



Computational Communication in Language E-Learning

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Abstract—This study investigated the communicated themes in journal articles of e-learning. The aim was to reveal the common issues and patterns of communication as written in the published articles of e-learning. A corpus of 152 journal articles in computer-based language learning was used from reputable journals in Computer Science between the years of 2017-2020. The results showed the themes of mobile learning, distance learning, situated learning, blended learning, teaching, and learning, as well as informal learning to be recurring in the past three years. In addition, e-learning for language was always focused on learning vocabulary. In conclusion, despite the development of technology in e-learning, human factors were identified to be at the center of discussion. Future implications included the use of e-learning as an organic technology for language learning in the future.

Keywords—*e-learning, language learning, Computer Science, human factors, technology*

I. INTRODUCTION

Studies of e-learning have been regarded as covering all aspects in life. There are studies in e-learning from professional training to autonomous learning. E-learning has been applied in all levels of education, from an early level or young age to adult learners [1]. Different majors and disciplines have also applied the platform, resulting in all kinds of knowledge made possible through e-learning.

In the last two decades, e-learning has also been linked to environmental issues and sustainability. It was noticed in several studies that the emerging learning cultures have reduced the number of printed materials altogether. The virtual mode of e-learning with e-books and other electronic materials supports green environment and zero-waste movements all over the globe [2]. As a result, e-learning becomes the new coveted way for sustainable education.

On the other hand, the accessible materials provided by e-learning brought forward equal opportunities for people. Regardless of nationalities and locations, people could access the same learning materials. Once given the access learners would be able to use and share knowledge provided by the e-learning platforms. Opportunities were also thought to be awarded to learners regardless of any cultural or social backgrounds [3]. Using online materials, learners of all gender would be able to access the knowledge. Equal opportunities for learners in underprivileged areas have also been discussed widely [4]. There has been continuous discussion on e-learning as the learning culture of the future.

E-learning has been known to be used for studying language since the 1960s. Since the 1960s, vast developments from both computer science and linguistic disciplines have created enjoyable and sustainable language learning experience. Learning language has also been identical to human or interpersonal communications. Regardless, learning with a computer or learning through computer has raised the issue of replacing human-to-human interactions. There were also proponents and opponents to the ideas of e-learning for language since then on.

Considering all the facts, this study aimed at investigating the issues in e-learning and language learning. It would be necessary to identify: (1) what themes or issues are of importance in language e-learning, and (2) how these issues were being addressed for the developments of language e-learning.

II. PREVIOUS STUDIES

A. *E-learning and the common issues in the study of e-learning*

Previous studies have identified the issues pertaining to e-learning. These issues included new technology [5], accessibility [4], various platforms [5], user interface [5], monitoring, evaluation, and feedbacks [5]. In recent years, emerging issues included digital humanities [5], ethics [5], data protection [6], as well as sustainability and environment [2]. These issues have been well studied and were expected to be further applied for the development of e-learning.

Developments of e-learning have been discussed widely in previous studies, especially in Computer Science journals. Reputable journals in Computer Science have also provided cutting-edge approaches in e-learning. Specific journals, such as those published by IEEE, Cambridge University Press, and Oxford University Press have been consistently publishing quality articles since the 1940s. It is therefore necessary to investigate these sources of information on what issues and new developments in e-learning could be adopted and adapted.

B. *Previous issues in e-learning and language learning*

Studies of e-learning for the past 30 years have been covering many areas of learning and technology. Language learning has also become increasingly oriented toward computer-based technology throughout those years. This is because one of the main training materials in early professional training through computer was to train how to speak English correctly.

Previous studies have identified the issues of massive language training, such as for preparing students from overseas to colleges in the U.S. [8]. The industrial spin-off on language learning was also criticized in many studies [8], amongst which was in relation to the commercialization of language testing [8]. Human aspects, as well as ethics remain the current issues in language e-learning.

However, many studies have been conducted from the perspective of pedagogy and educational dilemmas. Not many studies provide balanced portrayals of accessibility and opportunities created through e-learning. Identifying the caveats as well as the benefits in language e-learning studies are vital for further comprehensive and thorough e-learning understanding. Communicating achievements and developments in language e-learning seemed to take a different route. Those who were keen to display the advancements of technology preferred to disseminate their findings in Computer Science journals. Not many publications provide equal opportunities to learn about the technical algorithm in e-learning while looking at the human users' perspectives of the technology.

It is therefore necessary to gather more information from different publications to identify what issues have been discussed in language e-learning research. Equally important is to also identify how these publications communicate the importance of the issues in the papers.

III. RESEARCH METHODS

3.1 *Corpus*

A corpus of 130 articles on language e-learning between the years of 2017-2020 was used for this study. The journal used for this study was ReCALL and it was published by Cambridge University Press since 1989. ReCALL is the journal of the European Association for Computer Assisted Language Learning (EUROCALL). The association was known to have been consistent in promoting the use of information and communication technology for language learning. Currently, the journal website stores up to 320 articles and for this study 130 article abstracts from the past 4 years were used as the source of data. The abstracts were selected because abstracts are considered as miniature of the article and they are used to represent the importance of the articles [9].

The data for this study consisted of 3472 words and 27,653 tokens. The number of words referred to the word-types and tokens referred to the times of occurrence for all types of words as can be seen in Figure 1:

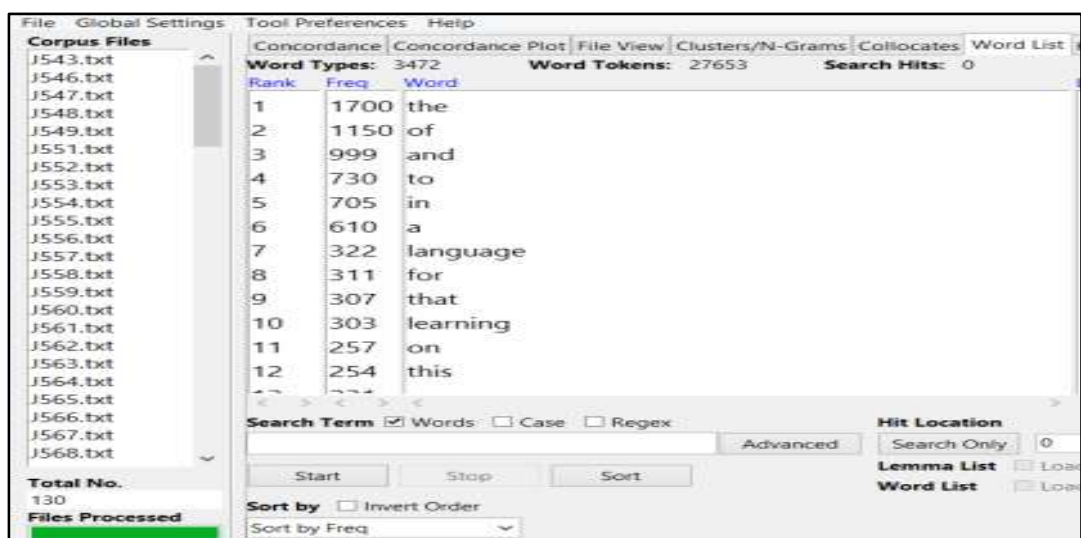


Fig. 1. The number of word types and tokens in the study

3.2 Procedure

In collecting the data, articles were transferred into .txt format. The files were then used as sources for generating the data. Data were generated using a freeware called AntConc 3.5.8. (2019). The steps to collect the data were:

First, frequent words and tokens were generated to inform the most frequently recurring lexical items in language e-learning.

Second, frequently occurring words were further inspected using the Concordance feature in the freeware. The concordance lines will provide the natural environment in which the words are used. This is important to semantically provide associations and meanings to the words.

Third, the recurring words were investigated in terms of their collocations. Collocations would provide further knowledge on how words occur together to form meaning. And this stage is to provide a comprehensive understanding of the themes or issues presented.

Fourth, identifying and categorizing the themes in relation to whether or not there were solutions of innovations made. This last stage is important in underlining the most relevant and urgent theme in the communication of e-learning through research publications.

. Figure 2 displays the steps toward collecting and analyzing the data.



Fig. 2. Research procedure

IV. COMMON THEMES IN LANGUAGE E-LEARNING STUDIES

In identifying and categorizing themes in language e-learning studies, frequently occurring words would be first presented.

4.1. The communicated issues in e-learning as shown in high-recurring words

From the data, it could be seen that there were recurring words related to language e-learning. These words could be seen in Table 1. From Table 1 it can be seen that the highly recurring Nouns were students (occurring 165 times), study (129 times), learners (126 times), and English (103 times), beside the words language (occurred 238 times) and learning (226 times).

TABLE I. 20 HIGHLY RECURRING NOUNS IN LANGUAGE E-LEARNING STUDIES

No	Frequency	Words	No	Frequency	Words
1	238	language	11	57	analysis
2	226	learning	12	53	corpus
3	165	students	13	53	results
4	129	study	14	50	interaction
5	126	learners	15	48	studies
6	103	English	16	47	group
7	85	research	17	44	EFL
8	70	data	18	44	teaching
9	68	teachers	19	42	CALL
10	58	paper	20	41	feedback

The table showing the highly occurring Verbs is as below:

TABLE II. 20 HIGHLY RECURRING VERBS IN LANGUAGE E-LEARNING STUDIES

No	Frequency	Words	No	Frequency	Words
1	49	used	11	16	made
2	37	use	12	15	reported
3	27	provide	13	14	supported
4	24	found	14	14	enhance
5	21	conducted	15	13	investigates
6	19	support	16	12	presents
7	18	help	17	12	suggest
8	18	showed	18	9	participated
9	18	discusses	19	9	integrated
10	17	collected	20	9	presented

The highly recurring Verbs are (to) use/used (37 and 49 times respectively) and (to) provide (27 times), found (21 times), and conducted (21 times). Table 3 showed the highly recurring Adjectives:

TABLE III. 20 HIGHLY RECURRING ADJECTIVES IN LANGUAGE E-LEARNING STUDIES

No	Frequency	Words	No	Frequency	Words
1	74	online	11	17	better
2	44	mobile	12	17	native
3	36	foreign	13	16	important
4	35	potential	14	16	quantitative
5	34	pedagogical	15	14	available
6	22	multimodal	16	11	authentic
7	21	current	17	11	short
8	19	effective	18	7	advanced
9	19	oral	19	7	appropriate
10	18	digital	20	6	asynchronous

The highly recurring Adjectives were online (occurred 74 times), mobile (44 times), and foreign (36 times).

And finally, the studies used Pronouns I (occurred 70 times), they (66 times), and we (42 times).

From the results, it is clear that certain words appealed more in the studies of computer-assisted language-learning. It is interesting to see that the words study, learners, English, and mobile were the

most communicated ideas in these studies. It was shown from the data that in the past 4 years, the advancement of the area was situated around mobile or e-learning. There was also high attention on the learners. The data indicated that in communicating language e-learning the focus area was toward developing the learners.

4.2. Associated meanings in the important issues in language e-learning

In order to get more insights to how e-learning was communicated in the studies, semantic analysis was conducted by identifying collocations and concordance lines. Collocations were made using the most frequently used word: language (occurring 238 times) and learning (228), which were the highest occurring words in language e-learning publications.

Collocations for the word learning environment were as seen in Table 4:

TABLE IV. COLLOCATIONS OF THE WORD LEARNING

F	F (L0)	F (R)	Stat	Collocates
8	6	2	6.52952	distance
12	12	0	6.41404	assisted
6	6	0	6.11448	blended
6	6	0	5.94455	informal
7	7	0	5.75191	situated
16	15	1	5.07009	mobile
12	11	1	5.07009	vocabulary
70	68	2	4.76398	language
12	8	4	4.65505	teaching

From Table 4 it could be seen that the word learning was communicated in the studies with the word distance. This means, distance learning was the focus of discussion in the data. In addition, learning was also discussed in line with blended and informal method, as well as focusing on vocabulary. The results indicated the developments of language e-learning in the past four years were aimed toward creating informal learning experience in vocabularies.

4.2. The manner computational communication was used in language e-learning

It was seen from the data that for the past four years e-learning in language focused on developing learning experience. The concordance lines would provide more information on how the manner of developing learning experience was discussed throughout the years. Figure 3 provides examples of such communication:

for in-class and out-of-class learning activities. According to this data set, learners was easy to use and useful during learning activities, and generally had a positive attitude to undertake mobile-based language learning activities, and the issues having an effect with this device for game playing and learning activities. In addition, because this device does onal mobile phones for school-centered learning activities. In this study a Nintendo DS mobile phones for performing language learning activities, or is there still a preference our findings, we conclude that designed learning activities supported by the VPen system could othesis was that skillsbased teaching and learning activities that are aligned with the needs . Furthermore, the students believed that learning activities were 'playful' and useful for improvin university who were assigned vocabulary learning activities which they could choose to complete technical settings. It offered a variety of learning activities with instant on-line selfevaluation fo speaking performance with appropriate learning activity design supported by Virtual Pen (VPen), the younger learners' community1 into a learning activity for the learning of English. The

Fig. 3. Concordance lines for "learning activity/activities"

From the concordance, it can be seen that the phrase "learning activities" was used together with the ideas of game-playing, playful, and younger learners' community with the learning activity, vocabulary and speaking performance were also aimed at when describing what the learning activity was for. It could be seen from the concordance that the manner of learning activity communicated in the studies was that of the engaging, fun, learner-oriented, and performative purposes.

The concordance for the learning environment (occurring 18 times in 14 articles), on the other hand, could be seen in the Figure below:

tutor role were affected by the new learning environment.
 show how the use of the Virtual Learning Environment facilitated the creation of exercises
 institutional context benefits the language learning environment in a manner that promotes L2
 nts benefit from a hypermedia-enhanced learning environment, specifically in terms of incidental
 hey can significantly enrich the language learning environment. There is still, however, a strong
 ased instruction can provide an effective learning environment to build vocabulary among ESP student
 by the learners. The hypermedia-assisted learning environment used in this study provides a
 supported by the use of the Virtual Learning Environment (VLE) WebCT, i.e. a new
 language learning. The use of the Virtual Learning Environment Web Communication Tools (WebCT), avail
 present a particular type of collaborative learning environment where collaboration can result in agg
 be found useful in a game-based learning environment where the primary focus for the
 ask design and implementation in online learning environments.
 the context of technology-rich language learning environments and in formulating suitable criteria
 course offered many elements of situated learning environments, and that some course activities wer

Fig. 4. Concordance lines for "learning environment"

It can be seen from the concordance lines that learning environment was discussed together with the ideas of virtual, game-based, and collaborative. From the concordance data, studies in language e-learning had been aimed at providing collaborative, learner-oriented, fun, playful, and performative oriented.

V. CONCLUSION AND IMPLICATION FOR FURTHER STUDIES

In conclusion, it could be confirmed that communication on language e-learning studies in the past four years have been focused on learners' experience and engaging/collaborative qualities. There had not been many discussions on evaluative or testing perspectives.

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