TREACLE: Improving the grammatical competence of Spanish university EFL students: design and implementation of a web-based learning system.

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WORK IN PROGRESS
Introduction

The TREACLE Project

Project: TREACLE

Teaching Resource Extraction from an Annotated Corpus of Learner English

A cooperation between:

- Universidad Autónoma de Madrid and
- Universitat Politècnica de Valencia

Funded by Ministerio de Ciencia e Innovación 2010-2013 (FFI2009-14436/FILO)

Official Title: “Developing an annotated corpus of learner English for pedagogical application”
What are the general goals of the TREACLE blended learning Project?

- Detailed study of vocabulary and grammatical skills of students studying English at Spanish universities.
- AIMS at efficient and quality teaching tailored to meet students’ individual needs.
- Focus on reform of grammar teaching both in the traditional classroom and also in online learning.
Towards Targeted Learning I
The "shotgun" approach to learning

- Many CALL systems take a **shotgun** approach to learning:
  - They have a general idea where the user is,
  - They teach language concepts (grammar, vocab, discourse, etc.) over that area.
Towards Targeted Learning I

Problem with the "shotgun" approach:

- Each learner is an individual - they have different learning experiences, learning aptitudes, etc.
  - Some of the language material will cover concepts they already know
  - Some of the material will cover concepts they are not yet ready for

  → Boredom

  → Confusion
Solution: **targeted learning**: the online system should teach exactly those language concepts that are most critical to the current learner at this point of time.

Learners learn best when they see a clear relevance to their needs.
Towards Targeted Learning I
A Targeted Learning Approach

**Critical concepts:** two aspects of criticality

1. Language concepts which peers of the learner know but the learner does not.

2. Language concepts that are real and observable problems to language learners.
Towards Targeted Learning I
A Targeted Learning Approach

Critical concepts: two aspects of criticality

1. Language concepts which peers of the learner know but the learner does not.

2. Language concepts that are real and observable problems to language learners.

Study of learner texts ranked over proficiency levels to see where concepts typically are an issue.

Study of learner texts to see which language features most frequently lead to errors.
Discovering Critical Grammar Concepts for Spanish Learners of English
Towards Targeted Learning I
A Targeted Learning Approach

Importance of using criticality in language teaching:

- Learning a foreign language requires mastering thousands of grammatical concepts.

- But many of these concepts are easily acquired, directly transferable from the mother tongue, e.g., English and Spanish share passive structure, progressive aspect, etc.

- So, observing where they go wrong (errors) can help us identify what parts of the language are critical for their learning.

- Also, comparing frequency of use of grammatical structures in learners against comparable natives show how much effort is needed for each problem.
Methodology - the corpora

The project involves two corpora:

- The **WriCLE** corpus (UAM) - *Written Corpus of Learner English*. 521 essays of ~1000 words each, written by Spanish learners of English at University level (about 500,000 words) (Rollinson and Mendikoetxea 2008)

- The **UPV Learner Corpus** (UPV) containing 150,000 words of shorter texts by ESP students (Andreu Andrés et al. 2010)

Oxford Placement test given at same time, to measure proficiency
Methodology

A two-pronged approach was followed:

○ Manual analysis of learners' errors
  **Coded**: 307 essays, 113,000 words, **16,200** errors
  What learners do wrong.

○ Automatic analysis identifying **syntactic** structures used by the learners:
  **Coded**: 1330 essays, 700,000 words, **98,000** clauses
  What learners are doing / not doing

Manual and automatic parsing done via UAM CorpusTool, developed by the project and available from: http://www.wagsoft.com/CorpusTool/
Error Annotation

- Errors tell us what problems learners face in their writing (and thus that need to be addressed by an online system).

- We explore errors in relation to proficiency levels to assign an "order of difficulty" to the language feature behind the error.

- We explore errors in terms of frequency to determine how much emphasis the online system should give to each feature.
The legalisation of Marijuana has become a very polemic topic in our present society because it concerns a lot of different opinions and because the decision of legalizing it or not will directly affect a whole society. So, legalizing Marijuana is a social debate whose outcome couldn’t possibly please everyone. In this essay I will try to discuss the different perspectives and opinions on the legalization of soft-drugs such as Marijuana.

The general opinion of people who are against the legalization argue that if the government legalize this type of drugs the crime rates will increase and many youths will be able to obtain the drugs without any problem at all. They also believe that drugs are very dangerous substances that can cause enormous problems to the

1. Select text containing error
2. Provide the corrected text here
3. Assign features to current segment here
Grammar errors account for nearly 50% of all errors at B1 level, which is reduced to 34% of total at C2 level.
Results of error analysis

Grammar errors - different sub-categories
Error Annotation - Lexical errors

- lexical-error
  - lexical-transfer-error
  - transfer-where-similar-exists
    - word-creation
    - coinage
    - borrowing
  - dictionary-error
  - spelling-error
    - word-choice-error
  - transmitted-spelling
  - false-friend
  - malformation

- lexical-intralanguage-error
Lexical Errors in terms of apparent difficulty

More common with basic learners

malformation
coinage
false-friend
transferred-spelling
verb-vocab-error
spelling-error
adverb-vocab-error
borrowing
noun-vocab-error
adjective-vocab-error

More common with advanced learners

With the exception of borrowing, Transfer errors are more common for beginners, while later, intralanguage errors predominate.

Borrowings at advanced levels: more explicit mention of Spanish institutional terms: “Fiscal Jefe”
Grammatical Errors in order of Frequency:

- determiner-present-not-required 1087
- prep-choice-error 818
- subject-finite-agreement 535
- determiner-absent-required 438
- wrong-number 428
- determiner-choice-error 248
- determiner-agreement 230
- obligatory-subject-absent 226
- unnecessary-preposition 204
- adjunct-order-error 177
- pronoun-choice-error 134
- ...
Syntactic Annotation

- Corpus has been automatically structurally parsed by Stanford parser
  - 1330 texts, 700,000 words, 98,000 clauses,
- Syntactic features extracted by pattern recognition (e.g. active/passive, ditransitive, past-perfect etc.)
- We measure the degree of occurrence of each grammatical feature in relation to rising proficiency score to order grammatical features in terms of difficulty. (See O'Donnell 2013)

- **Work to come**: extending the range of grammatical structures recognised to include a wider range of critical concepts.
Automatic Syntactic Annotation

The new points system for driving offences will be established in Spain before summer.

With this new system, the driving licence will consist of a number of points that can affect the licence.

I personally agree with the establishment of this new law, as I feel that...
So, We have:
- 16,000 manually annotated errors
- 98,000 clauses syntactically tagged

From this, we discover:

- **Frequency of occurrence** of grammatical errors and thus importance of the connected concepts

- **Order of difficulty** of grammatical concepts, both from when learners are making errors in them, and how often they produce them at each proficiency level.
Towards Targeted Teaching
Towards Targeted Learning II

- A "test of concept" web-system has been produced.
- Plan to deliver to our first year students for 2013-14
- Organisation of grammatical topics in terms of a topic hierarchy
Towards Targeted Learning II

Modelling the Language...

- Language Model: For each grammatical concept:
  - The order of difficulty of the concept
  - The frequency of occurrence of errors related to the concept

<table>
<thead>
<tr>
<th>Concept</th>
<th>Gloss</th>
<th>Example</th>
<th>Counter-example</th>
</tr>
</thead>
<tbody>
<tr>
<td>much-not-in-simple-decl</td>
<td>‘much’ is not usually used in affirmative sentences.</td>
<td>He has much water.</td>
<td></td>
</tr>
<tr>
<td>much-with-mass</td>
<td>‘much’ is used with mass nouns only.</td>
<td>much water</td>
<td>much apples</td>
</tr>
<tr>
<td>much-with-neg</td>
<td>‘much’ can be used in negated statements.</td>
<td>I don't have much money.</td>
<td></td>
</tr>
<tr>
<td>much-with-neg-embedded</td>
<td>‘much’ can be used in a positive clause embedded in a negative one.</td>
<td>I don't think he has much money.</td>
<td></td>
</tr>
<tr>
<td>much-with-question</td>
<td>‘much’ can be used in questions.</td>
<td>Do you have much money?</td>
<td></td>
</tr>
<tr>
<td>much-with-intens</td>
<td>‘much’ can be used in affirmative sentences when it is preceded by &quot;so&quot;, &quot;too&quot; or &quot;as&quot; (intensifiers).</td>
<td>I have too much water.</td>
<td></td>
</tr>
</tbody>
</table>
The Question Database

- a database of multiple-choice type questions.
- For each answer, indication of the grammatical concepts confirmed or broken.

[ ]他的腿在爆炸中受伤。

<table>
<thead>
<tr>
<th>Answer</th>
<th>Concepts Broken</th>
<th>Concepts Complied</th>
</tr>
</thead>
<tbody>
<tr>
<td>neither</td>
<td>neither-cant-be-nonpartitive-predet</td>
<td>use-dual-form-where-possible; neither-is-dual</td>
</tr>
<tr>
<td>the two</td>
<td>np-cant-be-nonpartitive-predet; use-dual-form-where-possible</td>
<td></td>
</tr>
<tr>
<td>both</td>
<td></td>
<td>both-can-be-nonpartitive-predet; both-is-plural; both-is-dual use-dual-form-where-possible;</td>
</tr>
<tr>
<td>either</td>
<td>either-is-singular; either-cant-be-nonpartitive-predet</td>
<td>use-dual-form-where-possible; either-is-dual</td>
</tr>
</tbody>
</table>
Towards Targeted Learning II

Modelling the LEARNER...

- Learner Model: showing, for each learner:
  - the level of assimilation for each grammatical concept
  - the response history for each quiz question

Student responses update recorded student model

System presents material and quiz items based on learner's critical concepts
A Learner Model

- Assimilated Concept
- Critical Unassimilated Concept
- Noncritical Unassimilated Concept

Difficulty
Online Teaching

Question Selection

- Student selects the theme to explore, and is presented some descriptive material.
- When student presses the "Quiz me" button, the system selects the question that tests the most critical concepts for the student.
Question Selection

- Concepts ranked on a combination of:
  - **Relevance**: centralness to the Topic being explored by the student
  - **Criticalness**: a score combining order of difficulty with degree of assimilation (less difficult unassimilated concepts score highest)
  - **Importance**: Frequency of occurrence of errors in relation to the concept (or degree of underuse of the structure)
Learner selects the theme they wish to study (currently only a Noun Phrase module available)
Intelligent Grammar Learning System

Indicate which sentence is correct:

A. Both my twin daughters are coming home for Christmas.
B. Each my twin daughters are coming home for Christmas.
C. Either my twin daughters are coming home for Christmas.

Home
Intelligent Grammar Learning System

Indicate which sentence is correct:

A. Both my twin daughters are coming home for Christmas.

B. Each my twin daughters are coming home for Christmas. **(Corrected: Each)***

C. Either my twin daughters are coming home for Christmas.

Wrong: you should revise the following concepts:

- **Use dual determiners for two items:** When referring to two entities, use a dual term ('both', 'either', 'neither') if possible.
- **each not dual:** Each should not be used with two items (use either).
- **each cannot be nonpartitive predicat**
Conclusions
This talk has presented the work in progress concerning the design of an online blended learning i-platform which is aimed at improving the grammatical competence of EFL learners in Spanish universities.

Our intention is 'targeted" learning: identifying the immediately most critical language concepts needed by the learner and presenting material and exercises aimed at educating the learner in regards to those concepts.
Conclusions

The TREACLE Project

- By directly addressing identified lacks in the student knowledge, students progress more quickly
  - less time on already known concepts,
  - less time trying to learn material they are not ready for

- Additionally, studies show that when engagement and motivation are high, learning is more effective.

- System will be tested on UAM students in the coming academic year.
Fin
Error Annotation

- Existing EFL materials give far more weight to phenomena which our students do not have problems with, and give little weight to problems that the students do recurrently stumble over.
- 20% of our grammatical errors involve either including an article before a noun when it is contextually inappropriate, or not including it when it should be.
- However, existing EFL materials do not in general spend a great deal of time teaching the rules behind this phenomenon.