

Linguistics Education and Cognitive Liberation

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"I can only show you the door, you're the one who has to walk through it."

Morpheus to Neo, in *The Matrix* (the film)

"indoctrinate: to instruct (in a doctrine, principle, ideology, etc)"

Webster's Encyclopedic Unabridged Dictionary of the English Language

We concluded the article, "Education and Cognitive Liberation" (this volume), with a plea to incorporate *deep understanding*, *critical understanding*, *critical thinking*, and *independent inquiry* as essential instructional goals — the desired learning outcomes — of education. In this article, we focus on critical understanding as a prerequisite to critical thinking, and explore ways to accomplish such understanding in an introductory course in Syntax, as an example of the 'liberating' approach to education in linguistics.

The organization of the article is as follows:

1. Understanding of conclusions vs. critical understanding
2. Observational and theoretical statements in scientific inquiry
3. The mindset of the critical thinker in scientific inquiry
4. Explanation-based argumentation in scientific inquiry
5. Examples of explanation-based justification in syntax
6. Examples of examination questions in syntax
7. Introductory syntax and standard textbooks

1. Understanding of conclusions vs. critical understanding

Traditional approaches to education focus on the *understanding* of what is currently taken as "knowledge" — a body of conclusions accepted as true beyond reasonable doubt by the academic community. Thus, an introductory course in syntax exposes a student to the following (explicit or implicit) propositions:

PROPOSITION 1: A sentence consists of one or more words.

PROPOSITION 2: Words are classified into the categories of noun, verb, adjective, preposition, etc., referred to as lexical categories.

PROPOSITION 3: Sentences have a hierarchical structure; that is, they have parts that are themselves composed of parts.

PROPOSITION 4: Such sentence-parts that are larger than words are called phrases. Phrases are classified into the categories of noun phrase, verb phrase, prepositional phrase, etc., referred to as phrasal categories.

PROPOSITION 5: The analysis of a sentence (along another dimension) also calls for functions (or functional categories) like SUBJECT, PREDICATE, OBJECT, ADJUNCT, and so on (or alternatively as functional categories like SPEC, COMP, SPEC of CP, SPEC of IP, etc.).

PROPOSITION 6: A sentence may have as one of its parts another sentence-like structure, referred to as a clause (or its equivalent). A sentence is itself a clause. A clause consists of a subject and predicate, and optionally, objects and adjuncts.¹

Propositions of this kind, which are **conclusions** that linguists have arrived at through their inquiry, are part of the textbook knowledge in the field. Traditional forms of education disseminate these conclusions, expecting students to **understand** them, and to demonstrate their understanding through successful solving of a range of problems.

But do students develop a **critical understanding** of these propositions? The answer is no. Most curricula do not include the relevant **justification** (i.e., the evidence and/or argumentation in support of or against them); as a result, students are not in a position to arrive at an informed rational judgment on the credibility of the propositions. Being required to accept and use the propositions without an understanding or an awareness of the relevant evidence and argumentation, students come to take them as true, simply because they have been told so. Educational activities that require students to accept or to take for granted a proposition on the grounds of the authority of the teacher/textbook are a form of **indoctrination**. Education in linguistics, like education in most other subjects, has failed to escape this form of indoctrination.

What can we do to prevent such unintended indoctrination in linguistics education? Drawing on our experiments with teaching, which succeeded to a great extent in conveying to students the joy of learning, the thrill of the discovery of knowledge, and the value of the evidence for the conclusions, we offer two educational commitments:

- A. **Evidence-Based Learning:** the commitment to ensure that whenever presenting a theoretical concept or a proposition, learners are familiarized with the relevant evidence and argumentation; and in situations where this is not feasible, to explicitly acknowledge that justification has not been given; and
- B. **Inquiry-Based Learning:** the commitment to provide ample practice in constructing knowledge propositions and constructs, justifying them, and critically evaluating them, on their own.

Evidence-Based Learning (**EBL**) is predicated on the position that it is important to know why we believe what we believe, and be aware of the evidence for/against beliefs. Inquiry-Based Learning (**IBL**) is predicated on the position that it is important for us to have the capacity to engage in independent inquiry, and the belief that the best way to acquire knowledge — wherever possible — is to construct it ourselves: the more we discover knowledge for ourselves, the better we internalize it; and the greater our delight in discovery, the deeper the learning.

¹ For the purposes of this article, we are interested only in the broad outlines. We are not, for instance, concerned with whether or not lexical categories are further decomposed into categorial features like [\pm N] and [\pm V], whether or not grammatical functions are best represented as configurations of functional categories such as SPEC of I, and so on.

Vital to the above commitments are two requirements:

1. careful design and sequencing of teaching-learning materials and of learning and assessment tasks; and
2. an environment where students get the opportunity to **learn** rather than be taught; where they unearth patterns, construct, test, critically evaluate, and defend theories; where they can argue with one another and with the teacher; where learning becomes exciting and meaningful.

EBL is an automatic consequence of IBL. However, it can be pursued even if, for some reason, we do not wish to adopt the radical pedagogy of IBL. Minimally, what we need is adherence to the commitment to EBL in our exposition and assessment.

In what follows, we sketch the epistemological infrastructure that goes hand in hand with the commitment to EBL in a course in introductory syntax. We give a sample of the content that students learn. And, as the outcome of any pedagogical enterprise depends to a great extent on the nature of the assessment tasks, we also include illustrations of assessment tasks that set the path of learning towards our chosen learning outcomes.

2. Observational and theoretical statements in scientific inquiry

In linguistics, as in any scientific inquiry, the first step towards critical understanding comes with meticulously distinguishing between observational and theoretical statements. Observational statements are those that independent observers can in principle verify through their own observation, either by being present at the observational site or through replication of the observational situation. For instance, consider the following data:

- (1) a. *Zeno ate a mango.*
b. * *Zeno ate mango a.*

The observational statement that (1a, b) makes is:

- (2) Given the strings of words (i) *Zeno ate a mango*, and (ii) *Zeno ate mango a*, the speakers of English that we consulted accepted (i), and rejected (ii).

Such asymmetry in experimentally-induced speaker behavior — the differences in the responses to the two stimuli — is something that an independent observer can verify. The corresponding non-experimental observation on the basis of corpora would be:

- (3) The string of words *Zeno ate a mango*, occurs in our corpus; the string *Zeno ate mango a*, doesn't.

Another observational statement on (1a, b) is:

- (4) The word *a* occurs at the end of the string *Zeno ate mango a*. It does not occur at the end in *Zeno ate a mango*.

What a linguist has to explain is the systematic **correlation** between observations such as those in (2)/(3) on the one hand, and in (4) on the other, stated as a generalization in (5):

- (5) Observational generalization: Speakers of English that we consulted reject sentences that end with the word *a*.

Such observational statements constitute the grounds of inquiry in syntax. In contrast, statements like (6) assert theoretical claims on how we should **explain** (2) and (3).

- (6) a. *Zeno* and *mango* are nouns; *ate* is a verb; *a* is a determiner.
b. A VP in English consists of a verb followed optionally by an NP.
c. An NP in English consists of an optional determiner followed by a noun.

Obviously, critical understanding of observational statements and critical understanding of theoretical statements are very different in nature. In the following sections, we outline what it takes to ensure critical understanding of theoretical statements.

3. The mindset of the critical thinker in scientific inquiry

Given assertions like those in (6), critical understanding of syntax requires that we answer the skeptic's questions such as those in (7).

- (7) a. What is the justification for the postulation of lexical categories in syntactic theory?
b. Granted that lexical categories are needed ((7a)), why should we accept the postulation of the particular categories noun, verb, and determiner?
c. Granted that we need lexical categories ((7a)) and the particular categories noun, verb, and determiner ((7b)), why should we accept the claim in (6a)?
d. Granted that we accept all of the above, why should we postulate phrasal categories?
e. Granted that we accept phrasal categories, why should we postulate the particular phrasal categories NP and VP?
f. Granted that we accept all of the above, why should we accept the constraints/rules in (6b) and (6c)?

To respond to the skeptic's challenge in (7a-f), we need to provide:

observational **grounds** that skeptical readers/listeners can verify on their own; and

sound justification to demonstrate that the conclusions questioned in (7a-f) follow from these observational grounds.²

4. Explanation-based argumentation in scientific inquiry

The mode of justification to support theoretical claims in science has a set of features that distinguish it from the justification of other kinds of claims such as mathematical conjectures, causal and correlational hypotheses, moral judgments on

² Our focus in this article is on the justification of theoretical claims. We sidestep the issue of justifying the claims of observational generalizations of the kind illustrated in (5).

practices and actions, the moral values and principles that serve as their basis, and the pragmatic judgments on the effectiveness and efficiency of products and procedures. Critical understanding in theoretical syntax requires students to understand these features.

The critical thinker's questions in (7) parallel questions like, "Why should I believe that the earth spins on a tilted axis and revolves around the sun?" "Why should I believe that there is such a thing as dark matter or dark energy?" and so on. The response to such questions involves the use of explanation-based arguments, the structure of which can be outlined as follows:

(8) Structure of explanation-based arguments for X:

There exists a body of observational generalizations G1, G2, ... Gn that calls for an explanation.

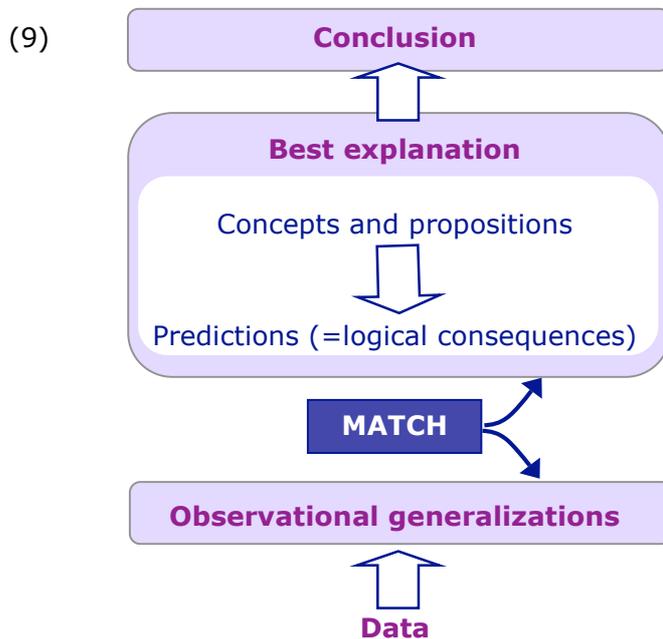
The generalizations G1, G2, ... Gn can be explained if we assume E, consisting of concepts C1, C2, ... Cn, and propositions P1, P2, ... Pn.

E is the best available explanation for G1, G2... Gn.

In the absence of counter-evidence that refutes E, and a better or equally good explanation, we must accept E, and hence all of its parts, namely, C1, C2, ... Cn, and P1, P2, ... Pn.

X is C3 (or P4). Given that we accept E, therefore, we must accept X as well.

The model of justification implicit in (8) can be pictorially represented as (9):³



³ In explanation-based arguments, if a conclusion to be defended is an interpretation internal to an already accepted theory (e.g., the justification for (6a)), the mode of reasoning employed is that of **abduction**; but if what is defended is the theory itself (e.g., the justification of the postulation of lexical categories in response to (7a)), the mode of reasoning is **speculative-deduction**. We will not go into the details of the difference here.

5. Examples of explanation-based justification in syntax

Let us take a few examples to see how (9) works. For our illustration, we adopt both material and the expository style that we have used in our own teaching over the years. We begin with an argument to show the need to postulate the lexical category NOUN. Consider the following data:

(10) <u>Puzzling observations (of an asymmetry)</u>			
a.	<i>Ana</i>	<i>Ana's</i>	e. <i>arrange</i> * <i>arrange's</i>
b.	<i>cat</i>	<i>cat's</i>	f. <i>shall</i> * <i>shall's</i>
c.	<i>chair</i>	<i>chair's</i>	g. <i>strong</i> * <i>strong's</i>
d.	<i>music</i>	<i>music's</i>	h. <i>this</i> * <i>this's</i>

We need to explain why speakers of English reject forms in which *-s* is attached to *arrange*, *shall*, *strong*, and *this*, even though they accept the forms in which *-s* is attached to *Ana*, *cat*, *chair* and *music*. Let us propose a possible explanation:

- | | |
|-------------------------|---|
| (11) <u>Explanation</u> | |
| a. | i) <i>Ana</i> , <i>cat</i> , <i>chair</i> , and <i>music</i> are nouns;
<i>arrange</i> , <i>shall</i> , <i>strong</i> , and <i>this</i> are not nouns. |
| | ii) [[<i>Ana</i>]'s], [[<i>cat</i>]'s], ... [[<i>arrange</i>]'s], [[<i>shall</i>]'s], ... |
| b. | <i>-s</i> can be attached only to nouns. |

It follows from (a) and (b) that [[*arrange*]'s], [[*shall*]'s], ... are ill-formed.⁴

Given the assumption that speakers of a language reject ill-formed linguistic forms as unacceptable, we correctly predict that the forms in (10e-h) are unacceptable, in contrast to those in (10a-d).

Based on this explanation, we formulate an argument as follows:

(12) Explanation-based justification

Speakers of English judge some forms with *-s*, such as those in (10e-h), as unacceptable, while accepting other forms with *-s*, such as those in (10a-d).

This asymmetry can be explained if we assume the propositions in (11a, b), which crucially include the distinction between nouns and non-nouns.

The explanation in (11) is the best available explanation for (10).

In the absence of counter-evidence that refutes (11), and a better or equally good explanation, we must accept (11).

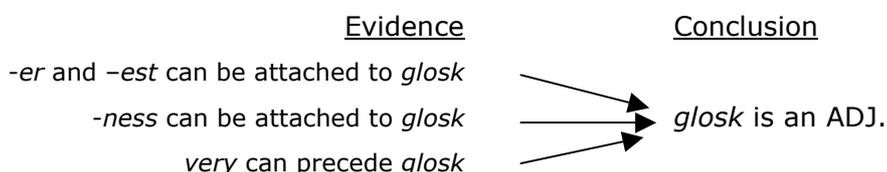
Since the distinction between nouns and non-nouns is crucial to (11), we must accept this distinction as well.

⁴ In this explanation, (11a) specifies representations, while (11b) specifies a constraint. The representations in (11ai) are of atomic morphemes, and those in (11aii) are of the internal structure of words. Explanations in theoretical linguistics are composed of representations and constraints/rules/laws/principles.

This is just a preliminary sample. (11), (13), and (14) make a number of other predictions. Our confidence in the hypotheses we postulate increases when predictions of such correlations we had not noticed in the original data are verified by further observations.

An important result of such logical interconnecting is that of *independent corroboration*, or *convergence of evidence* for theoretical conclusions. Suppose we find that a word, say, *glosk* allows the attachment of *-er* and *-est*. Given (13g), we must conclude that *glosk* is an adjective. Suppose we now find that *glosk* can occur immediately following *very*. Given (14a), we must again conclude that *glosk* is an adjective. Thus, the conclusion from (14a) corroborates our conclusion from (13g). To put it differently, (13g) and (14a), when applied to the data, yield the same conclusion, namely, that *glosk* is an adjective. If we now find that *glosk* permits the attachment of *-ness*, then three independent sources of evidence converge on the same conclusion.

Convergence of evidence



6. Examples of examination questions

The discussion in the preceding section touched on a sample of considerations that the curriculum for an introduction to syntax needs to incorporate if we value critical understanding, which serves as a pre-requisite to critical thinking and provides a safe-guard against indoctrination. In what follows, we give an sample of two examination questions of the kind we ourselves use, along with brief post-examination notes for students (given in boxes below each question/part) to facilitate further learning. We believe that it is only through such assessment tasks that the value of and practice in critical understanding and critical thinking can take root and become an integral part of students’ habits of thought.

QUESTION 1

Part I: As you know, the asymmetries illustrated in (1) below justify the general principle in (2):

- | | |
|---|--|
| <p>(1) a. <i>Zoe’s son adores her.</i>
 b. <i>Zoe adores her son.</i>
 c. <i>Zoe adores her.</i>
 d. <i>Zoe said Lee adores her.</i>
 e. <i>Zoe gave the child to her.</i>
 f. <i>She adores Zoe.</i></p> | <p><u>her/she refers to:</u>
 Zoe or someone else
 Zoe or someone else
 not Zoe; only someone else
 Zoe or someone else
 not Zoe or the child
 not Zoe</p> |
|---|--|

(2) A pronoun cannot refer to one of its sister grammatical functions.

Now consider the following argument:

In the sentence in (3):

(3) *Zoe promised him to take Alvin to the zoo.*

the pronoun *him* cannot refer to Alvin. Given principle (2), therefore, it follows that *him* and *Alvin* in this sentence are sister grammatical functions.

Critically evaluate the argument.

[Length: no more than 60 words; may be less than 60.]

Post-exam notes:

Question 1 tests your understanding of the distinction between deductive reasoning and abductive reasoning (not your familiarity with the terminology, but whether you have *understood* the conceptual distinction), and your ability to identify the mode of reasoning appropriate for a given situation. Parts I and II of the question are designed to find out if you have understood the point that:

given a set of premises, and a conclusion that is alleged to follow from the premises, it is possible for the reasoning to be valid as a form of abduction, while being invalid as a form of deduction.

The argument in part I is formulated as deductive reasoning. (2) translates as: "If a pronoun and X are sister grammatical functions (GFs), the pronoun cannot refer to X." Given (2), and the observation that the pronoun in "Zoe promised him to take Alvin to the zoo," cannot refer to Alvin, it is not legitimate to conclude deductively that *Alvin* and *him* are not sister GFs. [The fallacy here is that of concluding P on the basis of "If P then Q," and "Q."]

Some of you simply disagreed with the conclusion, and asserted that *him* and *Alvin* are not sister GFs. Asserting your preconceptions does not answer the question. You need to minimally provide evidence against the conclusion to support your assertion.

Part II: If you think that the formulation of the argument in Part I is flawed, provide a revised formulation to support the conclusion that *him* and *Alvin* in (3) are sister grammatical functions.

Post-exam notes:

Here is a valid abductive argument:

Given the following principle, which we have already accepted as correct:

2) A pronoun cannot refer to one of its sister grammatical functions.

we can explain why the pronoun in "Zoe promised him to take Alvin to the zoo," cannot refer to Alvin, if we assume that *him* and *Alvin* are sister GFs. Until we find evidence to the contrary, or an alternative explanation that is at least as good, therefore, it is reasonable to conclude that *him* and *Alvin* are sister GFs.

[Given the information presented in the question, the argument is valid, although the conclusion is obviously false.]

Part III: Provide evidence to demonstrate that given (2), *him* and *Alvin* cannot be sister GFs in (3).

Post-exam notes:

This part of the question tests your ability to identify counterevidence.

In the sentence in (4), *him* can refer to *Alvin*:

(4) *Zoe promised Alvin to take him to the zoo.*

Given (2), it follows that *him* and *Alvin* in (4) are not sister GFs. Since they occupy the same positions as *him* and *Alvin* in (3), it follows that *him* and *Alvin* in (3) are not sister GFs.

Some of you said that *Alvin* is the object of *promise* while *him* is the object of *take*, and hence the two cannot be sister GFs. While this may count as a legitimate objection if we assume that *Alvin* and *him* are indeed objects of two different verbs, it does not count as providing evidence to demonstrate that they are not sister GFs.

Instead of giving counterevidence, some of you simply drew tree diagrams for *Zoe promised Alvin to take him to the zoo*, and pointed out that in the diagrams you drew, *Alvin* and *him* are not sister GFs. But the question is, why can't we represent *Alvin* and *him* as sister GFs. You cannot respond to that question simply by asserting that they are not sister GFs.

QUESTION 2

Provide evidence and arguments to justify the claim that:

A finite subordinate clause in English must have an overt subject.

Post-exam notes:

This question tests your understanding of explanation-based arguments for theoretical constraints, and your ability to come up with such arguments. It requires you to identify easy-to-spot data, propose an explanation, and articulate the argument with an awareness of potential objections.

Consider the following data:

- i) Mary said she saw Alvin at the mall.
- ii) * Mary said saw Alvin at the mall.

Suppose we represent these sentences as:

[_{FIN} Mary said [_{FIN} she saw Alvin at the mall.]]

S P S P O A

[_{FIN} Mary said [_{FIN} saw Alvin at the mall.]]

S P P O A

The subordinate clause in (ii) does not have a subject. Hence, the constraint that a finite subordinate clause in English must have an overt subject correctly predicts that (ii) is unacceptable. If the constraint together with the representations in the explanation do not make incorrect predictions, and if we do not find an alternative explanation that is at least as good, the explanation (and hence the constraint as a part of the explanation) must be accepted as correct.

Given the crucial condition of the absence of incorrect predictions and of the availability of alternatives that are at least as good, a sound explanation-based argument must address potential instances of counterevidence and alternatives that a skeptical reader might raise as objections. (An important part of learning the art of theoretical argumentation is that of **anticipating** and **pre-empting** the sceptic's potential objections.)

It is hard to find counterevidence for the obligatoriness of overt subjects in finite clauses in English. So let us turn to arguments based on potential alternatives. A typical objection that appeals to alternatives would be: Why do we need to stipulate finiteness? Why not formulate the constraint as follows?

A subordinate clause in English must have an overt subject.

Another possible objection could be: Why do we need to stipulate subordinate clauses? Why not formulate the condition as:

A finite clause in English must have an overt subject.

That you need to stipulate both 'finite' and 'subordinate' is shown by examples like the following:

- iii) Mary promised Alvin to meet him at the mall.
- iv) While shopping at the mall, Mary bumped into Alvin
- v) Go away.

The non-finite clauses in (iii) and (iv) do not have overt subjects. (Draw the relevant representations yourselves), nor does the non-subordinate clause in (v). Hence, both stipulations are necessary.

A different line of objections from a skeptical reader would be: Why formulate the constraint in terms of 'subject'? Why not formulate it as 'agent' or as 'the highest semantic role' (e.g., the highest semantic role must be overtly expressed in finite subordinate clauses in English). If you have followed our discussions in class on the use of the passive construction to argue for subjecthood on the basis of agreement, case, and so on, you should know how to deal with this objection.

Objections of this kind can in principle be never-ending. The question does not look for a response to all the possible objections (an impossible task), or even a comprehensive set of responses. All it asks for is an indication of your sensitiveness to potential objections. It is this sensitiveness that distinguishes a researcher from a novice.

7. Introductory syntax and standard textbooks

In the preceding sections, we illustrated some of the basic considerations that we need to pay attention to if we wish to facilitate critical understanding and critical thinking in an introductory syntax course, as a strategy to pre-empt indoctrination. The "theory" that we have touched upon is rudimentary. It focuses on what the varied "approaches" and "frameworks" of syntactic theory have in common, ranging from Chomsky's *Syntactic Structures* to the latest versions of minimalism, and their various tributaries.

The reader would have noticed that we have studiously avoided terms as DP, CP, INFL, and Binding Theory. This is intentional, because we believe that novice students are not capable of understanding the justification for the postulation of these sophisticated constructs and principles until they have an adequate understanding of, and practice in **doing**, more basic syntax.

We cannot expect a student who has not learnt basic arithmetic and geometry to understand quantum mechanics and general relativity. Likewise, students who have not grappled with the kinds of questions illustrated in (7) cannot hope to challenge a teacher who presents Chomsky's latest ideas on syntactic analysis. All they can hope to do, if the curriculum demands familiarity with the latest 'theory', is accept what the textbook or teacher says on faith, more or less the way students in a religious instruction class accept on faith the statements of the scriptures and the priest. Introduction to syntax that pursues this path becomes a means for academic

indoctrination, instead of becoming a course in scientific inquiry, or in cognitive liberation.

Such indoctrination is common in courses on introductory syntax. A classic example would be the chapter on syntax in O'Grady and Archibald (2009), *An Introduction to Contemporary Linguistic Analysis*. The authors use the 43 pages allocated to syntax (out of the total of 576 pages) to introduce XP, specifier, head, and complement (on the 6th page of the chapter), the merge operation (on the 10th page of the chapter), IP and I (on the 11th page), CP and C (on the 16th page), move alpha (on the 17th page), landing site (on the 18th page)... one could go on.

Unfortunately, the kinds of assertions in O'Grady and Archibald (2009) are widespread in standard textbooks, with conclusions that are typically unaccompanied by justification and critical questioning, thus trapping students' minds into uncritical acceptance of those conclusions. We hope to have pointed to Evidence-Based pedagogy as a diametrically opposite mode of teaching syntax — one that hopes to liberate the mind rather than imprison it.