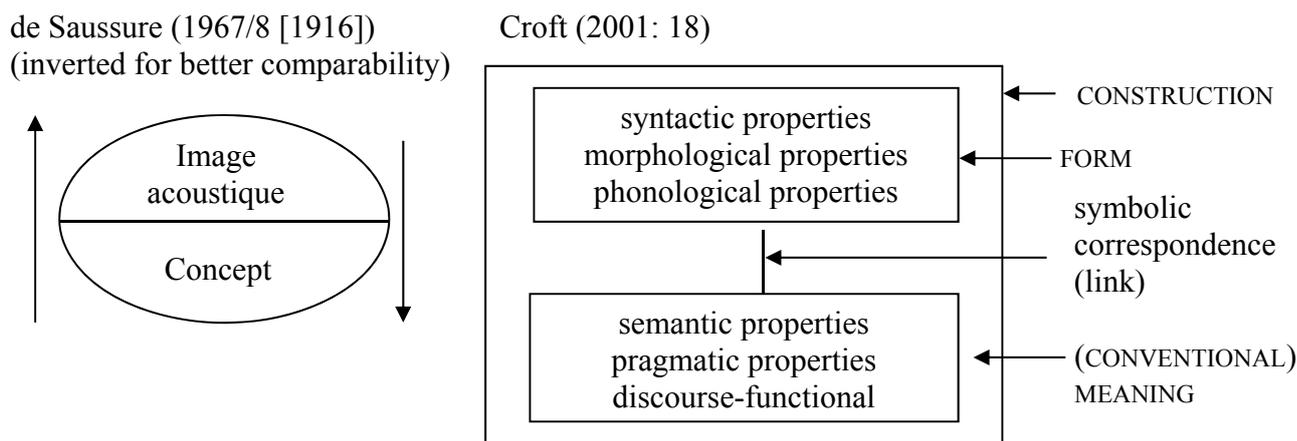


Constructions (Mimeo by B. Wälchli & M. Wirén, January 2013)

This text summarizes some elements of Tomasello (2003), Croft (2001: 14-29), Goldberg (2006), Booij (2010), and Wible & Tsao (2005) without striving at completeness.¹

Constructions are pairings of form and meaning which can be complex (but need not be complex). According to Croft (2001: 18) constructions are fundamentally **symbolic units**, with form and meaning linked by symbolic correspondence. In this respect constructions are very similar to de Saussure's linguistic sign in semiotics/structuralism (see Figure 1).

Figure 1: Symbolic links in structuralism and in construction grammar



Most theories of language are at least marginally compatible with the view that some linguistic units are symbolic (especially words) even though this is not always made explicit. What distinguishes construction grammar is that syntax is symbolic. In the caused motion construction in (1) the verb *sneeze* is used as a transitive verb, although it is normally an intransitive verb that does not express motion. The transitivity and the motion meaning are properties of the construction as a whole. The meaning of the whole clause cannot be derived from the combination of the meanings of its parts only.

(1) Pat sneezed the foam off the cappuccino. (Goldberg 2006: 73)

Constructions are not meaningless algebraic rules (Tomasello 2003: 99). Associated with the claim that constructions are symbolic in the same way as lexical units is usually another premise “that the traditional division between lexical knowledge on the one hand and grammatical rules on the other is an artificial one” (Wible & Tsao 2005: 25). According to Croft (2001: 17) construction grammar has generalized the notion of a construction to any grammatical structure. He refers to this uniform representation as the **syntax-lexicon continuum** (Table 1).

¹This text has been written by Bernhard, with some substantial additions by Mats. It reflects the views of Bernhard and Mats, and is only meant to facilitate an understanding of what the planned workshop might be about. We don't necessarily expect everyone to agree with the points made here (we do not either). You are welcome to agree or disagree, and maybe your presentations will even reflect this somehow.

Table 1: The syntax-lexicon continuum² (Croft 2001: 17)

| Construction type | | Traditional name | Examples |
|-------------------|--------------------|--------------------|---|
| Complex | Schematic (mostly) | syntax | Passive [SBJ <i>be</i> -TNS VERB- <i>en</i> by OBL] |
| Complex | Specific (mostly) | idiom | [<i>pull</i> -TNS NP-'s <i>leg</i>] |
| Complex | Bound | morphology | Plural [NOUN- <i>s</i>] |
| Atomic | Schematic | syntactic category | [DEM], [ADJ] |
| Atomic | Specific | word/lexicon | [<i>this</i>], [<i>green</i>] |

For Tomasello (2003) construction grammar is a hallmark of **usage-based** approaches. There is no distinction between core and periphery; all kinds of usage patterns, even those of only limited generality, must be considered. Tomasello (2003) considers constructions in language acquisition and is aimed at “establishing the kinds of cognitive and social cognitive processes by means of which children acquire different constructions and organize them into some kind of structured inventory and use them to produce creative yet canonical utterances” (ibid 192). The psycholinguistic processes of acquisition posited fall under two overall headings (ibid 295): **intention-reading** (unique for humans) and **pattern-finding** (also found in other species). Intention-reading (inseparably tied to cultural learning) accounts for how children learn symbols in the first place. Pattern finding processes are schematization and analogy (for abstracting constructions out of concrete exemplars), entrenchment and competition (account for constraining abstractions made), and distributional analysis (accounts for forming paradigmatic categories). Table 2 lists the main types of child constructions ordered according to increasing complexity and chronology of acquisition.

Table 2: Main types of child constructions ordered according to increasing complexity and chronology of acquisition listed together with requisite cognitive processes (Tomasello 2003: 174)

| Structure (= Construction type) | Cognitive Process | Input (Examples) |
|---|--|--|
| Expression Holophrase | <ul style="list-style-type: none"> Reproducing sequences | I wanna see it I wanna see it I wanna see it |
| Pivot schema | <ul style="list-style-type: none"> Schema formation Slot-filler category | Throw ball Throw can Throw pillow |
| Item-based construction | <ul style="list-style-type: none"> Second-order symbols | John hugs Mary Mary hugs John |
| Abstract construction (and syntactic roles) | <ul style="list-style-type: none"> Analogy Constrained by entrenchment and competition | X hugs Y A kisses B M kicks N |
| Paradigmatic category (= part of speech) | <ul style="list-style-type: none"> Categorization (via distributional analysis) | a X, the Xs, Eat a X a Y, the Ys, Eat a Y a Z, the Zs, Eat a Z |

Holophrases are a single linguistic symbol to express communicative intentions about an entire experiential scene.

² Interestingly, the “syntax-lexicon continuum” is no continuum in the traditional sense of anything that goes through a gradual transition from one condition to a different condition, without any abrupt changes, at least not one on one dimension complex-atomic.

In **pivot schemas** one event word (the “pivot”) is used with a wide variety of object labels (*more milk, more grapes, more juice*). The experiential scene is divided into at least two component parts. Pivot schemas have an open slot, but no syntax (the slot has no label). Pivot schemas are constructional islands; no generalizations are made across pivot schemas.

Like pivot schemas, **item-based constructions** have a constant element (usually an event word), but are syntactically marked (use of word order, grammatical morphology or function words to indicate explicitly some participant roles in scenes). Item-based constructions are **constructional islands**. Every construction has its own syntax. Tomasello follows Croft’s (2001) convention of writing concrete forms in italics and lower-case letters and abstractions in upper case and small caps:

| | | |
|---------------------------|---------|---|
| HIT-SUBJ’s <i>hitting</i> | HIT-OBJ | (<i>John’s hitting Mary, Mary’s hitting John</i>) |
| break-SUBJ | broken | (<i>The car’s broken, the glass’s broken</i>) |

HIT-SUBJ is not a subject in general; it is the hitter, the particular “subject” of the hitting constructional island.

Psychological evidence for the existence of abstract constructions comes from **structural priming** (Tomasello 2003: 316). In a priming study, older children around 6 years of age could be primed to produce a particular construction such as the passive. Younger children at the age of 3;0 could not be structurally primed, but were primed by the more lexically specific primes. **Abstract constructions** generalize over item-based constructions. They come with an attentional frame, a particular perspective on a scene (Langacker’s “construal”, Talmy’s “windowing of attention”). The earliest abstract utterance level constructions such as the identificational (It’s a/the X, That’s a/the X, This’s a/the X) are more concrete than the label “abstract” suggests. In the treatment of simple transitive and simple intransitive constructions, Tomasello (2003: 149) follows Croft (2001: 54) in using only construction-internal labels for parts of constructions:

TRANS-SUBJ TRANS-VERB TRANS-OBJ

Thus, the transitive construction does not contain subject, verb and object, but a transitive subject, a transitive verb and a transitive object. (Here it is confusing that the multi-word labels suggest compositionality where there is none. Croft [2001: 54] emphasizes that these are just convenience labels; “Intransitive Verbs” and “Transitive Verbs” could also be named “Rosencrantz” and “Guildenstern”.) This is the hallmark of *Radical Construction Grammar* in contrast to what Croft calls “reductionist” construction grammar [SBJ VERB OBJ] where parts of constructions can occur in more than one construction. In *Radical Construction Grammar* English intransitive and transitive verbs can only be united under the Morphological Verb category by virtue of the Tense-Agreement inflection of the verb (Croft 2001: 55).

Many construction grammar approaches emphasize that constructions form **taxonomic hierarchies** (Croft 2001: 25). Put differently, they form a network of relations (Booij 2010, ch. 2). Croft’s example is the idiom *kick the bucket* that has the same argument structure pattern as ordinary transitive uses of *kick*. In a taxonomic hierarchy, each construction is simply an instance of the more schematic construction(s) in the chain [SBJ *kick the bucket*]—[SBJ *kick* OBJ]—[SBJ TRVERB OBJ]—[CLAUSE]. However, according to Croft, grammatical constructions do not form a strict taxonomic hierarchy. Constructions can have multiple parents. Thus, the clause [I didn’t sleep] is an instantiation of both the Intransitive Clause construction [SBJ INTRVERB] and the Negative construction [SBJ AUX-*n’t* VERB].

According to Goldberg (2006: 21) an actual expression typically involves the combination of many different constructions. (2a) involves the eleven constructions listed in (2b)

(2a) A dozen roses, Nina sent her mother!

(2b) Ditransitive construction, Topicalization construction, VP construction, NP construction, Indefinite determiner construction, Plural construction, *dozen, rose, Nina, send, mother* constructions

Constructions are combined freely to form actual expressions as long as they can be construed as not being in conflict (Goldberg 2006: 22). According to Goldberg (2006: 39-40) there are two general principles constraining the ways in which constructions can be fused. The **Semantic Coherence Principle** ensures that the participant roles of a verb and the argument roles of a construction must be semantically compatible. The **Correspondence Principle** is a default principle, aligning lexical semantics and discourse pragmatics iconically. Semantically salient profiled participant roles are encoded by grammatical relations that provide them a sufficient degree of discourse prominence.

Table 3: Possible routes to argument status (Goldberg 2006: 42)

| | Role of argument structure construction | Not a role of argument structure construction |
|---|---|--|
| Profiled/obligatory participant role of verb | Argument of verb and construction: <i>She gave him a letter.</i> | Argument contributed only by the verb: <i>She loaded the wagon with hay.</i> |
| Not a profiled/obligatory participant of verb | Argument contributed by construction: <i>He baked her a cake.</i> | Traditional adjunct: <i>He baked a cake for her.</i> |

Goldberg’s approach is heavily criticized by Croft (2012, ch. 9). He argues that neither linguists nor speakers encounter verbs outside of argument structure constructions. How can we be sure that in the case of *bake*, the lower monotransitive argument structure construction manifests the “basic” verb meaning while in the case of *kill*, the lower-valency Intransitive construction (*Tigers only kill at night*) is derived from the basic transitive argument structure of *kill*? Furthermore, it is not simply possible to derive unitary construction meanings and unitary verb meanings. If we take “transfer of possession” as the basic meaning of the Ditransitive construction, meanings of ditransitive clauses are not always simply a product of the verbal root and a basic construction meaning. Unlike with central sense transitive verbs such as *give*, creation verbs such as *bake* have a “**modulation**” of intended meaning (agent intends to cause recipient to receive patient). This could be accounted for by positing an intermediary level of a creative verb construction that has the particular meaning ‘intended’ when combined with ditransitive constructions. A danger is that construction grammar might end up with a multiplicity of intermediate levels of constructions like Minimalism has ended up with an inflation of projections.

A major question is how to deal with the Compositionality Principle (or Frege Principle) that formal semanticists adhere to. According to the Compositionality Principle the meaning of a complex expression is a function of the meaning contribution of its constituents. Constructions (i.e. non-atomic constructions) are strong evidence against the Compositionality Principle because non-atomic constructions make contributions to the meaning of the whole, and this has been a major motivation for developing construction grammar in the first place. Now the question arises whether we want construction grammar to be a remedy to re-establish a (weaker) form of the Compositionality Principle (a complex expression is a function of the meaning contribution of its constructions) or whether the

Compositionality Principle should be entirely abandoned. Unfortunately, most constructionalists do not provide an explicit answer of their stance.

According to Croft (2001: 17) **morphological constructions** differ only in being made up entirely of bound morphemes. Tomasello (2003) emphasizes the role of morphology, but deals mostly with the acquisition of a morphologically impoverished language (English). It is therefore interesting to see what Geert Booij (2010) as a morphologist has to say about construction grammar, even though the book is mainly restricted to Dutch (only slightly less morphologically impoverished than English) and other European languages.

Booij takes a word-based morphological stance. Words, not morphemes, are the starting point of morphological analysis. Word-internal morphological structure is a paradigmatic relationship between pairs of words. From *buy, buyer, eat, eater, skype, skyper* etc. we can abstract a word-internal morphological schema $[[x]_{V\ er}]_N$ ‘one who Vs’. In Booij’s approach constructions are schemata.³ Schemas are a data structure for representing the generic concepts stored in the memory (following Rumelhart 1980: 34).⁴ An important starting point for Booij (2010) is the notion of **constructional idiom**, a type of idiom in which not all positions are lexically fixed and hence some are variable (such as the head-switch construction *a brute of a man*, Spanish *esa mierda de libro*, French *ton phénomène de fille*). Constructional idioms are largely the same thing as Tomasello’s (2003) item-based constructions with the difference that the variable slot rather than the fixed slot is in focus. Morphological schemas such as $[[x]_{V\ er}]_N$ ‘one who Vs’ are constructional idioms at the word level.

Booij (2010: 7) makes extensive use of indexing in schemas. He distinguishes between lexical indices and the ones of affixes. “If the verb *bake* carries the lexical index 82, then we can refer to its properties as $PHON_{82}$, SYN_{82} , and SEM_{82} . Note that affixes do not have a lexical index since they are not words” (Booij 2010: 7). Co-indexation of affixes is only used for correlating phonological information with a position in morpho-syntactic structure. Lexical indexing has thus a similar function as symbolic correspondence links in Croft’s model, while indexing of affixes is obviously not symbolic.

The **hierarchical lexicon** plays a crucial role in Booij’s (2010) approach. Constructional word formation schemas directly dominate words. Information about a complex word can be inherited in two directions. Complex word can inherit from the schemas that dominate it. However, there is also inheritance of information from the base word. Following Jackendoff, Booij assumes a full entry theory. A complex word is licensed by the schema of which it is an instantiation together with the base word with which it is unified.

Evidence for construction comes from subschemas in compounding (ch. 3). There is both semantic and formal evidence for subschemas. There are many constructional idioms in compounds where the productive fixed part has another meaning in compounds than when used as a free word (also called “**affixoids**”). There are e.g. the many intensifying affixoids such as Dutch $[[bere]_N[x]_{Aj}Aj] \leftrightarrow [very\ SEM_{ij}]$ as in *bere-sterk* ‘very strong’, *bere-gezellig* ‘very cosy’ (*ber* is ‘bear’, the *-e* is a necessary linking element). The specific intensifying function goes together with the possibility of repetitive coordination in Dutch: *bere- en bere-*

³ Note that “schema” is not the same thing here as “schematic” (vs. specific) used by Croft (2001: 17) to characterize general construction types.

⁴ Rather than adopting a Croftian model of constructions, Booij follows Jackendoff (see, e.g., Culicover & Jackendoff 2005) in positing a tripartite parallel architecture with phonological form PHON, syntactic structure SYN and conceptual structure SEM. This is very much the componential model of grammar (Croft 2001: 15) which is not compatible with construction grammar according to Croft (2001). In doing so, interestingly, the morphologist Booij almost entirely does away with morphology. Morphology is left as a part of the phonological structure and by virtue of the limitation of the linguistic sign to words as smallest units. I have put this in a footnote because I think most of Booij’s findings are also compatible with a more symbolic model of language à la Croft. Booij (2010) himself often conflates phonological and morpho-syntactic form in one representation.

goed ‘very, very good’. A further argument for subschemas in compounding is headedness alternation. Most Italian compounds are left-headed. However, there are some constructional idioms with right-headed compounds such as *auto-* ‘car’, *foto-*, *tele-*.

Construction morphology can account for embedded productivity (a word formation process is normally unproductive, but is productive when it co-occurs with another word formation process) by **schema unification**. In Dutch, as in other Germanic languages, NV compounds are not productive. However, embedded in nominal compounds, NV compounds appear to be quite productive [[aardappel]_N[schil]_V][mesje]_N ‘potato peeler’ (Booij 2010: 47).

Constructions are also a locus of language change. What happens to morphological markers when a language changes? According to Booij (2010, ch 9) they may be recycled as **construction-dependent morphology**. For instance, a genitive marker may be reinterpreted as a linking element in NN-compounds (German and Dutch). The old genitive also survives in some constructional idioms such as Dutch [[*tot* [_{V-INF-(s)}]_{Ni}]_{PP} (*aan*) *toe*]_{PPj} <-> [in a manner leading to SEM_i]_j: *tot sterv-en-s toe* ‘to die-INF-s to > in such a manner that it leads to dying’.

A major asset of Booij (2010) is that he is quite explicit about the relationship of phonology and morpho-syntax. He argues that phonology is always stored as surface phonology and not in a form of deep-structure phonology. There is no such thing as restructuring the underlying form of a word. Rather, a theory of how to select the proper phonological form of a base word in derivation is needed. Booij emphasizes that the stored form need not be the same as the base form. Rather the base form can be computed from several stored surface forms. Thus, Dutch [pa:r.dəx] ‘horsy’ is not derived from an underlying form /pa:rd/ ‘horse’, but from a base computed from the stored forms [pa:rt] ‘horse (SG)’ and [pa:r.dən] ‘horse (PL)’. A consequence is that there are many more forms stored than in a generative lexicon. Lexemes may have more than one phonological form in the lexicon. Booij refers to psycholinguistic research (especially of Harald Baayen and collaborators) that stem allomorphy does not impede the recognition of relatedness between words.

From the point of view of **natural language processing** a major reason to deal with constructions is their status as troublemakers (Wible & Tsao 2010: 25). Idiomatic constructions are, for instance, well known to cause parse failures. Wible & Tsao (2010) are interested especially in the regularity and idiomaticity of constructions and the inheritance-like hierarchical relations in constructions. Their approach is to deal with constructions as **hybrid n-grams**. An n-gram is a sequence of n contiguous text words. In hybrid n-grams, however, a word can be represented by its word form, its lexeme or its part of speech. Lexemes are given in boldface and parts of speech in brackets. Thus, **pay** *attention* [*prep*] is a 3-gram where *pay* is a lexeme (stands for *pay*, *pays*, *paying*, *paid*) and [*prep*] is a word class (stands for *to*, *of* etc.). Taking the most widely used English corpus, the British National Corpus (BNC), as basis Wible & Tsao (2010) extract StringNet, which consists of all hybrid n-grams up to n=8 occurring at least five times. StringNet is 250 times the size of BNC (over 1,000 GB). Wible & Tsao (2010) define an association measure with which the best n-grams for a query word can be found. For instance, the query word *eye* (lexeme) yields such constructions as (3):

(3) visible [*prep*] the naked eye, turning a blind eye to, out of the corner of [*possessive*] eye...

These n-gram constructions are either **substantive (or “lexically filled”) idioms** or **formal (or “lexically open”) idioms** in Fillmore, Kay and O’Connor’s (1988) terms. Formal idioms are similar to Jakendoff’s constructional idioms and Tomasello’s item-based constructions. A particular asset of StringNet is that it can deal with multiple hierarchies among constructions in a neat way by means of inclusion or subsumption between hybrid n-grams (referred to as

parent-child relationship), simply on the basis of extension. Thus, e.g., *my point of view* is a child of [*possessive*] *point of view*, but also of *my point of*. StringNet allows for navigation up and down through hierarchies. With the query **count**, we can discover, among other things, the 4th ranked construction *it be the [noun] that count*, whose proto-ancestor is *it be the [noun] that [verb]*, a bare-bones frame of the It-Cleft construction. StringNet can even partly account for agreement. A grand-daughter of the It-Cleft is *it be the [noun singular] that [verb-s]* (Wible & Tsao 2010: 30). Wible & Tsao show that there are computational solutions to hierarchies of constructions; at least as far as the formal component of constructions are concerned (the meaning part is disregarded). Some kinds of item-based constructions can be accounted for at least in a morphologically impoverished language such as English on the cost of introducing parts of speech as basic units. Wible & Tsao's (2010) approach also demonstrates the high costs in terms of memory NLP approaches to constructions can entail. Large corpora are needed as input and an even much larger number of potential candidates for constructions must be processed. To what extent such an approach is psychologically realistic is another question.

Some conflicting issues and open questions

Does construction grammar have to be **usage-based**? If we define usage-based as drawing from a large number of concrete utterances, Tomasello's approach and Wible & Tsao (2010) are most clearly usage-based. However, aside from some references to Harald Baayen's and Joan Bybee's work and occasional examples from Google, Booij (2010) is not usage-based at all.

To an outsider the use of the term "construction" by constructionalists may appear quite inflationary. This may be associated with the fact that constructionalists more often write about newly identified constructions rather than about what is not a construction. Are there any **limits to constructions**? According to Goldberg (2006: 5) all levels of grammatical analysis involve constructions ranging from the morpheme to the passive. According to Booij (2010: 15), however, the morpheme is no construction, since it is no linguistic sign, the minimal linguistic sign is the word.

Is there **isomorphism** or non-isomorphism between **form and function**? If for children the word *to* in 'want' constructions is not a semantically empty infinitive marker for the second verb, but rather a meaningful morpheme that is simply one more use of the word *to*, as claimed by Bloom, Tackeff and Lahey (1984, reported by Tomasello 2001: 246), is there a general construction of a lexeme *to* at all? If *to* does not have a general meaning, it can obviously not be a construction on its own (it is only form, then, without meaning; a part of various constructions and itself representing several lexematic constructions with different senses).

What is the status of **rules** in construction grammar? Virtually all constructionalists drastically restrict the role played by rules. Constructions are not rules (Tomasello 2003: 98; Booij 2010: 4). However, for instance, in Booij (2010: 6) there are still phonological, syntactic and conceptual formation rules related by linking rules.

Are constructions necessarily **schemas** stored in the memory (=lexicon) as claimed by Booij (2010: 5)? One motivation for constructions is that they are easier to learn than the abstract rules of generative grammar (Tomasello). However, some representations of

constructions such as Booij's schemas are quite abstract and complex. Is it really appropriate to use lexical indexes in all schemas?

What is the role of **default** in constructions? According to Booij (2010: 27) regular properties of constructions are accounted for by default inheritance from dominating nodes of the construction hierarchy. This is a crucial feature of Booij's approach to construction grammar. According to Tomasello (2003: 237), however, children are not inclined to impose default forms (evidence: German plural, Polish genitive). Irregular and regular forms can both be overgeneralized.

What is the meaning of constructions? Are they **Aristotelian categories** where every exemplar is equally good or are they prototypes or radial categories with **family resemblance**?

Parts of speech are basic units in Wible & Tsao (2010); in Booij's schemas even parts of words have parts of speech labels. However, in Tomasello's (2003) approach parts of speech (paradigmatic categories) are the most abstract type of constructions which are acquired late. Note also that Radical Construction Grammar differs most markedly in the treatment of parts of speech from other approaches ("reductionist")

If intention-reading is unique for humans, but pattern-finding is more general, why do the late constructions in Tomasello's (2003: 174) model involve more pattern-finding than intention-reading? Is **distributional analysis** really a developmentally late process?

How can **meaning in corpora** be addressed? Meaning is an obligate part of symbolic constructions, but corpora consist only of form. Are there indirect methods to remedy this, such as distributional analysis?

Related to the previous point, how can you make **computational sense** of constructions? One answer is provided by Wible & Tsao (2010), but their database is just based on form, whereas meaning is disregarded. Ideally, one would like to use meaning as another criterion for knowing what is a good construction, but how can you do this?

How do you **evaluate** some theory or machinery which is supposed to give you constructions? What is the gold standard?

Construction grammar may be thought as more explanatory than other approaches, but are there also **applications** for constructions in (computational) linguistics, such as L2 learning or grammar tools?

There are many more conflicting issues and questions, but if this paper gets too long, who will read it?

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