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| RESEARCH ARTICLE

The Intersection of Computer-Assisted-Language-Learning and SLA

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| ABSTRACT
This article provides an overview of the relationship between Computer Assisted Language Learning (CALL) and Second Language Acquisition (SLA) and how CALL practices can be informed and supported by SLA theories. To illustrate how CALL research has drawn on SLA research, a theoretical discussion of CALL theory and approaches and their underpinning principles in SLA is crucial. Research has proven the effectiveness of educational technologies in language learning. Therefore, it has become mandatory that the effectiveness of educational technologies should be blended with SLA insights about language and language learning to create theoretically and pedagogically sound CALL projects. Moreover, research in CALL, as a relatively new field, should make use of approaches and methods used in SLA research to investigate the questions of interest.

| KEYWORDS
CALL, SLA, Educational Technologies, Language Learning, Assertive Cognitive CREED.

| ARTICLE INFORMATION
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1. Introduction

The field of second language acquisition (SLA) finds itself in a continuous discussion of the rapid development of information and communication technologies (ICT). This discussion revolves around the potential of these technologies to enhance and potentially transform SLA and research in the area of technology-assisted SLA (Reinders and Stockwell, 2017). The integration of ICT in language learning is not new, and teachers and educationalists have long tried to discover how these emerging technologies can be used to enhance the language learning process. Nowadays, new technological devices such as computers, mobile phones, and tablets have become more affordable than before. In most regions of the world, these devices have a constant and stable connection to the internet. This fact necessitates that research must be conducted in different environments to discover how these modern technologies are implemented in language learning.

Computer Assisted Language Learning, CALL for short, is a term used by teachers and students to refer to the use of computers as a part of a language course. Nazlı Gündüz (2005) stated that the term is traditionally used as a means of presenting, reinforcing, and testing language items**.** Jones & Fortescue (1987 cited in Nazlı Gündüz, 2005) criticized this traditional description of CALL as 'unfortunate,' and instead, they described computers as a learning aid that can be used both in and out of class in a variety of ways and for different purposes. Research in this field has developed to the point where CALL should be considered an independent field of study (Zhou, 2010). Sometimes, CALL can simply be considered as a subfield of Computer Assisted Instruction (CAI). However, because CALL is specifically interested in language learning, many researchers consider CALL to be a part of applied language studies and strongly related to SLA. According to Chapelle (2001), the term CALL came to replace CAI in a Teachers of English to Speakers of Other Languages (TESOL) conference in 1983. Since then, the term CALL has been used to refer to the use of technology in the learning and teaching of languages.

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The use of computers in education dates back to the 1960s, although they have been used in other domains since the first half of the twentieth century. The development of research related to the use of computers to create suitable language learning environments paved the way for the evolution of CALL in the 1970s. In America, the first pioneering projects in CALL that introduced computer-based introductory courses were referred to as Computer-assisted Instruction (CAI). The beginning of the 1980s witnessed the spread of computers both in schools and homes.

According to Warschauer & Healey (1998), the history of CALL can be divided into three phases: behavioristic CALL, communicative CALL, and integrative CALL. Under the influence of the audiolingual method, behavioristic CALL was formed and widely used in the 1960s and 1970s. This phase of CALL was characterized by repetitive drills, and the computer was considered a mechanical 'tutor' who did not allow students any kind of freedom to learn at their own pace. Communicative CALL started in the 1980s when the behavioristic approach was rejected both theoretically and pedagogically. Based on communicative language teaching, communicative CALL considers learning as a process of ongoing discovery and development and that CALL activities should focus on using language forms. Integrative CALL began in the 1990s under the influence of learner-centered methods. This time, CALL activities focused more on language use in authentic social contexts.

Many research studies have been conducted in the field of CALL since its emergence in the 1960s. The results of these studies are as different as the variables involved in the learning process. CALL research can be divided into two kinds. The first looks at what happens when learners engage in CALL as compared to non-CALL contexts. The second, which represents the great majority, looks at what "better" outcomes can be achieved in implementing particular CALL practices. Generally, CALL research varies in terms of the types of technologies and the underlying pedagogies, as well as attitudes to technology, patterns of engagement, and the acquisition of aspects of L2 (Reinders & Stockwell, 2017). This continuous research has brought about a change in CALL-SLA research methodology. Researchers began to argue against the traditional comparative method that compares CALL activity with their corresponding non-CALL in an attempt to spot the superiority of one over the other. Now, a variety of qualitative and quantitative methods are used to investigate different areas related to SLA and CALL (Chapelle & Jamieson, 1989).

The intersection between SLA and the new technologies and their potential in language learning yielded the domain of computer-assisted language learning (CALL). Today, the relationship between SLA and CALL has gained the interest of many researchers. Research in CALL has drawn on research in SLA and started to change our understanding of the SLA process (Reinders & Stockwell, ibid). CALL research in SLA has shifted from effectiveness studies that focus on how effective these new technologies in SLA can be to more sophisticated studies that aim at investigating how these technologies can affect language learning (Reinders & White, 2010).

2. Effectiveness of educational technologies in language learning.

Comparative studies of CALL and face-to-face instruction have demonstrated the effectiveness of integrating educational technologies in language teaching. The incurrence of ICTs in different areas of knowledge has made their use in education and language teaching imperative. There has been adequate recent research that studies the effectiveness of technology and how the acquisition of skills and language systems via computers differs from face-to-face interaction (Chappelle, 2009). According to Chapelle, "newer technologies are not limited to the traditional implicit/explicit grammar teaching approaches and offer both learner-computer and person-to-person interactions" (Chapelle & Sauro, 2017cited in Wigham, 2020). Qing Ma (cited in Wigham, 2020) proposed a framework to understand the mediation role of technologies in L2 vocabulary learning. This tripartite framework, i) the role of computer technologies, ii) the incidental/intentional approaches to vocabulary acquisition, and iii) technology-mediated lexical applications, can be used by teachers to select and implement learning resources as well as choose the right technologies.

The use of technology not only facilitates the development of language components but also ensures the formation of language skills for students. Liaw and English (2017 cited in Wigham, 2020) offered an overview of the technologies most relevant to L2 reading based on a synthesis of three perspectives that explain L2 reading processes (structural, cognitive, and metacognitive). These technologies add interactive and social dimensions to the reading process (Liaw & English, ibid). In the same way, Li et al. (2017 cited in Wigham, 2020) offer a classification of technologies for L2 writing and describe the affordances of each. They discussed the importance of promising technologies for L2 learners' writing skills. Hubbard (2017, cited in Wigham, 2020) introduced the affordances of technologies that can support listening for L2 learners. The value of these technologies, according to Hubbard, appears in supporting comprehension, processing, and acquisition. Blake provided "a clearer idea of the rich array of contexts, tasks, and CALL tools that can be used to promote L2 speaking" (Blake 2017, cited in Wigham, 2020). Different studies have tackled the effectiveness of educational technologies in language teaching and learning. Most of these studies demonstrated the "superiority" of technology-based instruction over traditional instruction. However, these affordances do not go without posing challenges for both teachers and learners.

3. CALL theory.

Anyone who went through the literature on CALL research will notice an interesting gap in the area of theory and practice for CALL (Hubbard, 2021). Unlike SLA, which is based on a sound theoretical background, CALL still lacks a clear and comprehensible theory. Hubbard defined CALL theory as follows:

> *Collectively, CALL theory is the set of perspectives, models, frameworks, and specific theories that offer generalizations to account for phenomena related to the use of computers and the pursuit of language learning objectives, to ground relevant research agendas, and to inform effective CALL design and practice.... a CALL theory is a set of claims about the meaningful elements and processes within some domain of CALL, their interrelationships, and the impact that they have on language learning development and outcomes (Hubbard, 2009: p3 quoted in Hubbard, 2021)*

Alternatively, CALL theory has been drawn from other disciplines, including SLA theories, general learning theories, linguistic theories, and human-computer interaction theories. Hubbard (2009, cited in Hubbard, 2021) developed a typology to describe the relationship between CALL theory and practice. CALL research can be described as *'atheoretical'* (based on no theory), *'theory borrowing'* (a theory from another discipline is borrowed), *'theory adaptation'* (a theory is modified to suit CALL environment), "*theory synthesis"* (two or more theories are combined), and a very few examples of *'theory creation.'* Later, Hubbard and Levy (2016 cited in Hubbard 2021) added two other categories to the list: *'theory instantiation'* in which a theory that is related to both language learning and technology is used, and *"theory ensembles"* in which perspectives from two theories are used without synthesizing them in on entity.

4. CALL practices need to be informed by SLA theories.

SLA theories have offered a tremendous understanding of how languages are learned and how language teaching materials may be developed. Research on the intersection between CALL and SLA has raised the issue that CALL should make use of research in SLA (Chapelle, 2016). In an influential article under the title "*CALL in the year 2000: Still in search of research paradigms?*" in 1997, Chapelle illustrated how CALL practices should be informed by SLA. She stated that:

> The suggestion that theoretical concepts from instructed second language acquisition research should be useful for CALL research has been picked up, discussed, and expanded to the point that it is typical for CALL research articles to begin with an explanation of the theoretical basis for the study. Importantly, today, this theoretical basis is typically pertinent to second language acquisition. (Chapelle, C. A. 2016. p. 160).

Failure to make use of insights from SLA in CALL research led to more product-oriented comparison studies that focused on learning outcomes when technology is integrated without any theoretical background to explain their basis. Other studies focused on investigating aspects of technology performance without linking this to SLA theory (Chapelle, 2021). Chapelle (ibid) postulates that it has become imperative today that CALL research studies start with a theoretical background that is pertinent to SLA. Today, CALL research has become much broader than before regarding the different assumptions about what effective language use is. CALL use and development should be driven by second language-informed pedagogy, syllabi, evaluation, and tasks.

Under the influence of Chapelle's work (1997), CALL researchers began to use a variety of approaches that have representation from SLA to design studies and investigate questions of interest. However, because of the ongoing methodological discussion and reform in SLA and the continuous innovation in CALL, developing a research methodology at the intersection of SLA and CALL is challenging (Isbell, 2022). New CALL affordances motivated the emergence of additional and new methods to investigate learning and learning processes (Isbell ibid). Discourse analysis, for example, has been applied with the spread of text-based chat. Similarly, corpus linguistics was used with the introduction of online writing instruction. Existing methods have proven effective in CALL-based SLA research. However, this did not prevent CALL-based SLA research from producing some of its methods. For example, the feature of recording detailed user activity that apps and websites offer produced high-volume records of user behavior and the use of 'learning analytics' (Isbell, 2022).

5 SLA theories associated with CALL

Chapelle (2009) states that incorporating SLA theories in CALL is crucial to rationalizing the vast interaction and linguistic environment provided by technology. To illustrate connections between SLA and CALL, Chapelle (ibid) grouped four general approaches under which several SLA theories fall: cognitive linguistic, psycholinguistic, human learning, and language in social contexts. Such SLA theories can be useful in the development and evaluation of CALL materials and tasks (Chapelle, ibid). Sociocultural theory and the Cognitive CREED theory are among the theories that have been most discussed in the literature on CALL.

One of the theories that is strongly associated with and has been extensively investigated in the field of CALL is sociocultural theory. Sociocultural theory claims that learning is not an individual process but a result of social interaction (Farr and Murray, 2016). Based on this perspective, communication is a vital element of language acquisition (Hockly, 2016). Moreover, L2 learners need to interact with others in a meaningful way and be actively involved in learning by paying attention to form and meaning to acquire it (Hockly, 2016). L2 learners can develop competence through interaction with more knowledgeable people, including computer devices. The role of technology in Vygotsky's theory can be a tool of mediation for social interaction that leads to learning and social growth (Farr and Murray, 2016).

The sociocultural contexts cannot be separated from CALL research because they contain the notion of mediation and how tools can influence human actions (Hockly 2016). Another reason for associating CALL with this theory is that it encompasses various aspects that occur during the negotiation of language, such as identity, social contexts, and technology (Chapelle, 2009). In addition, Hockly (2016) stated that sociocultural theory includes certain behaviors and mental processes that cannot be understood and analyzed without the cultural aspect.

A different language view that has gained much interest in the field of CALL is Assertive Cognitive CREED, which is distinguished by its openness to different theories. Assertive Cognitive CREED theory combines both elements of behaviorist and cognitive theories. It states that learning occurs through repeated exposure to learning content. This theory reused elements of behaviorism, such as repetition and habit formation, that were hardly criticized in the 50s. The influence of this language view is to design CALL tasks that offer optimal exposure to the targeted linguistic learning outcomes (Chappelle, 2009). Additionally, this language view means that skills are acquired through practice, which allows the development of declarative knowledge (knowing what) to be procedural (knowing how) as the language gets more automatized (Chapelle, 2009). Chappelle (2009) suggests that a combination of all the various theories when designing CALL materials provides a wide range of learning opportunities.

6. Conclusion

This paper provided an overview of the intersection between CALL and SLA. It highlighted the ways in which SLA theories can inform and support CALL practices. The relationship between CALL and SLA is mutually beneficial. Integrating SLA theories into CALL practices can enhance the effectiveness of language learning by leveraging technology to provide more personalized, interactive, and engaging experiences. Conversely, insights from CALL implementations can further inform SLA research. CALL and SLA should have a dialectic relationship in which SLA informs CALL practices and research while CALL challenges SLA perceptions and theories. Reinders and Stockwell (2017) used the term "Computer-Assisted SLA" to stress the idea that CALL and SLA are two couple fields.

Technology is in ongoing evolution, creating vast language learning opportunities in various forms. As a result, enormous opportunities are provided for research to investigate the impact and effectiveness of technology in English language learning. CALL, like any applied field, is defined by three dimensions: theory, research, and practice. CALL today still lacks a comprehensible theory that can guide its research and practice. While the relationship between CALL and SLA is promising, more research is needed to determine how CALL can optimally use the research approaches developed and used in SLA. This further investigation will help to refine CALL practices, ensuring they are informed by the most effective and current SLA methodologies.

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