FACULTY OF ARTS AND PHILOSOPHY

DEPARTMENT OF TRANSLATION, INTERPRETING AND COMMUNICATION
RESEARCH GROUPS LT³ AND MULTIPLES

ICALL ECOSYSTEMS: EVALUATION, VALIDATION AND FUTURE DIRECTIONS

Jasper Degraeuwe & Patrick Goethals – EUROCALL2023

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LEARNING
ENVIRONMENT

LEARNING ENVIRONMENT

1. Corpora
2. NLP-driven methods (→ “Intelligent”)
3. Online user interface
4. Using and creating language learning materials (vocabulary lists, customised exercises, etc.)

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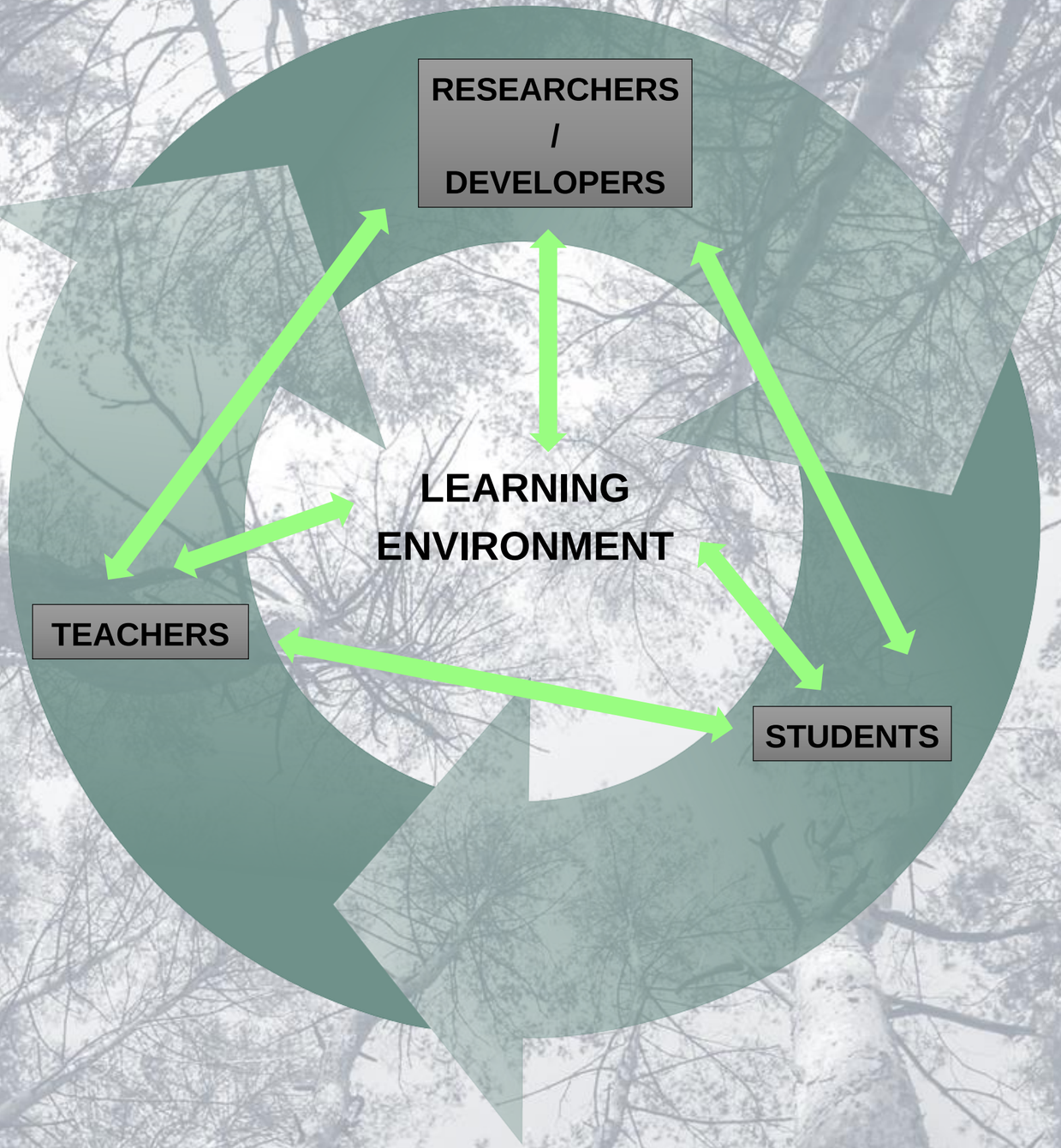
LEARNING
ENVIRONMENT


LEARNING
ENVIRONMENT
TEACHERS
STUDENTS


RESEARCHERS / DEVELOPERS
LEARNING ENVIRONMENT
TEACHERS
STUDENTS


RESEARCHERS / DEVELOPERS
LEARNING ENVIRONMENT
TEACHERS
STUDENTS

CORE ECOSYSTEM ASPECTS

1. Using and creating language learning materials → **environment “affects” students + teachers**

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CORE ECOSYSTEM ASPECTS

1. Using and creating language learning materials → **environment "affects" students + teachers**
2. Gaining "technological metaskills" (Schweinberger, 2021) → **researchers/developers "affect" students + teachers**

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CORE ECOSYSTEM ASPECTS

1. Using and creating language learning materials → **environment “affects” students + teachers**
2. Gaining “technological metaskills” → **researchers/developers “affect” students + teachers**
3. Collect user activities to improve NLP-driven methods → **students + teachers “affect” environment + researchers/developers**

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CASE STUDY (2022)

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CASE STUDY (2022)

- Presented at EUROCALL2022
- Degraeuwe and Goethals (2022)

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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,

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CASE STUDY (2022): DESIGN

- 32 students of Spanish as a foreign language
- B2+ level Spanish writing course at university
- Blended vocabulary learning module
  - 2 on-campus classes
  - Online module on lexical ambiguity
- Evaluation instrument: questionnaire that gauges attitudes towards ICALL (Vandewaetere & Desmet, 2009)

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CASE STUDY (2022): RESULTS

- Average pre-score (on 8-point Likert scale): 4.81
- Average post-score: 5.36
- Qualitative analysis
  - ⊕ Enhanced insight into NLP and increased confidence in computer as learning assistant
  - ⊖ No increased curiosity or better user experience

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DEMO

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CORE ECOSYSTEM ASPECTS → PRACTICE

Concept	Practice
Using and creating language learning materials	“Consultar” and “Aprender” sections
Gaining technological metaskills	Knowledge clips and interactive exercises in “Colaborar” section
Collect user activities to improve NLP-driven methods	Collect responses to exercises in “Colaborar” section

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CASE STUDY (2023)

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CASE STUDY (2023): DESIGN

- 22 students of Spanish as a foreign language
- B2+ level Spanish writing course at university
- Blended vocabulary learning module
  - 2 on-campus classes
  - Online module on lexical ambiguity
- Evaluation instrument: questionnaire that gauges attitudes towards ICALL (Vandewaetere & Desmet, 2009)

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CASE STUDY (2023): ECOSYSTEM UPGRADES

- Free text component in interactive exercise on lexical ambiguity
- Integration of short quizzes into knowledge clips
- Possibility to download customised learning materials with WSD method being applied to them

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CASE STUDY (2023): RESULTS

Year \ Test	Pre Mean (standard deviation)	Post Mean (standard deviation)
2022 (*n* = 32)	4.81 (1.64)	5.36 (1.58)
2023 (*n* = 22)	**5.32 (1.36)**	**5.4 (1.42)**

- Paired samples t-test: statistically non-significant change
- But: (very) positive initial attitudes

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RESULTS: QUALITATIVE ANALYSIS

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Nr	Question	Pre		Post	
		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.).	**5.95** (5.12)	**1.21** (1.62)	**6.64** (7.18)	**1** (0.86)
2	I am interested in knowing more about the technology which enables computers to automatically create vocabulary exercises and resources.	**5.32** (4.16)	**1.52** (2.2)	**4.73** (3.89)	**2.07** (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** (4.91)	**1.69** (1.51)	**4.68** (5.96)	**1.81** (1.48)
4	I have confidence in computer-created vocabulary exercises and tests.	**5.27** (4.69)	**1.28** (1.31)	**5.3** (5.86)	**1.53** (1.3)
5	If I introduce a large collections 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.	**6.41** (5.56)	**1.3** (1.37)	**6.68** (6.71)	**0.95** (1.05)

Nr	Question	Pre		Post	
		Mean	SD	Mean	SD
6	The computer is able to generate vocabulary exercises and resources tailored to my proficiency level.	**5.5** (5.34)	**1.5** (1.21)	**6.55** (6.68)	**1.06** (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.(*)	**3.09** (3.22)	**1.41** (1.77)	**3** (3.54)	**1.69** (2.12)
8	Computer-assisted vocabulary learning offers more flexibility to learning vocabulary in Spanish.	**5.68** (5.33)	**0.84** (1.5)	**6.05** (5.61)	**1.17** (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.	**5.32** (4.53)	**1.32** (1.27)	**5.64** (5.61)	**1.33** (1.47)
10	Computer-assisted vocabulary learning is as valuable as traditional methods for vocabulary learning in Spanish.	**5.77** (4.28)	**1.48** (1.49)	**5.95** (4.82)	**1.43** (1.49)

Nr	Question	Pre		Post	
		Mean	SD	Mean	SD
11	I (would) like to learn Spanish vocabulary with the help of the computer.	**6.77** (5.28)	**1.07** (2.1)	**5.95** (4.89)	**1.21** (1.91)
12	I find it easier to accept an error committed by a language teacher, than an error committed by the computer.(*)	**3.64** (4.06)	**1.92** (1.78)	**4** (4.07)	**1.83** (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.(*)	**6.5** (6)	**1.19** (1.93)	**6.32** (6.29)	**1.52** (1.41)
14	Computer-assisted vocabulary learning is a valuable extension of traditional learning methods for vocabulary learning in Spanish.	**6.73** (6.09)	**1.08** (1.47)	**6.59** (6.07)	**1.1** (1.74)
15	Vocabulary exercises and resources created automatically by an application cannot contain errors.(*)	**2.91** (3.34)	**1.57** (2.06)	**2.82** (3.18)	**1.59** (1.93)

RESULTS: QUALITATIVE ANALYSIS

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RESULTS: QUALITATIVE ANALYSIS

- Enhanced insight into NLP (questions 1, 5, 9)
- Increased confidence in the computer as vocabulary learning assistant (questions 4 and 6)

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ENHANCED INSIGHT INTO NLP

Nr	Question	Pre		Post	
		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.).	**5.95** (5.12)	**1.21** (1.62)	**6.64** (7.18)	**1** (0.86)
5	If I introduce a large collections 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.	**6.41** (5.56)	**1.3** (1.37)	**6.68** (6.71)	**0.95** (1.05)
9	The computer is able to analyse the syntactic structure of sentences, and assign the correct syntactic function (subject, direct object, etc.) to words.	**5.32** (4.53)	**1.32** (1.27)	**5.64** (5.61)	**1.33** (1.47)

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INCREASED CONFIDENCE

Nr	Question	Pre		Post	
		Mean	SD	Mean	SD
4	I have confidence in computer-created vocabulary exercises and tests.	**5.27** (4.69)	**1.28** (1.31)	**5.3** (5.86)	**1.53** (1.3)
6	The computer is able to generate vocabulary exercises and resources tailored to my proficiency level.	**5.5** (5.34)	**1.5** (1.21)	**6.55** (6.68)	**1.06** (1.22)

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CONCLUSIONS QUESTIONNAIRE

- Enhanced insight into NLP (questions 1, 3, 5, 9)
- Increased confidence in the computer as vocabulary learning assistant (questions 4 and 6)

- No increased curiosity (question 2)
- No better user experience (question 11)

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NO INCREASED CURIOSITY

Nr	Question	Pre		Post	
		Mean	SD	Mean	SD
2	I am interested in knowing more about the technology which enables computers to automatically create vocabulary exercises and resources.	**5.32** (4.16)	**1.52** (2.2)	**4.73** (3.89)	**2.07** (1.87)

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NO BETTER USER EXPERIENCE

Nr	Question	Pre		Post	
		Mean	SD	Mean	SD
11	I (would) like to learn Spanish vocabulary with the help of the computer.	**6.77** (5.28)	**1.07** (2.1)	**5.95** (4.89)	**1.21** (1.91)

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CONCLUSION

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MAIN TAKEAWAYS

- Corroboration last year's results: +/-

→ Difficult to improve (very) positive attitudes even further

- Upgrades did not yield desired effect

- Ecosystem improves insights into NLP (→ helps users gain technological metaskills)
- Ecosystem improves confidence in computer as learning assistant

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DIRECTIONS FOR FUTURE RESEARCH

- Rethink some of the aspects of the ecosystem?
- Integration of generative AI into ecosystem?
- Expand target audience → case study with teachers
- Improve user interface
- Allow export to formats such as QTI

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LINKS

- Publicly available environment of ecosystem: scap.ugent.be
- Demo of complete, non-public version of SCAP: youtube.com/watch?v=RFaIWEEZcVM
- Knowledge clip on word sense disambiguation integrated into the ecosystem: youtu.be/-ev56uEpIkA

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