THE CASE OF EFL: DOES TECHNOLOGY LEAD TO LEARNING?

O CASO DO INGLÊS COMO LÍNGUA ESTRANGEIRA: A TECNOLOGIA CONDUZ AO APRENDIZADO?

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Abstract: This paper reviewed a series of studies which investigated the validity of educational software as tools to promote EFL learning. A metasummary approach was used to appraise and synthesize the main findings of four studies. The results are presented in a comparative form, providing information extracted from each report in the following domains: objectives of the studies, instruments of data collection, sample composition, theoretical background, major findings and conclusions and implications of the studies. It is concluded that the four studies reviewed do believe in the contribution of technology to EFL teaching and learning but express a concern about the integration of human-computer interaction and pedagogic features of educational software for EFL learning.

Keywords: *EFL. Learning. Technology.*

Resumo: Este artigo revisa uma série de estudos que investigaram a validade de softwares educacionais como ferramentas para promover o aprendizado de inglês como LE. Uma meta-análise foi utilizada para avaliar e sintetizar os principais resultados de quatro estudos. Os resultados são apresentados de forma comparativa, provendo informação sobre os objetivos dos estudos, instrumentos de coleta de dados, composição da amostra, arcabouço teórico, principais resultados, conclusões e implicações dos estudos. Concluiu-se que os quatro estudos revisados acreditam na contribuição da tecnologia para o ensino-aprendizagem de LE, porém expressam preocupação em relação à integração dos aspectos da interação humano-computador com as características pedagógicas dos softwares analisados.

Palavras–chave: *Inglês como língua estrangeira. Aprendizado. Tecnologia.*

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INTRODUCTION

We live in the information society (LÉVY, 1999) where technological advances in the form of new digital technologies (DT) enabled a more democratic and inexpensive flow of communication, information, products and services. The affordances of DTs changed the way we express ourselves and the way we produce and acquire information, as shown, for example, in the number of massive online open courses (MOOCs) and Social Network Sites (SNSs) used in both formal and informal educational contexts. It is possible to say that these changes were enabled by the increase in access to technological tools worldwide; the increase in access to the internet worldwide and; the affordances of the web 2.0. Whereas the internet has given more access to information, the web 2.0 has given more voice and autonomy in the expression and production of information.

The number of people who seek information and education in MOOCs (for example FINARDI; TYLER, 2015) and who exercise their voice in SNSs (for example FINARDI; PORCINO, 2016) is evidence of this new way of relating to and with the world. Autonomy in learning is considered a characteristic of postmodern education (GRADDOL, 2006) and some authors (FINARDI; PREBIANCA; MOMM, 2013) suggest that in the current information society we live in, both English as an international language (FINARDI, 2014) and digital literacy are passports to access information online and to form social capital (WARSCHAUER, 2003) defined as the ability to generate benefits by means of relationships in social practices and networks. Despite these changes in society, educational practices are not always aligned with current trends in society, perhaps due to the many challenges associated with the incorporation of technologies in teaching methodologies, especially on the part of teachers (TEIXEIRA; FINARDI, 2013; FINARDI; TEIXEIRA; PREBIANCA; DOS SANTOS, 2014).

So as to help teachers incorporate technologies in teaching methodologies in critical and informed ways, research must strive to provide evidence of the effects of the use of certain pieces of technologies on learning. Because this seems to be a hard task, it is our understanding that systematic reviews such as the metasummary undertaken here are needed in order to critically interpret the main findings of research in the field. This constitutes the main aim of this study.

REVIEW OF LITERATURE

Until recently, there seemed to be a gap in the literature regarding ways of assessing the impact and incorporation of technology in education in general and in English as a foreign language (EFL) learning in particular. While the literature on the benefits of incorporating technology in teaching practices, more specifically in the teaching and learning of foreign languages, has been accumulating (e.g.: CHAPELLE, 1996; 2007; DUARTE; ALDA; LEFFA, 2016), studies conducted to measure the impact of the use of technological resources on EFL learning are still incipient.

In this context, it is worth mentioning that one might decide to look at the effects of technology from different perspectives: considering students' own perceptions of the learning process, evaluating its impact on the development of learners' autonomy,

investigating how and when such technological resources are used by teachers in particular teaching/learning (educational or pedagogical) scenarios, discussing teacher education for the use of technology in class, and so on. In spite of their relevance and contribution to a comprehensive view of how educators and learners have dealt with the massive incorporation of technology in our daily lives, such studies have fallen short to explain whether and to what extent EFL teaching mediated by technology has effectively proved to contribute to learning.

A very important attempt to statistically measure the impact of the use of technological resources to EFL learning was undertaken by Prebianca and Vieira (2013). For the sake of their study, the authors defined learning as the retention and accurate use of the syntactic structure *I wish + subject + past tense verb* and aimed at analyzing whether it was improved by a blended teaching-learning approach which combined a traditional form-focused approach and computer-based activities implemented in the virtual learning environment known as Moodle. Thirty students from the second year of two Technical High School Programs (Farming and Computing) of the Federal Educational System were divided into control and experimental groups. After taking a pretest to assure learners had no knowledge about the target syntactic structure, both groups completed an instruction and a practical phase. Immediately after both initial phases, learners took a written test to check for the retention of the target structure (the immediate retention test) and thirty days later they took another written test to verify whether retention of the target structure remained (the delayed retention test). Retention of the target structure later in time, as measured by scores on accurate use were interpreted as corresponding to the learning of the target syntactic structure. Data analysis revealed that the retention of the target syntactic structure was due to treatment for both groups - the control one, which received traditional isolated focus on form instruction, and the experimental one, which was submitted to a blended teaching approach. This result was due to the fact that, as suggested by Prebianca and Vieira (2013), there seems to be some incongruence between learners' L1 and L2 syntactic patterns regarding the accurate use of *I wish + subject +past tense verb*, since in English it is possible to mix present and past verb tenses to refer to factual meaning (p. 53). However, a Wilcoxon Signed Rank Test performed on the data showed that learners performed better in the immediate retention test than in the delayed retention test. This counterintuitive result was explained by Prebianca and Vieira (2013) as being caused by insufficient practice of the target syntactic structure, which could have led to knowledge proceduralization if learners had had more time for language production. The results also showed that, contrary to what was initially expected, the control group outperformed the experimental group in the delayed retention test, as confirmed by a MannWhitney U test. According to the authors of that study, it is possible that learners from the control group were more proficient and had language use procedures more automatized. It is worth noting that language proficiency was not tested in that study.

In sum, although Prebianca and Vieira (2013) were not able to confirm that computer-based instruction had a positive effect on EFL learning, their study represent an important step towards a quantitative assessment of the possible impacts of technology use in the teaching and learning of a foreign language. Therefore, the results of their study as well as the need to further examine the contribution of technology to

EFL learning, motivated the present researchers to search for different approaches to answer the question of whether technology may in fact lead to learning. Thus, another way to analyze the impact of technology on learning is to see whether it takes into account the particularities of the learning process and how these particularities are implemented by pieces of technology in specific learning contexts.

Within this line of thought, learning can then be understood from a cognitive perspective involving the modification of cognitive structures through the integration of novel information with already stored knowledge, resulting in new connections in the brain (FEUERSTEIN; FEUERSTEIN, 1991; FEUERSTEIN, 1997). The acquisition of novel information is made possible through social-interaction mediation, which ultimately enables learners to transcend their actual knowledge stage so as to perform at higher levels of cognition in more autonomous performances.

The concept of mediation is key in this perspective because mediation, be it fostered by a tutor, a professor, or even by a piece of technology (PREBIANCA; DOS SANTOS; MOMM; SILVA; NEHRING, 2013), is responsible for selecting and modifying the input learners process during learning experiences. In the case of educational software to learn English such as the ones reviewed here, software designers need to take into account the knowledge learners have about the language (mental models) as well as their learning needs and reasoning patterns so as to offer optimal mediation which may ultimately lead to learning.

Mental models or schemas are representations people build up during their life experiences. They refer to general knowledge about everything that surrounds us, from personal traits to procedures on how to operate things or about how to do things (SEARLEMAN; HERRMANN, 1994). Research has demonstrated that schemas are especially important for learning as they can facilitate the encoding, comprehension and retrieval of information (SEARLEMAN; HERRMANN, 1994). In this sense, it is essential that educational software for EFL learning is designed by taking into account learners' schemas on how to learn, in general, and about learning languages, in particular. The studies reviewed in the present metasummary analysis offer a relevant contribution by filling in the gap in the literature regarding ways of assessing the impact of technology on EFL both from a cognitive and an ergonomic perspective.

One study that investigated learners' perceptions on the use of educational software as a pedagogic tool was the one carried out by Prebianca, Finardi and Cardoso (2015). In that study, the authors analyzed the perceptions of first year students of the Integrated Technical High School on the use of technology during their English classes in a hybrid approach that combined traditional, face-to-face classes with the use of an educational software. The study was carried out with 158 students of the Agricultural and Informatics Courses of a Federal Institute of Education, Science and Technology in Brazil. Data were collected through two questionnaires - before and after using the software in English as foreign language classes. The qualitative analysis of the study showed that most participants understand there are advantages in the use of the educational software in hybrid contexts, but they do not believe in an approach that uses only technology for language learning, for it is possible to conclude, based on participants' evaluation of the software, that they believe the use of such

technological resource seems not always to fit their needs or sometimes may function as a complement for more traditional, face-to-face language classes.

Because the use of technology in Brazilian formal educational settings regarding EFL teaching and learning has grown considerably in the last decade, it is our view that more research is needed to fully grasp the impact of technology on the development of foreign language skills.

METHOD

In this study, a systematic review was carried out to critically appraise the main findings of four studies which aimed at validating educational software as tools to promote English as a foreign language (EFL) learning in a Brazilian educational context. The study used a metasummary approach as an interpretative strategy to compare the studies analyzed in six main domains: objectives of the studies, instruments of data collection, sample composition, theoretical background, major findings and conclusions/implications of the studies.

Decision on the articles to be reviewed took into account the research conducted by the Brazilian CNPQ[3] research group entitled Language, Cognition and Technology which aims at understanding the effects of technology on language learning by Brazilian non-native learners of secondary and tertiary institutions. Among all the publications of this research group, just the articles that dealt more specifically with the analysis of education software for EFL learning which were published in indexed journals or international proceedings were selected. These are: Prebianca; Santos Júnior; Finardi, 2014; Prebianca; Vieira; Finardi, 2014; Finardi; Prebianca; Schmitt; Andrade, 2014; Finardi; Prebianca; Schmitt, 2016. The results of the metasummary are presented and discussed in the next section.

RESULTS AND DISCUSSION

This section presents and discusses the results of the metasummary carried out in order to review a series of studies which investigated the validity of educational software as tools to promote English as a foreign language learning. Table 1 depicts the analysis regarding the objectives, the instruments of data collection and the sample composition of each study analyzed.

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3   Conselho Nacional de Desenvolvimento Científico e Tecnológico - http://cnpq.br/

Table 1- Objectives, data collection instruments and sample composition of the studies.

Studies	Main objectives	Instruments of data collection	Sample
Analysis of an Educational Software for language learning: insights from the Theory of Structural Cognitive Modifiability and Human-Computer Interaction Prebianca; Santos Jr; Finardi (2014)	- to analyze the validity of an educational software designed to teach English as a foreign language to beginners. *Aspects evaluated:* - Pedagogic features -Human-Computer Interaction features (interactiveness and usability)	*Pedagogic analysis:* judgment of a set of criteria based on a scale of 5 levels designed to evaluate how well each criterion was implemented by the software *Ergonomic analysis:* judgment of a set of criteria proposed by Ergolist (2011)	*Object of investigation:* Interchange Arcade computer program (3rd edition). *Pedagogic analysis:* 3 raters (professors at a private graduate school, who did not hold a degree in English or was an EFL student). *Ergonomic analysis:* 1 rater (Computing expert who did not evaluate the pedagogic features of the software)
Assessing EFL learners' perceptions on the use of an educational software for English learning: an analysis of pedagogic and ergonomic features Prebianca; Vieira; Finardi (2014)	- to assess the pedagogical strategies implemented by the educational software from the perspective of the learners - to evaluate, according to users' perceptions, human-computer interaction aspects of the software so as to determine its degree of interactiveness and usability	An initial questionnaire. Blended learning through software use during one academic semester A final term questionnaire	*Object of investigation: Interchange Arcade computer program (3rd edition),* 159 learners from the Agribusiness and Computer Science courses of an Integrated Technical High School Program
Technology, English language teaching and Internationalization at a crossroad: insights from the analysis of a virtual learning environment in Brazil Finardi; Prebianca; Schmitt; Andrade (2014)	- to address internationalization and educational policies in Brazil in relation to the use of technologies in general and the effectiveness of the MEO course for EFL learning in particular, - to discuss the ergonomic features of the software underpinning the virtual learning environment (MEO) as well as its affordances and limitations in what concerns EFL learning	Two questionnaires, one designed to assess students' satisfaction with the course and another to evaluate the ergonomic features of the software. The first questionnaire was composed of open questions which aimed at capturing students' impressions of MEO and its prospective contributions to English learning. The second questionnaire comprised a list of eighteen ergonomic criteria submitted to students' evaluation on a Likert-type scale of six level (0 to 5)	*Object of investigation:* Online self-instructional course *My English On-line,* 25 Brazilian undergraduate students of a federal university
English distance learning: possibilities and limitations of MEO for the Flipped Classroom Finardi, Prebianca; Schmitt (2016)	- to investigate the possibilities and limitations of the MEO course and its potential as an educational tool for learning English in the inverted classroom format, considering the human-computer interaction features of the software.	A questionnaire for the quantitative data. A semi-structured interview for the qualitative data	*Object of investigation:* Online self-instructional course *My English On-line,* 292 students of English at MEO course as part of the *English without Borders* program

Source: Authors'

As can be seen in Table 1, the studies reviewed aimed at investigating several

aspects of two pieces of technology designed to teach English as a foreign language - Interchange Arcade 3rd Edition and My English Online (MEO) -, such as their pedagogic and ergonomic characteristics.

Both educational software are aimed to be used by Brazilian EFL learners as tools for self-instructional learning or as a complement to face-to-face classes. Although both can be used in these two different learning situations, it is worth mentioning that that they are still used, most of the time, in the absence of the teacher. That is why the assessment of pedagogic and ergonomic features of educational software is paramount to validate pieces of technology which intend to promote learning. Table 2 presents the theoretical background adopted by the studies reviewed.

Table 2- Studies' theoretical background.

Studies	Theoretical background
Prebianca; Santos Júnior; Finardi (2014)	The study is grounded on the Theory of Structural Cognitive Modifiability which sees learning as the modification of cognitive structures through mediated learning experiences, defined by their intentionality, transcendence and meaning characteristics. The mediator plays an essential role in the learning process and, as proposed by the authors, the educational software mediates between stimuli and learners, leading them to transcend their actual cognitive stage towards the modification of their reasoning patterns, which in turn, results into learning. It also considers the Human-Computer Interaction theory which seeks to understand the way end users interpret and deal with software, taking into account aspects of interactiveness and usability that may influence users performance.
Prebianca; Vieira; Finardi (2014)	The study assumes a sociointeractional view of learning, in which interaction allows for the construction of historical and social knowledge through which learners become able to notice aspects of the environment that would not be noticed by themselves, in non-interactional situations. As also put forward by the authors, it is important to take into consideration the usability features of the educational software as they might influence the interactions that take place among learners and the computer program and thus, the quantity and quality of knowledge acquisition.
Finardi; Prebianca; Schmitt; Andrade (2014)	Following Finardi, Prebianca and Momm (2013), the authors propose that knowledge of English as an international language as well as digital literacy enable learners to be part of the globalized world. However, the authors believe that language and internationalization policies embedded in the **English without Boarders** Program are not enough to guarantee the critical use of the new digital information and communication technologies in Brazilian educational practices.

Studies	Theoretical background
Finardi; Prebianca; Schmitt (2016)	In line with Finardi, Teixeira, Prebianca and dos Santos Júnior (2014), the authors claim that new teaching methods, particularly the ones that prioritize the use of the new digital information and communication technologies, are needed to fill the gap between students' expectations and teachers' beliefs in what regards English teaching and learning. Based on this argument, and on evidence from Finardi, Prebianca, Schmitt and Andrade (2014) which showed that on-line English courses such as MEO do not afford the development of speaking in the foreign language, the authors propose the implementation of MEO in a hybrid learning environment in the flipped classroom format, where productive skills such as speaking would be given special attention.

Source: Authors'

As can be seen in Table 2, the theoretical background adopted in the studies reviewed included the Structural Cognitive Modifiability Theory, the Theory of Human-Computer Interaction and the Sociointeractional Theory of learning which were to sustain the authors' claim that, in order for learning to take place, it is essential to combine the development of mental operations with sociointeractional aspects of human cognition into a framework that can reflect not only the ergonomic (interactiveness and usability) but also the pedagogic features needed for knowledge acquisition. In Table 3, data analysis regarding the major findings of the four studies reviewed are reported.

Table 3 - Studies' major findings.

Studies	Major Findings
Prebianca; Santos Júnior; Finardi (2014)	In what regards the pedagogic analysis, results indicated that the educational software analyzed had a content-oriented approach to learning, failing to provide detailed feedback that could help learners to understand and correct their errors, thus hampering the development of a meta-cognitive, strategic behavior necessary for language learning. The analysis of the ergonomic features of the software revealed that some of its usability and interactiveness features need re-elaboration so as to permit users' to exercise more autonomy during their performance in the software as well as to capture and internalize aspects of the instructional content that may be applied in novel learning situations, thus leading to structural cognitive modifiability.

Studies	Major Findings
Prebianca; Vieira; Finardi (2014)	The findings of the pedagogic qualitative analysis of the software revealed that both Agribusiness and Computer learners agreed that Interchange Arcade – 3rd edition meets the criteria related to mediation of intentionality, transcendence and meaning and thus, seems to be able to foster the structural cognitive modifiability required for learning to take place (FEUERSTEIN, 1997). Concerning the learners' assessment of the human-computer interaction features of the software, data analysis showed that some usability and interactiveness characteristics of the software are deficient and do not seem to be compatible with learners' expectations.
Finardi; Prebianca; Schmitt; Andrade (2014)	The major findings of the study revealed that relevant aspects of language learning such as interaction and oral practice are not catered by the MEO course, thus hindering the development, specially, of the speaking skill. According to the researchers, MEO's lack of affordance for the development of oral skills may indicate a misconception in educational policies in Brazil in relation to what a proficient learner should be able to do in a foreign language. This seems evident once the reading ability has been the skill mostly emphasized by language policies in Brazil for primary and secondary education. In this sense, the findings of the study suggest that the MEO course falls short of correcting the lack of proficiency by Brazilian EFL learners, as it was created for. Regarding the usability analysis, results showed that the feedback provided by the online course focus on technical aspects of the tasks rather than on the pedagogic ones, which indicates a fragile relationship between the pedagogic and ergonomic characteristics of the software, thus affecting the development of EFL proficiency in a negative way.
Finardi; Prebianca; Schmitt (2016)	The quantitative analysis of the human-computer interaction features of MEO showed that the criteria of Flexibility and User Experience, which refer to aspects of the software usually under user control, were not well evaluated by more experienced learners. This finding was against authors' expectation since it was expected that the criterion of feedback would present the worse assessment by students in the most advanced levels of the MEO course, due to their relatively greater amount of linguistic knowledge. The qualitative analysis of semi-structure interviews, on the other hand, revealed that the feedback (correction/ comments) on the performance of the activities provided by the software (MEO) is limited in the sense that the texts and audios posted by students are not corrected. Data analysis also showed that students consider the lack of pedagogical feedback a risk to fossilization of errors. In their opinion, productive skills such as writing and speaking are seriously affected by the nonexistence of adequate pedagogical feedback.

Source: Authors'

As can be observed in Table 3, the major findings of the studies which analyzed the Interchange Arcade 3rd Edition software – Prebianca, Santos Júnior and Finardi (2014) and Prebianca, Vieira and Finardi (2014), point to differences in the dimensions

investigated: the pedagogic and the ergonomic ones. As regards to the pedagogic dimension, the studies showed that some features such as mediation of intentionality, transcendence and meaning are implemented by Interchange Arcade 3rd Edition, making this piece of technology a relevant one for FL learning. However, the analysis of this dimension also indicated a lack of more didactic, instructional feedback needed for learners to perceive and correct their mistakes thus, raising students awareness in relation to the content being studied and to the learning process itself.

Concerning the ergonomic dimension, the analysis carried out in both summarized studies revealed that some usability characteristics of Interchange Arcade 3rd Edition seem not to be in accordance with learners expectations as the software investigated does not permit students to change color, font types and sizes, background features of the software or even decide to replace the use of the mouse by keyboard commands. In addition, findings of both studies showed that the feedback provided by the educational software at hand is not sufficient to lead learners to knowledge restructuring as it is limited to the technical aspects of the learning activities only.

In the case of the software analyzed by Finardi, Prebianca, Schmitt and Andrade (2014) and Finardi, Prebianca and Schmitt (2016) - the My English Online course (MEO) -, findings indicated that this piece of technology does not fully account for the development of learners' fluent performance in the foreign language since its focus resides on the acquisition of receptive skills such as listening and reading. The results of such studies also revealed that the feedback provided by MEO is narrow in scope thus failing to provide adequate correction for the written and audio texts produced by learners. Finally, Table 4 displays the main conclusions and/or implications of each study.

Table 4 - Conclusions and/or implications of the studies.

Studies	Main conclusions and/or implications
Prebianca; Santos Júnior; Finardi (2014)	The study concluded that the educational software *Interchange Arcade 3rd Edition* seems to be an appealing technological resource to be used in the teaching and learning of English as a foreign language. However, according to the authors, more research is needed to fully evaluate its contribution to foster structural cognitive modifiability (learning), since, due to its more content-oriented approach, the software fails to provide learners' with opportunities to knowledge restructuring.
Prebianca; Vieira; Finardi (2014)	Based on the findings of the study, the researchers suggest that there should be a connection among the software pedagogic characteristics and its interactiveness and usability features in order to foster learners' propensity to structural cognitive modifiability (and thus, learning) as for mediating factors such as intentionality, transcendence and meaning, the core of Feuerstein's (1997) learning theory, seem to be reflected on human-computer interaction features of the software. As a result, the quality of the implementation of such mediating factors by the software also seem to influence the whole learning process.

Studies	Main conclusions and/or implications
Finardi; Prebianca; Schmitt; Andrade (2014)	The study concluded that the EwB program is a relevant internationalization program and an important step to drive internationalization in Brazil forward. However, authors also suggested that it must be improved in at least three crucial ways: (i) offer the actions of the program sooner, for basic education and not only for university students; (ii) offer face to face classes to all students and not only to a limited number of students per institution and, (iii) improve the online course (MEO) so as to provide pedagogic feedback and the possibility for the development of productive skills. The researchers also claim that the informed, critical use of technology must be combined with coherent language policies if the lack of English language proficiency of Brazilians is to be fight off.
Finardi; Prebianca; Schmitt (2016)	Based on the assessment of the human-computer interaction features of MEO regarding the Flexibility, Feedback and User Experience criteria, the researchers concluded that the use of MEO would be optimized if it were handled in the inverted classroom format. Regarding the Flexibility and User Experience criteria, MEO, when used in the form of inverted classroom, could allow users to exercise their flexibility and autonomy in performing the tasks, thus respecting learners' style and rhythm of learning. The criterion of Feedback, in turn, would also be improved both from the ergonomic and the pedagogical point of view so as to guarantee the necessary knowledge restructuring that leads to learning and to provide room for speaking and writing improvement. In both cases, the researchers suggest that the feedback given by teachers in the inverted mode, would allow a more effective use of MEO so as to build the L2 syntactic, grammatical and lexical knowledge also needed for the development of the receptive skills (reading and listening).

Source: Authors'

As depicted in Table 4, Prebianca, Santos Júnior and Finardi (2014) and Prebianca, Vieira and Finardi (2014) agree that, despite some positive aspects, Interchange Arcade 3rd Edition should implement a combination of the main pedagogic and usability features necessary to promote foreign language learning. Its content-oriented approach, present in the evaluated version of the software, seems to prevent the integration of such features thus hindering the L2 learning process, especially in what concerns the building up of metacognitive strategies and knowledge restructuring.

Regarding MEO, the main conclusions of Finardi, Prebianca, Schmitt and Andrade (2014) and Finardi, Prebianca and Schmitt (2016) point to the need for a revision of the software (its implementation and actual use) in terms of the language policies which serve as its foundation. As suggested by both studies, MEO should be given a broader scope so as to foster the development not only of EFL receptive, but also productive skills from earlier formal education stages in Brazil. In order to accomplish that, the authors claim that MEO should be used in a flipped classroom format to allow adequate feedback to be provided along with the necessary linguistic knowledge for EFL speaking and writing improvement.

FINAL REMARKS

This study used a metasummary approach to critically appraise a series of studies (PREBIANCA; SANTOS JÚNIOR; FINARDI, 2014; PREBIANCA; VIEIRA; FINARDI, 2014; FINARDI; PREBIANCA; SCHMITT; ANDRADE, 2014; FINARDI; PREBIANCA; SCHMITT, 2016) which aimed at investigating the validity of educational software as tools to promote the learning of English as a foreign language. The studies reviewed analyzed two online self-instructional courses designed to teach EFL in terms of: (i) the aspects of the interaction between the software and the learner; (ii) the cognitive/mental operations learners need to undergo in order to perform the tasks required by the software; (iii) the pedagogical strategies implemented by the software and (iv) the Human-Computer Interaction (HCI) aspects of the software so as to determine its degree of interactiveness and usability.

In general, it is possible to conclude that the findings of all studies suggest that the quality of mediation offered by the educational software is an important factor in the use of technology to promote language learning. More importantly, the findings revealed that mediating factors such as intentionality, transcendence and meaning seem to be reflected on human-computer interaction features of the software, thus indicating a straightforward relationship among the software pedagogic characteristics and its interactiveness and usability features. In other words, what these studies suggest is that there might not be propensity to learning if pedagogic and ergonomic features are not concomitantly taken into account in the design of educational software.

Besides that, regarding the ergonomic features of software, some of the studies revealed that both of the online self-instructional courses analyzed might not be sufficient to promote language learning by itself since interaction and oral practice are important aspects of foreign language learning not catered by them. In addition, results point to the conclusion that the lack of feedback focused on pedagogic hints rather than on technical ones is a negative feature of both educational software, indicating a fragile relationship between their pedagogic and ergonomic characteristics, which is likely to hinder the development of EFL proficiency.

Taken together, the findings of these studies also show that the instrument designed and used for data analysis in the studies reported here have been accumulating evidence that supports its validity as a way to assess pieces of technology commonly employed by teachers and learners to learn English. In other words, the piece of research presented here seems to present interesting insights for language practitioners and researchers in terms of the contribution of educational software to learning.

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