ICALL ecosystems: making ICALL's intelligence both accessible and understandable

Jasper Degraeuwe[1] and Patrick Goethals[2]

Abstract. This paper presents a reflection on the design of an Intelligent Computer-Assisted Language Learning (ICALL) 'ecosystem', integrated into an online learning environment for Spanish as a Foreign Language (SFL). The innovative dimension of the ecosystem lies in its triple focus: apart from enabling users to create and use intelligent language learning materials, it also tracks their activities in the environment and provides them insights (e.g. through knowledge clips) into Natural Language Processing (NLP), the source of ICALL's 'intelligence'. The reflective analysis is carried out by means of a case study with 32 SFL students, who work with the ecosystem in a blended writing course focused on vocabulary learning, lexical ambiguity, and Word Sense Disambiguation (WSD). Students' attitudes towards engaging in the ICALL ecosystem are gauged through a questionnaire, which revealed a statistically significant positive change in attitude after having completed the course. However, the results also show that enhanced insights into NLP and increased confidence in the computer as a learning assistant do not necessarily go hand in hand with an increased curiosity and a better user experience.

Keywords: ICALL, NLP, reflective analysis, user attitudes.

1. Introduction

With applications such as example sentence selection systems (Pilán, Volodina, & Borin, 2016) and exercise generation tools (Zanetti, Volodina, & Graën, 2021), the implementation of ICALL in language learning courses can be a valuable addition to the arsenal of teaching methods, for example as a complement to on-campus vocabulary learning activities (Ruiz, Rebuschat, & Meurers, 2021). Nevertheless,

1. Ghent University, Ghent, Belgium; jasper.degraeuwe@ugent.be; https://orcid.org/0000-0003-0850-314X
2. Ghent University, Ghent, Belgium; patrick.goethals@ugent.be; https://orcid.org/0000-0003-1421-562X

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using ICALL also comes with its limitations. Recognising lexically ambiguous items and distinguishing between their senses is one of those pending issues (Pilán et al., 2016), as the NLP-driven technique of WSD is not yet integrated in corpus query tools or in the development of computer-readable resources for didactic purposes, such as graded word lists. Additionally, it should be taken into account that, in order to get the most out of ICALL environments, end users (which may refer to students, teachers, or even textbook designers) should possess certain 'technological metaskills' (Schweinberger, 2021) that allow them to decide which queries are relevant and feasible to perform. In this study, we carry out a case study to analyse how both above mentioned aspects can be tackled by designing an ICALL ecosystem.

2. Method

2.1. Ecosystem design

Conceptually, the ecosystem should enable users to generate and use customised learning materials **(Aspect_1)**, as well as help them gain technological metaskills by stimulating their curiosity and promoting their autonomy **(Aspect_2)**. In the meantime, all activities of users who give their informed consent end up in a structured database, which can then be used for improving the NLP-driven methods integrated into the environment **(Aspect_3)**.

2.2. Case study design

The participants of the study are 32 SFL students enrolled in a third bachelor (B2+ level) Spanish writing course at Ghent University in Belgium. During the course, they work with the online learning platform of the Spanish Corpus Annotation Project[3] (SCAP; Goethals, 2018), which includes:

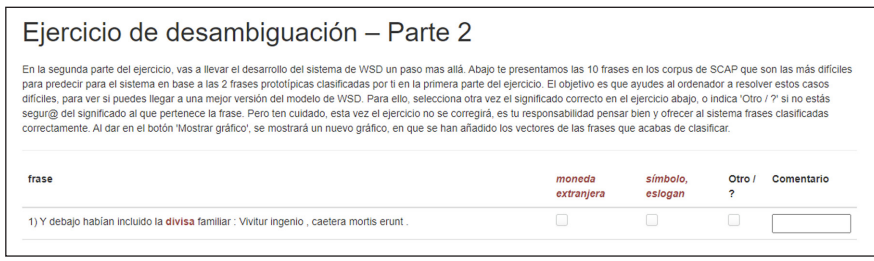
- a section on corpus consultation, in which users can perform targeted queries based on part-of-speech and lemma information and generate lemma lists with frequency and keyness values;
- a section on vocabulary learning, in which users can automatically generate customised vocabulary lists/glossaries and fill-the-gap exercises; and

3. Publicly available version of the platform accessible through scap.ugent.be. Demo video of the in-house version available at youtube.com/watch?v=RFaIWEEZcVM

- a collaborative section for research purposes.

Part of the course consists of completing a blended vocabulary learning module, which encompasses two on-campus classes and an online module on lexical ambiguity. During the classes, the students learn to use the corpus consultation and vocabulary learning functionalities of the SCAP platform **(Aspect_1)**. For the online module, they consider lexical ambiguity from the perspective of the computer by watching knowledge clips[4] and develop their own WSD models by making interactive exercises on lexically ambiguous vocabulary items in the collaborative section of the platform[5] **(Aspect_2)**. The responses to those exercises (see Figure 1 for an example) are collected in a database and used to develop the actual WSD method integrated into the environment **(Aspect_3)**.

Figure 1. Example of interactive exercise on lexical ambiguity



2.3. Questionnaire

To gain insights into the potential of the ecosystem, the students are administered an adapted version of the A-CALL questionnaire (Attitude towards CALL; Vandewaetere & Desmet, 2009) before and after completing the vocabulary learning module. The questionnaire contains fifteen eight-point Likert scale questions, each of them representing a specific attitude towards ICALL (see Table 1).

3. Results

Table 1 reports the mean scores and standard deviation (SD) values of the 15 questions (four students failed to complete the module, which explains the

4. Complete video available at youtu.be/-ev56uEpIkA
5. Demo video available at youtube.com/watch?v=OjPWKEpYiAA

different value for *n*). A paired samples t-test revealed a statistically significant (p=0.01) difference, meaning that engaging with the ecosystem positively affected students' attitudes towards ICALL (as represented by the 15 average scores). However, the results also show that enhanced insights into NLP (Questions 1, 3, 5, and 9) and increased confidence in the computer as a vocabulary learning assistant (4 and 6) do not necessarily go hand in hand with an increased curiosity (2) and a better user experience (11).

Table 1. Questionnaire results, with scores on questions marked with (*) being reversed

Nr	Question	Pre (n=32)		Post (n=28)	
		Mean	SD	Mean	SD
1	The computer is able to analyse the grammatical characteristics of words, and link words to their corresponding part-of-speech (noun, verb, adjective, etc.).	5.12	1.62	7.18	0.86
2	I am interested in knowing more about the technology which enables computers to automatically create vocabulary exercises and resources.	4.16	2.2	3.89	1.87
3	The computer only sees sequences of letters which are combined into words, it is not able to see meanings and concepts behind these sequences of letters.(*)	4.91	1.51	5.96	1.48
4	I have confidence in computer-created vocabulary exercises and tests.	4.69	1.31	5.86	1.3
5	If I introduce a large collection of texts on a certain domain into a specific application, I think that this application will be able to return a keyword list with the most typical words for the domain.	5.56	1.37	6.71	1.05
6	The computer is able to generate vocabulary exercises and resources tailored to my proficiency level.	5.34	1.21	6.68	1.22
7	The teacher's attitude and enthusiasm towards and knowledge of computer-assisted vocabulary learning determine to a large extent my attitude towards using computers for vocabulary learning purposes.(*)	3.22	1.77	3.54	2.12
8	Computer-assisted vocabulary learning offers more flexibility to learning vocabulary in Spanish.	5.53	1.5	5.61	1.89
9	The computer is able to analyse the syntactic structure of sentences, and assign the correct syntactic function (subject, direct object, etc.) to words.	4.53	1.27	5.61	1.47

10	Computer-assisted vocabulary learning is as valuable as traditional methods for vocabulary learning in Spanish.	4.28	1.49	4.82	1.49
11	I (would) like to learn Spanish vocabulary with the help of the computer.	5.28	2.1	4.89	1.91
12	I find it easier to accept an error committed by a language teacher, than an error committed by the computer.(*)	4.06	1.78	4.07	2.02
13	People who learn Spanish vocabulary through computer-assisted learning methods are less proficient in Spanish than people who learn Spanish vocabulary through traditional paper-and-pencil methods.(*)	6	1.93	6.29	1.41
14	Computer-assisted vocabulary learning is a valuable extension of traditional learning methods for vocabulary learning in Spanish.	6.09	1.47	6.07	1.74
15	Vocabulary exercises and resources created automatically by an application cannot contain errors.(*)	3.34	2.06	3.18	1.93
		4.81	**1.64**	**5.36**	**1.58**

4. Discussion and conclusions

In this paper we reflected upon the design of an ICALL ecosystem using a specific questionnaire as our survey instrument. Working with the ecosystem significantly improved students' attitudes towards ICALL, but this did not automatically mean that they also enjoyed working with the computer more, or that the ecosystem sparked their interest in learning even more about language technology. In other words, these preliminary findings highlight the area of tension between what students consider to be the value, quality, and/or potential of learning methods, and the user experience these methods provide. To analyse this phenomenon in more detail, we will organise a follow-up case study in the 2022-2023 academic year, in which we will evaluate a revised version of the ecosystem based on this year's results.

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