Investigating Categories in a Syntactically-Annotated Corpus of Second Language Learners of English

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Starting point

Learner corpora contain the output of second language learners at a certain point in their development

- Regardless of the state of the categories in their interlanguage, we only have the output to annotate
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  - Providing detailed representations for researchers
  - Specifying only what can be reliably (& “theory-neutrally”) specified
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  - Specifying only what can be reliably (and “theory-neutrally”) specified

**Today:** Describe our attempts to define categories in a way that leaves full interpretation to a researcher
How to linguistically annotate?

Approaches to annotating linguistic properties:
- In tandem with error annotation, i.e., annotating the category of the correction
  - Map to target hypotheses before annotating POS (e.g., Granger 2003) or syntax (e.g., Hirschmann et al. 2010)
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- Directly annotate the text (Ragheb and Dickinson 2011; Díaz-Negrillo et al. 2010)
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▶ Directly annotate the text (Ragheb and Dickinson 2011; Díaz-Negrillo et al. 2010)

This latter approach allows for a thorough investigation of what learner categories are composed of & is useful for:

▶ Error detection (Tetreault et al. 2010)
▶ Learner profiling (Hawkins and Buttery 2010)
▶ Acquisition research (Ragheb and Dickinson 2011)
Our goal

We discuss how our corpus annotation effort defines categories, surveying three aspects:

1. Ill-fitting categories: how do we precisely define types of categories?
2. Broadly-applicable annotation: how can the annotation be applied across various meta-variables?
3. Annotation utilization: how can the resulting annotation be used for research?
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We are working to make these points practical, transparent, & able to be debated by annotating c. 10,000 tokens

- The SALLE (Syntactically Annotating Learner Language of English) Project at Indiana University (IU)
- Placement essays from IU, scored on a 1–7 scale
Ill-fitting categories

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▶ **Solution:** break a category into multiple layers of annotation, based on different kinds of evidence

▶ Díaz-Negrillo et al. (2010); Ragheb and Dickinson (2011, 2012)
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  - Díaz-Negrillo et al. (2010); Ragheb and Dickinson (2011, 2012)

(1) I have see a movie

We annotate two POS tags for see:

- morphological properties of a baseform verb (VV0)
- distributional slot of a past participle (VVN)
Making the annotation concrete

This splitting of layers gets us quite far

- But we discovered that this clean split into multiple layers is not really clean at all
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We tried to precisely define three syntactic layers of annotation & discovered many questions & redundancies:

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Overall tension: annotate every possible analysis or just contextually-appropriate one(s)?
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► Distributional dependencies (e.g., have \text{see})

Overall tension: annotate every possible analysis or just contextually-appropriate one(s)?

► We will just sketch the issue: see Ragheb and Dickinson (2012) for more details
Sketch: defining morphosyntax

Morphosyntax based on the visible forms of words

We use distribution to disambiguate:

(2) And also I can heart the step of my walked.

3 POS for can, 2 for step, 2 for walked: 3x2x2=12 trees

What would be the tree for past tense of walked?

Adjectival/past participle fits better to the context

Distribution likewise uses morphology

(3) ... having an DET experience

MOD & QUANT are possible here, but an = DET

Overall point: The layers are inter-defined

We do not annotate distributional dependencies: mostly covered by other layers
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A Syntactically-Annotated Corpus of Second Language Learners

Introduction

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Broadly-applicable annotation
Heuristics
Applying the annotation
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Broadly-applicable annotation

The annotation is based on linguistic evidence from the L2 grammatical system, making it applicable:

- to learners with different L1s
- to learners at different stages of interlanguage development
- across contexts (e.g., text type)
- regardless of one’s (SLA) theory

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  ▶ The goal is to be robust to learner innovations & cases lacking evidence or with ambiguous evidence
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- **During**: Applying the annotation to difficult usage shows the applicability to innovations
- **After**: Comparable occurrences of usage, found across different learner variables
Broadly-applicable annotation
Our heuristics to define the annotation

**Primary focus:** use surface evidence always at hand

- Make categories systematic & broadly applicable

Although it not big and famous, but it still has something itself. We give the learner the benefit of the doubt (if there is no way to disambiguate based on context). We try not to assume too much about the intended meaning of the learner, focusing on morpho-syntax. As much as possible, we annotate the language “as is”, i.e., in terms of linguistic evidence. When the linguistic properties cannot be fully determined, we may underspecify the annotation. If nothing else works, we choose the more “primary” grammatical form (e.g., based on dictionary forms). Principles ensure researchers can interpret categories...
Broadly-applicable annotation

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⇒ Principles ensure researchers can interpret categories.
Example annotation

... it still has something own itself
... <SUBJ,OBJ>
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Broadly-applicable annotation

Applying the annotation

One of the most challenging aspects for annotators is our strict focus on syntax.
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(5) All these me felt better.

- In context, this probably means that all these [things] were things that made the writer feel better
  - But there is no made here!
Broadly-applicable annotation
Applying the annotation

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Regardless, there are some easy properties to annotate:
▶ felt is ROOT, with better as its predicate (PRED)
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Our (morphologically-based) solution rests on:

▶ All these making for a proper subject
▶ An allowance for underspecification
Applying the annotation (2)

▶ All these me felt better.

- me is some unspecified dependent of felt
Applying the annotation (2)

▶ *me* is some unspecified dependent of *felt*

What meaning does this correspond to?
▶ We don’t know precisely (future work?)
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Does this correspond to the intended meaning?
- Probably not (need more meta-information to know?)
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These analyses would be useful, but this analysis:
▶ Fits the evidence at hand & still provides access to useful categories
Broadly-applicable annotation

Comparable occurrences

e.g., learners using multiple arguments when one is required
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- Some cases are found by a search for TOP (topic)

(6) **Korea (level 3):** So, My goals\textsubscript{TOP} I catch\textsubscript{OBJ} them

(7) **Thailand (4):** First, atiquet\textsubscript{TOP} of eating,\textsubscript{SUBJ}’s very different from atiquet of eating in my country ...

(8) **Afghanistan (6):** So the person\textsubscript{TOP} who has gotten education by the government money and help, he\textsubscript{SUBJ} is owned to serve as hard as he can.
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⇒ What each TOP label means may differ, but we are able to group cases together across L1 & level
Comparable occurrences (cont.)

> Other example are found by finding multiple dependents of the same type when only one is required

(9) **Korea (3, same as previous):** I’m not decide yet *which*$_{DET}$ *my*$_{DET}$ *job*.

(10) **Thailand (4, same):** It’s not suitable for *dress*$_{POBJ}$ *something*$_{POBJ}$ complecated.

(11) **Thailand (4, same):** They *can leave*$_{VC}$ *supapreat*$_{VC}$ with their family.
Comparable occurrences (cont.)

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  (9) Korea (3, same as previous): I’m not decide yet which my job.
  
  (10) Thailand (4, same): It’s not suitable for dress something complicated.
  
  (11) Thailand (4, same): They can leave with their family.

⇒ Whether this corresponds to the same type of thing as with TOP is up to the researcher.

- The annotation brings the sentences to light.
Ways to utilize the annotation

We will consider different ways to utilize the annotation

1. Simple gathering of statistics, e.g.:
   - 10 uses of the ELL (elliptical) label
   - 24 past tense copulas (VBD) taking a predicate (PRED)

2. Finding of mismatches:
   - POS mismatches (e.g., have see)
   - Subcategorization vs. realization mismatches

3. Examining underspecified labels (e.g.,)
   - I can't losing these all things.
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(12) I do n’t have to care other person .

(13) ... I can n’t losing these all things .
Ways to utilize the annotation (2)

- Investigating rare/interesting labels: ELL, APPOS, ...

(14) I think if I was in my hometown, or in\textsubscript{ELL} better word, in my home country, I wouldn't be as hard working person, as now I am.
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- Quantitatively & qualitatively investigating correct and innovative uses of specific labels/constructions
  
  ❯ e.g., We are currently investigating all the instances of determiner (non)use in the annotated part of the corpus

  (15) a. **Correct**: In addition, the government provides for students food and facilitative dormitories

  b. **Mismatch**: So the person who has gotten education by the government money and help ..
Ways to utilize the annotation (3)

- Examining words with more than one syntactic head
  - e.g., right node raising:

(16) All countries in the world, especially United States of America helped and are helping our country\textit{OBJ} to be in a better situation.
Ways to utilize the annotation (3)

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- e.g., relative clauses
Summary and Outlook

**Take-home point:** Corpus categories as well-documented indices provide data for researchers to interpret
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We have discussed three points to our annotation scheme:

- Challenges in defining (morpho)syntactic categories for second language learner annotation
- Notes on how the annotation applies in different settings
- Opportunities in utilizing the annotation for research

Some immediate next steps:

- Annotate more data, including parsing as a first step
- More thoroughly utilize the annotation
- e.g., ongoing determiner study (Ragheb forthcoming)
- More deeply explore the connection between this annotation & error annotation
- More thoroughly investigate how the annotation connects to semantic forms
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Current status of the corpus/annotation

The annotation:

- Has been tested for inter-annotator agreement (Ragheb and Dickinson 2013)
- Has extensive guidelines already available online (Dickinson and Ragheb 2013)
  - These guidelines let you know what the categories mean

See: http://cl.indiana.edu/~salle/
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Target corpus release: within the next year (fingers crossed)
▶ Currently: 24 essays, 474 sentences, 7208 words ... with 5 main layers of annotation for each sentence
▶ This still needs more hand-checking

See: http://cl.indiana.edu/~salle/
References


Consider this complement clause:

(17) When I walked on the road, **I always found somebody smiled to me**.

- Even though it is odd, most of the annotation decisions are relatively easy
  - e.g., *to* is treated like a normal preposition
Applying the annotation

How is the sentence ungrammatical?

- *smiled* is a finite verb heading a clause, as a complement (COMP) of *found*, cf.

  (18) I found that somebody was smiling at me.

- The only mismatch is the complementizer (CPZR) on the subcategorization list of *smiled*

  - We do not need to know why the absence of *that* makes a difference here, only annotate as such
Defining subcategorization

Subcategorization encodes general constraints

► It can help capture discrepancies in argument structure

(19) ...we moved again to other house ...

► Annotate every possible subcategorization or only one?
  ► One annotation makes it context-specific, overlapping with distributional evidence

(20) One [goal] is to contribute to both global and local community ...

► <DET> fits discourse; <> is a general possibility
Defining morphosyntax

Morphosyntax based on the visible forms of words

- e.g., analysis should be appropriate for 3 sg. verb:
  
  (21) I had a problem about chooses my car.

- We use distribution to disambiguate:
  
  (22) And also I can hear the step of my walked.

  - 3 POS for can, 2 for step, 2 for walked: 3x2x2=12 trees
  - What would be the tree for past tense of walked?
    - Adjectival/past participle fits better to the context
Defining distribution

- Syntactic distributional slot: position where token with particular properties (e.g., singular noun) predicted to occur, on the (syntactic) basis of surrounding tokens
- Does morphology play a role in disambiguation?

▶ MOD & QUANT are possible here, but *an* = DET

**Overall point:** The layers are inter-defined

- Morphosyntax + subcategorization covers nearly all distributional dependency distinctions
- We thus do not to annotate distributional dependencies
Interannotator agreement

Initial layers

Overview of agreement rates before & after discussion (phases 2 & 4):

<table>
<thead>
<tr>
<th>Annotators</th>
<th>lemma</th>
<th>POS&lt;sub&gt;m&lt;/sub&gt;</th>
<th>POS&lt;sub&gt;d&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P2</td>
<td>P4</td>
<td>P2</td>
</tr>
<tr>
<td>A, B</td>
<td>93.4</td>
<td>96.9</td>
<td>99.0</td>
</tr>
<tr>
<td>B, C</td>
<td>94.4</td>
<td>97.7</td>
<td>99.0</td>
</tr>
<tr>
<td>C, A</td>
<td>92.4</td>
<td>96.9</td>
<td>99.7</td>
</tr>
</tbody>
</table>

▶ **POS<sub>m</sub> & POS<sub>d</sub>:** High agreement rates reflect annotators making very few changes to automatic pre-annotation.

▶ **Lemmas:** Improvement in agreement—although it could be higher, given the simplicity of lemma information.
### Interannotator agreement

#### Dependencies

Overview of agreement rates before & after discussion (phases 2 & 4):

<table>
<thead>
<tr>
<th>Annotators</th>
<th>Subcat.</th>
<th>UAA</th>
<th>LAA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P2 P4</td>
<td>P2 P4</td>
<td>P2 P4</td>
</tr>
<tr>
<td>A, B</td>
<td>85.5 94.0</td>
<td>86.6 97.0</td>
<td>80.0 95.2</td>
</tr>
<tr>
<td>B, C</td>
<td>86.1 95.7</td>
<td>86.7 97.1</td>
<td>80.3 96.0</td>
</tr>
<tr>
<td>C, A</td>
<td>86.1 96.6</td>
<td>86.9 97.7</td>
<td>82.4 96.7</td>
</tr>
</tbody>
</table>

- Initial agreement rates around 80–85%: moderately high
- Agreement rates improved after discussion, achieving approximately 95% agreement
## Interannotator agreement

### Dependencies (cont.)

<table>
<thead>
<tr>
<th>Ann.</th>
<th>UAA</th>
<th>LAA</th>
<th>LOA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P2</td>
<td>P4</td>
<td>P2</td>
</tr>
<tr>
<td>A, B</td>
<td>81.8</td>
<td>96.1</td>
<td>73.6</td>
</tr>
<tr>
<td>B, C</td>
<td>80.9</td>
<td>96.2</td>
<td>73.4</td>
</tr>
<tr>
<td>A, C</td>
<td>83.6</td>
<td>97.6</td>
<td>79.7</td>
</tr>
</tbody>
</table>

**Table:** MASI percentages for dependencies, Text 1

<table>
<thead>
<tr>
<th>Ann.</th>
<th>UAA</th>
<th>LAA</th>
<th>LOA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P2</td>
<td>P4</td>
<td>P2</td>
</tr>
<tr>
<td>A, B</td>
<td>92.6</td>
<td>98.1</td>
<td>87.8</td>
</tr>
<tr>
<td>B, C</td>
<td>93.8</td>
<td>98.3</td>
<td>88.7</td>
</tr>
<tr>
<td>A, C</td>
<td>90.9</td>
<td>97.9</td>
<td>85.7</td>
</tr>
</tbody>
</table>

**Table:** MASI percentages for dependencies, Text 2
Interannotator agreement

Subcategorization

<table>
<thead>
<tr>
<th>Ann.</th>
<th>MASI</th>
<th>GCM₁</th>
<th>GCM₂</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>P2</td>
</tr>
<tr>
<td>A,B</td>
<td>84.3</td>
<td>92.4</td>
<td>81.9</td>
</tr>
<tr>
<td>B,C</td>
<td>83.6</td>
<td>93.8</td>
<td>74.4</td>
</tr>
<tr>
<td>A,C</td>
<td>84.9</td>
<td>96.1</td>
<td>83.0</td>
</tr>
</tbody>
</table>

Table: Agreement rates for subcategorization, Text 1

<table>
<thead>
<tr>
<th>Ann.</th>
<th>MASI</th>
<th>GCM₁</th>
<th>GCM₂</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>P2</td>
<td>P4</td>
<td>P2</td>
</tr>
<tr>
<td>A,B</td>
<td>87.1</td>
<td>95.9</td>
<td>88.9</td>
</tr>
<tr>
<td>B,C</td>
<td>89.3</td>
<td>98.0</td>
<td>88.3</td>
</tr>
<tr>
<td>A,C</td>
<td>87.6</td>
<td>97.2</td>
<td>91.2</td>
</tr>
</tbody>
</table>

Table: Agreement rates for subcategorization, Text 2