely to oviposit on host plants that possess eggs or egglike structures. These egg mimics are an unambiguous example of a plant trait evolved in response to a host-restricted group of insect herbivores.
2. Heliconius butterflies lay their eggs on Passiflora vines. In defense the vines seem to have evolved fake eggs that make it look to the butterflies as if eggs have already been laid on them.

How does the language of these two texts work to organize particular kinds of meanings and perspectives on the topic at hand? The first excerpt, published in a professional scientific journal, is concerned with furthering conceptual understanding within a sub-discipline of biology. Its language is carefully developed to do this—to build evidence and marshal support for certain biological claims within particular parts of the biological community. The subject of its initial sentence is “experiments,” a primary methodological tool in biology. The subject of the next sentence is “these egg mimics.” Note here how parts of the plant (“these egg mimics”) are named, not in terms of the plant itself, but in terms of the role they play in a particular theory of natural selection and evolution, namely, coevolution of predator and prey. Note, too, how they are framed as an “unambiguous example” of the relation in question,

a linguistic turn that underscores the importance of the experiments being reported.

Looking further into this text, the butterflies are referred to as “a host-restricted group of insect herbivores,” which points simultaneously to an aspect of scientific methodology (as “experiments” did) and to the logic of a theory (as “egg mimics” did). Scientists arguing for the theory of coevolution face the difficulty of demonstrating a causal connection between a particular plant characteristic and a particular predator despite the fact most plants have many different animals attacking them. To overcome this problem, they use a strategic methodological technique: They study plant groups that are preyed on by only one or a few predators—“host-restricted.” “Host-restricted group of insect herbivores,” then, refers both to the relationship between plant and insect that is at the heart of the theory of coevolution and to the methodological technique of focusing research on plants and insects that are restricted to each other. This first excerpt, then, is concerned with addressing a particular problem and advancing knowledge within biology; the language of the text has been carefully shaped to communicate these concerns.

The second excerpt, published in a popular science magazine, is about animals in nature, not methodology and theory or claims and arguments. Scientists write for popular magazines to

inform the public and to build public support for their work and the field at large. Here, too, they shape their language to meet these purposes. The language in the second example focuses on nature itself as the subject, rather than the activity of science as in the first text. In the second text, the subject of the first sentence is “butterflies” and the subject of the second is “the vine.” In contrast with the first text, the butterflies and vine are both labeled as such, rather than being described in terms of their role in a particular theory. This second text is a story about the struggles of insects and plants that are transparently open to the trained gaze of the scientist (as opposed to inferences derived from clever experimental manipulation, as suggested in the first text). The plant and insect are dramatically represented as intentional actors: The plants act in their own “defense” and things “look” a certain way to the insects, who are deceived by appearances as humans sometimes are.

Interestingly, these two excerpts reflect a historical shift in the relationship between the scientist and nature. In the history of biology, the biologist’s relationship with nature has gradually changed from telling stories about direct observations of nature (as in the excerpt from the popular science magazine) to carrying out complex experiments to test complex theories (as reflected in the excerpt from the profession-

al journal). These two texts also reflect a shift in curricular focus from early elementary science, in which direct observation is usually stressed, to upper level science education, in which experiment grows in importance. A shift in the academic nature of the language used in the science classroom, from conversational, storylike styles to more academic styles, likewise accompanies the transition from elementary to high school.

SCIENCE TEXTBOOK WRITING

A third style of academic language is one with which we are all—sometimes painfully—familiar: the science textbook. An example of a common type of academic language that occurs in science textbooks, called explanatory definition, follows. It is taken from a high school earth science textbook (Martin 1990, p. 93).

The destruction of a land surface by the combined effects of abrasion and removal of weathered material by transporting agents is called erosion.... The production of rock waste by mechanical processes and chemical changes is called weathering.

A number of related grammatical features occur together to mark this excerpt as academic language, some of which we encountered in the professional journal text above. These features also conspire to make this text difficult to read. They include:

- complex subjects, such as “the production of rock waste by mechanical processes and chemical changes”;
- nominalizations, a word linguists use for verbs that have been turned into nouns, such as “production” rather than “produce”;
- passive main verbs, such as “is called”;
- complex embedding, for example, “weathered material by transporting agents” is a nominalization embedded inside “the combined effects of ...,” and this more complex nominalization is embedded inside a yet larger nominalization, “the destruction of ...”

The distinctive features of this particular style place it within a certain genre, or text type, based on the sorts of things it is meant to do, such as explain some of the processes associated with the destruction of a land surface and define related terms. The genre of explanatory definition is characterized by language that classifies things with relation to one another. As readers familiar with this style of academic language read the passage, they know to form a classification scheme in their heads that goes something like this:

Two kinds of changes can happen to a land surface: erosion and weathering. Erosion is the abrasion

and removal of weathered material. Weathering, the production of rock waste, can happen by either of two processes, one mechanical, the other chemical.

The goal of this text is to mark distinctions in the kinds of changes that can happen to a land mass by using distinctive forms of language. In the best of cases, readers will know to connect this new information to what they already know about geologic change.

IMPLICATIONS FOR TEACHING

There are two main points to be drawn from this brief sketch of academic language used in the sciences. The first is that the styles of language on which a given scientific discipline draw are critical tools for engaging in the discipline’s characteristic sorts of thinking and acting, such as theorizing, observing, experimenting, and classifying. The second and related point is that these academic styles of language use grammatical patterns that differ, more or less strongly, from those found in conversational styles of face-to-face communication.

By the time children come to school, they are well versed in using conversational styles of language to think about, talk about, and act on the world of their daily experience (Gee 1996). Indeed, they continue to develop their conversational styles of language throughout their lives. The dilemma for teaching,

as captured in the case of Jill and Philip, is how such conversational styles can serve as a foundation for students' learning in science and, in parallel, their acquisition of academic styles of language (Lee 1993; Warren et al. 2001).

How Students Acquire Academic Language

All students acquire new styles of language—often, academic styles of language—throughout their school years and often beyond.

For English language learners, the challenge of learning academic styles is greatly magnified.

To date, however, researchers have not focused much on how children acquire new styles of academic language. We know much more about how they learn to decode print, which is ironic because more children fail or quit school because they cannot handle academic language than because they cannot decode. For native speakers of English, each new style of academic language differs from, but also builds on, their conversational variety of English. For English language learners, however, the challenge of learning academic styles is greatly magnified. They must acquire a conversational style of English in addition to a number of academic styles, sometimes simultaneously. (See Bialystok, p. XX, for a discussion of some of the challenges associated with learning a second language.)

Although academic styles of language build from grammatical resources in distinctive ways, students cannot acquire these styles through direct instruction on grammar (Gee 1994). Effective instruction must build on, and rely on the aid of, students' conversational styles of language. Students acquire new styles of language by hearing them used in appropriate contexts and by using them themselves in such contexts. It also seems increasingly clear that students acquire academic styles of language when they engage in overt discussion about how language works to organize and represent meaning in scientific disciplines.

Although the question of how students acquire academic styles of language is not well studied, we discuss below some key factors that seem to influence its acquisition and therefore have important implications for teaching and learning.

FACTOR 1: PREPARING YOUNG CHILDREN FOR ACADEMIC LANGUAGE

In many middle-class homes in the United States, parents and other caregivers introduce very young children to certain features of academic styles of language when they are learning to talk (Heath 1983). Children acquire their initial sense of family and community identity as part and parcel of the process of acquiring their native conversational language. When caregivers incorporate certain features

of academic language into initial language socialization, they marry the child's emergent sense of who she or he is—what people “like us” do and value—to earlier forms of academic language that the child will see more fully in school. This is one powerful way in which affiliation with school and schooling is constructed for some children before they even reach school.

As one example of a parent incorporating features of academic language into early socialization, consider a mother talking to her three-year-old about dinosaurs. The child is a “little expert” on dinosaurs, or in the words of Crowley and Jacobs (2002), dinosaurs are an “island of expertise” for the child. Mother and child are interacting around a plastic replica of a dinosaur and its egg, as well as a card with information about the dinosaur. The mother says things like: “And that’s from the Cretaceous period. And that was a really, really long time ago. And this is . . . the hind claw. What’s a hind claw? (pause) A claw from the back leg from a velociraptor.” (Crowley and Jacobs 2002, pp. 343–344). This is not simply “everyday talk.” It mixes in forms of school-based academic (“booklike”) talk. This practice is common in some homes that encourage their children to develop “islands of expertise.” Indeed, such “islands of expertise” are an ideal basis on which to build “informal lessons” on school-based language (see Gee 2004).

Consider the following example, which illustrates simple ways that middle-class caregivers, mostly unknowingly, prepare young children for the kind of academic language valued in school. At dinnertime, a mother says, “Tell Daddy about what happened when we went to the store today.” As her daughter begins to report on the events at the store, the mother coaches her to make information explicit by asking such questions as, “And what happened next?” or “Who did that?” This child is being asked and then helped to tell about an event or activity in a way that assumes that her listener does not know anything about it (even if the listener actually does). She is being coached to express her meaning as explicitly as possible so that someone who has not experienced the event can appreciate and understand it. Although they may not be aware of it, middle-class caregivers routinely practice this kind of explicit reporting, which facilitates early school success, with their children at home (Heath 1983).

The dinnertime example illustrates a second way that middle-class children are prepared by parents and caregivers, again unknowingly, for the kind of academic styles of language they will encounter in school. In this example, in addition to being prompted to give more explicit information, the child is also being taught how to talk on the same topic for an extended period of time. She is gradually learning to take longer and longer turns

(Snow 1986). This exercise allows children to develop the grammatical resources that enable them to add more and more information on a single focused topic. Extended turns of talking are characteristic of academic language. In school and in academic disciplines like science, academic styles of language are typically used to talk in extended ways about a single topic, using complex grammatical resources to add new information.

Conversational language, on the other hand, often encourages short turns of talk, a quick back-and-forth between speakers, and rapid movement from topic to topic. Indeed, these characteristics are often hallmarks of good conversation and of people achieving solidarity with each other. In addition, explicit reporting is not a characteristic of conversational language styles, which trade on knowledge that is known to both listener and speaker. In the rust case presented at the start of this essay, Jill and Philip assign different meanings to the same words (“on there,” “it,” and “all rusty”), but neither is confused because they are looking at the objects in question together. Conversational styles trade on this kind of shared knowledge in part because they are acquired as part of the process of participating in activities and events with family and community.

Although the dinnertime example may seem simple, both of the practices illustrated help the children who participate in them gain fluency with the kind of language that is

a foundation of academic language and success in school. It is important to remember that learning is the result of practice (Scribner and Cole 1981). As a result, children who have had a great deal of practice with these kinds of academic language styles before they enter school have an advantage over those who have not had such practice, i.e., children from non-middle-class homes or families with limited formal schooling. Although these children come to school with strong language skills that can serve as the basis for learning, they must rely on the schools to teach academic styles to them. And the earlier and more often they are given opportunities to learn and practice them, the better.

FACTOR 2: STUDENTS IDENTIFYING AS SCIENTISTS

An important aspect of learning science includes learning to understand and value a certain sort of identity—the identity of being a scientist. Students must be interested in emulating this identity, in however attenuated a form, in their classrooms. This identity is, in turn, integrally connected to scientists’ ways of using language and other sorts of representational tools, such as equations, models, and theories, that help them do their work (Halliday and Martin 1993).

If students see this identity as conflicting with other identities they assume and hold important, including those connected to their gender, ethnic community, lin-

guistic community, family, or local community, then they will not be motivated to learn the styles of language and thinking associated with it. Indeed, this is one of the reasons why acquisition of academic styles of language must build on and respect students' conversational styles of language, as well as the family and community-based identities with which these are associated. Bridges must be built through language between the identities students have developed outside school and new ones they are being asked to take on in school.

In these ways, acquisition of academic styles of language is heavily tied to identity issues, to how students see themselves in relation to the discipline they are learning. When students acquire a new style of language, they do not need to lose their other styles; they can instead add yet another tool to their linguistic repertoire. At the same time, they also acquire a new sense of themselves, their capacities, and their connection to new social practices and new social groups.

How can teachers encourage students to identify as scientists and want to learn academic styles of language? Let us again consider, in this light, the case of Jill and Philip presented at the start of this essay. By publicly sharing their observations with the rest of the class, these students might discover a need to make an explicit distinction between physical and chemical mechanisms of rust formation. Their teacher could support them

in this by writing their words on chart paper and then asking the class what they think Jill and Philip might have meant in the two instances. Based on her students' responses, the teacher might then engage the class in discussing similarities and differences in the ways Jill and Philip described what happened to the bottle cap and plastic plate, and how their observations and descriptions of those observations relate to scientific forms of explanation. Such a practice would support the students in bridging their conversational style of language and a more academic style as they work out possible meanings for scientific ideas they actually care about understanding.

This kind of practice, in which different ways of using language in science class to communicate ideas and understandings become an explicit focus of discussion and inquiry, has been developed and studied by researchers and teachers at the Chèche Konnen Center (Warren et al. 2003). It engages children in considering scientific meaning in relation to the varied forms of language, both conversational and academic, that they and others—for example, authoritative science texts—use to express that meaning. (See Warren, p. XX, for more discussion of this practice.)

FACTOR 3: MULTIPLE MODELS OF ACADEMIC LANGUAGE

When they are learning in a content area like science, students

need to engage with multiple models of the academic style of language used in the discipline, both in speech and writing. Furthermore, these models need to be explicitly connected to the activities for which they are used in the discipline (Halliday and Martin 1993). For example, in certain fields of science, particular styles of language might be used to write field notes, describe data, construct arguments, or write research reports. As noted earlier, each of these activities melds language and meaning in a relatively set way that results in a genre. The earlier excerpt about land surface destruction from a high school textbook is an example of the genre of explanatory definition, which is used in specific places, like textbooks, for specific purposes, such as classifying and explaining the kinds of changes that can destroy a land surface.

Scientists use language and other symbolic tools—equations, graphs, and models, for example—to perform certain sorts of characteristic activities. Just as a learner in a mathematics class needs to learn why one type of equation is well suited for solving certain problems but not others, so too does a science student need to learn why certain words, such as work, which has a different meaning in physics than in conversational English, and certain forms of language, such as complex subjects like “The destruction of a land surface by the combined effects of abrasion and removal of weathered mate-

rial by transporting agents ...,” are well suited for certain tasks, but not others.

FACTOR 4: HOW LANGUAGE REFLECTS A PERSPECTIVE

The words and grammar of any style of language, including conversational styles, exist not only to carry out certain sorts of activities but also to allow people to take and communicate alternative perspectives on their experience (Tomassello 1999). For instance, the grammatical construction, “Microsoft’s new operating system is loaded with bugs,” takes a perspective in which Microsoft’s activities are less intentional and deliberate than in the grammatical construction, “Microsoft has loaded its new operating system with bugs.”

To investigate perspective taking in science further, return for a moment to the examples of scientific journal writing and popular science magazine writing offered in the first part of this essay. To be successful, an ecology student must eventually understand that a sentence like, “Experiments show that Heliconius butterflies are less likely to oviposit on host plants that possess eggs or egglike structures,” takes a perspective on the world that stresses butterflies and vines as tools for building theory rather than as actors in their own right. A sentence like, “Heliconius butterflies don’t like to lay their eggs on plants that look like they already have eggs on them,” on the other hand, takes a perspective in which the behavior

of butterflies is of central concern and its importance to theory building is left tacit. Although there is nothing inherently wrong with this alternate perspective, it is not one that ecologists typically take when doing science professionally. To act in and on the world with a scientist's perspective, it is necessary to understand and use something like a scientist's language.

How do children learn how words and grammar express particular perspectives on experience? Even before they begin school, children have the capacity to distance themselves from their own perspectives and mentally simulate the perspectives another person is taking (Tomasello 1999). Research shows that they learn this skill through interactive dialogue with more experienced peers and competent adults. In such dialogue, children can see when others have used an unfamiliar form of language to take a different perspective on the subject being discussed than the perspective they themselves have taken. Later, in other interactions, or in thinking to themselves, they can rerun such simulations and imitate the perspective taking the more experienced peer or adult has demonstrated by "trying on" the new words and forms of grammar. However, for this to work, the learning environment—including the ways of talking and texts used in it—must be rich and redundant enough to allow learners to make good guesses about what perspective someone is taking.

One implication to draw from research on perspective taking is that, to learn academic language, students must hear and practice academic language with adults and more experienced peers who know those language forms and are using them in rich contexts—such as inquiry—in which their meaning and function are clear. Immersion in practice is not, however, enough. The learning environment must be structured to be rich, ordered, and redundant enough so that learners can make good guesses about what these new forms of language mean and can do. The same is true of the academic texts students read.

FACTOR 5: PURPOSES AND FORMS OF ACADEMIC LANGUAGE

There is no evidence that giving children grammar lessons on academic styles of language is effective by itself. But this does not mean that talk about academic styles of language, how they differ from conversational styles of language, and how they express particular perspectives is not effective. Indeed, it is important for teachers to call learners' attention explicitly to aspects of academic language and to the genres in which these are used, both in the midst of practices such as active inquiry and outside of them.

One way to call attention is for teachers to develop with their students a "metalinguage," or a shared language, with which to talk

and think about language, how it is used for various functions, and how it expresses various perspectives (Halliday and Martin 1993). This can be done even with young children, for example, in kindergarten

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and in first grade. Such metalanguage allows students and teachers to talk in consistent and mutually comprehensible ways about language and its uses. If academic styles of language are to be learned in school, students must be immersed in rich activities in which academic language is modeled and used in purposeful and meaningful ways. That learning must also be supplemented with an emphasis on thinking and talking about language—how and why language is used to carry out certain characteristic tasks in specific scientific disciplines.

To talk about language means to call students' attention to how samples of academic language are written or spoken and why they are written or spoken that way. This is no easy matter. How might teachers approach this endeavor? Returning to the excerpts of scientific writing presented earlier in this essay, a teacher might ask students to consider what they think each text means, what each is about (as described earlier in the case of Jill and Philip, and in Warren, p. XX). As students discuss possible meanings, the teacher might then ask them where specifically in the texts

they see those meanings being developed and how—in other words, which grammatical resources are being used to communicate these different meanings. This approach could lead to further, comparative discussion of particular elements of these texts. A teacher might pose questions such as: Why does the first text use “experiments” as the subject of its first sentence, while the second uses “Heliconius butterflies”? Why does the first use a phrase like “host-restricted group of insect herbivores” instead of “butterflies,” as in the second? Teachers might think of this kind of language work as analogous to the kind of close instructional attention they give when teaching poetry as a designed form of language.

Conclusion

All children come to school with well-developed conversational dialects. These dialects are wedded to their sense of who they are in life, in terms of their affiliations with families and communities. Failing to build on students' conversational dialects is a recipe for destroying their interest in and affiliation with school and schooling.

At the same time, failing to teach all learners new ways with words privileges those whose conversational styles already incorporate aspects of academic language. It places at a disadvantage those students whose early language socialization has not incorporated aspects of academic language that are valued

and recognized in school, because they are left without the tools necessary for academic success.

Many people who believe that science is primarily about thinking and problem solving ignore the role that language plays in accomplishing these tasks. Others believe that academic styles of language are too demanding or daunting for some learners, especially English language learners or low-achieving students. But what are these students to do when they encounter textbooks written in academic styles of language, which will certainly happen by middle and high school, if not before?

The reality is that all children need to learn academic styles of language if they are to be successful in science, or any other subject in school, and such learning must build on children's conversational styles. The challenges for teachers are to engage children in using academic styles of language in purposeful and meaningful ways and to make these styles of language an explicit focus of inquiry and discussion.

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