THEORETICAL FRAMEWORKS USED IN CALL STUDIES: A SYSTEMATIC REVIEW

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Abstract

In the last three decades, there has been a great interest in the field of Computer Assisted Language Learning (CALL). As a newly flourished area, CALL borrowed or adapted theories from other disciplines, such as second language acquisition, linguistics, psychology and education; however, it is still questioned how these theories are modified, utilized and integrated into CALL research. In this study, the articles published in *Computer Assisted Language Learning, System, British Journal of Educational Technology,* and *Language Learning and Technology* between 1997 and 2018 were analyzed and the suggested theoretical frameworks for the research studies were examined. First, the articles without any explicit theoretical frameworks were eliminated. Second, the articles with specific theories were categorized and discussed in categories. At the end of the study, it was found that the prominent theoretical frameworks used in the last two decades were Social Constructivism, Sociocultural Theory, and Interactionist SLA in CALL studies. As for further studies, it can be claimed that these prominent theories will continue to be adopted by the researchers no matter what kind of new tools and platforms emerge for educational purposes. These findings might help researchers to better understand the past and the present situation of CALL research and to design further studies.

Keywords: Computer Assisted Language Learning; theoretical framework; Social Constructivism; Sociocultural Theory; Interactionist Second Language Acquisition

1. Introduction

The importance of theories in any discipline cannot be underestimated. Without established theories, the results of the research studies can constitute no more than a collection of data in the field of practice (Perraton, 2010). Depending on the theoretical frameworks, scholars can ask questions, test hypotheses, design their research studies, conduct some empirical studies and predict the future occurrence of the actions. From the educational perspective, the researchers test the validity of learning theories and try to make generalizations referring to the results of their studies in line with the current learning theories.

As a field that emerged towards the end of the 1970s, Computer Assisted Language Learning (CALL) has been of interest to the researchers studying language learning and technology. Warschauer and Healey (1998) described three phases of CALL, which they call Behaviouristic, Communicative, and Integrative. The names of the phases were inspired by the learning theories of those periods. For example, Behavioristic CALL was the first phase of CALL, and it "… was based on the then-dominant behaviorist theories of learning" (Warschauer, 1996: 3). Then, Communicative CALL appeared in the 1980s, because Communicative Language Teaching emerged as a new approach all over the world. As can be seen, the theories used in CALL studies were parallel with the then-dominant learning theories. However, there were no explicitly proposed CALL theories in the literature. The theories were borrowed or adapted from other disciplines, such as second language acquisition (SLA), linguistics, psychology, and education. However, it is still questioned how these theories are adapted, utilized and integrated into CALL research, and what kind of theories were followed in research studies.

On the other hand, some researchers questioned the necessity of CALL-specific theories. Bax (2003, 2011) claimed that the use of computers had been going on through a process of "normalization", and there is no need to find a specific CALL theory. Chapelle (2005) claimed that CALL studies should be grounded on the interactionist view of SLA, and the technique for analyzing the data should be discourse analysis in order to better understand the interaction patterns in conversations. In other words, she claimed that there was no need to find a specific theory for CALL. However, the interactionist SLA theories were criticized for dealing "… exclusively with linguistic dimensions and lacks provision for dealing with cultural dimensions of language learning" (Kern, 2006: 186).

Social Constructivism is another theory that has prominently featured in research studies. The founder of social constructivism was Vygotsky, who emphasized the role of language and culture in cognitive development and proposed that learning occurs as a result of social interaction among learners. According to him, the learners construct their knowledge by interacting with one another. Felix (2002) argued that social constructivism, in which learners construct new information combining their previous experience and newly learned knowledge, could be implemented in CALL studies. Hubbard and Levy (2016) acknowledged that "… social constructivist describes the mind as a distributed entity that extends beyond the bounds of the body into the social environment" (p. 31).

Another commonly accepted theory in CALL studies is the Sociocultural Theory, which grew from social constructivism. It focuses on the social and cultural situatedness of learner activities. O'Rourke (2005) mentioned that the interaction among the learners could not be

reduced to isolated interaction, and the cultural values of the learners are also included in computer-mediated communication. Additionally, the widespread Internet usage has allowed collaborative and cooperative learning, and the ordinary users of the Internet started to create communities of practice – a term coined by Lave and Wenger (1991). The studies that focused on the nature of communities of practice embraced the principles of the sociocultural theory.

Recently, Hubbard and Levy (2016) summarized these three learning theories – the Interactionist view of SLA, Social Constructivism and the Sociocultural Theory – as the main theories that could stand out. In addition to these three learning theories, they listed eight sources of theories in language education and technology as follows:

- *Theory ensemble:* Combining multiple theories in a single study to capture a broader range of perspectives.
- *Theory synthesis:* Creating a new theory by integrating parts of existing ones.
- *Theory construction:* Creating a new theory specifically for some subdomain of CALL.
- *Theory refinement:* Cycles of theory adjustment based on accumulated research findings.
- *Atheoretical CALL:* Research and practice with no explicit theory stated.
- *Theory borrowing:* Using a theory of SLA etc. without change.
- *Theory instantiation:* Taking a general theory with a place for technology and/or SLA consideration.
- *Theory adaptation:* Changing one or more elements of a theory from SLA etc. anticipating or in response to the impact of the technology.

According to Hubbard and Levy (2016), the theoretical frameworks of the studies can be constructed, adapted, borrowed, refined or synthesized from the current learning theories. As they mentioned, there is only one study in which the author claimed that he used the CALL theory in the literature (Oller, 1996, cited in Hubbard & Levy, 2016). Thus, it can be understood that the field of CALL has benefitted from other disciplines and the researchers somehow integrate the theories into CALL research studies.

In this systematic review of the literature, it was attempted to determine what kind of theoretical frameworks have been used in the last two decades. This kind of analysis could be helpful to see the overall picture of theoretical frameworks used in the research studies and to speculate upon future directions for CALL research. For this purpose, the articles published between 1997 and 2018 in the prestigious Social Sciences Citation Index (SSCI) indexed journals

– *British Journal of Educational Technology, System, Computer Assisted Language Learning,* and *Language Learning and Technology* – were analyzed, and the suggested theoretical frameworks in the published research studies were examined. Firstly, 3315 articles published in these journals were downloaded and categorized into separate folders according to their dates. Then, they were added to a reference management software, Mendeley, and the articles were searched for two keywords "theoretical" and "theoretical framework" so that the articles in which the theoretical frameworks were explicitly stated were found. Finally, the articles that focused on language learning/teaching and technology were determined, while the other articles were eliminated. In the end, the authors of 239 articles in total claimed that they had used a specific theoretical framework and these studies were analyzed in terms of the theories embraced throughout the study. Some theories, such as positioning theory (Wu, 2018), concept mapping (Lin, 2016), personal epistemology (Karimi, 2014), were mentioned only once in all data, hence these kinds of studies were ignored.

2. The theoretical frameworks used in CALL research studies

As a result of this systematic review of the literature, some theories were found to be used in CALL research studies. While some of them disappeared in time, some of them emerged as a response to the technological developments in the field. For example, the popularity of educational games in the recent years has led to an increase in the number of studies adopting student engagement as the theoretical framework. In Table 1, the list of the theoretical frameworks mentioned in the studies is presented.

Table 1. The theories used in CALL research studies

The name of the theory	**Sample Paper**	**Journal**
Social Constructivism	Thang, S. M., & Bidmeshki, L. (2010)	*CALL Journal*
Sociocultural Theory	Huang, L. S. (2010)	*System*
Interactionist SLA	Grgurovic, M., & Hegelheimer, V. (2007)	*Language Learning & Technology*
Computer Supported Collaborative Learning	Tsuei, M. (2011)	*BJET*
Learning styles and strategies	Adkins, D., & Guerreiro, M. (2018)	*BJET*
Activity Theory	Choi, H., & Kang, M. (2010)	*BJET*
The Community of Inquiry Model	Lomicka, L., & Lord, G. (2007)	*System*
Student Engagement	Vaughan, N., & Cloutier, D. (2017)	*BJET*

TPACK	Cheng, K.-H. (2017)	*CALL Journal*
Technology Acceptance Model	Lau, S. H., & Woods, P. C. (2009)	*BJET*
Self-regulated learning	Lai, C., & Gu, M. (2011)	*CALL Journal*
Multimodal Analysis of Interaction	Guichon, N. (2017)	*Language Learning & Technology*
Theory of Planned Behavior	Yusop, F. D. (2015)	*BJET*

2.1. From 1997 to 2010

Between the years 1997 and 2010, a total of 109 articles were found to include a specific theoretical framework, and they were explicitly mentioned in the manuscripts. The percentages of theories are presented in the following chart.

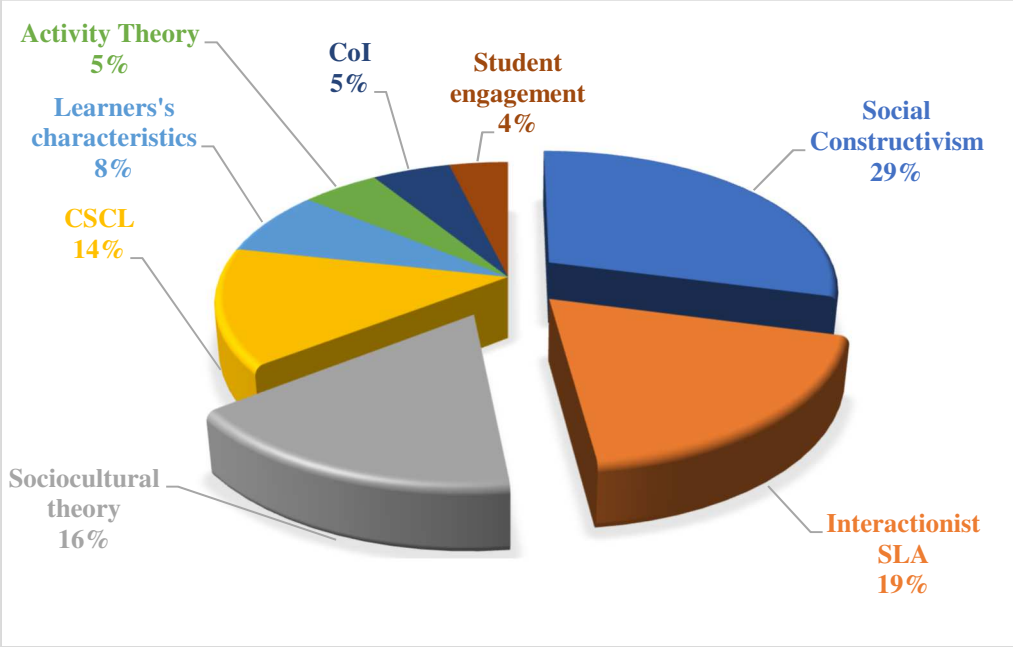

Figure 1. The theoretical framework between the years 1997-2010

As can be seen in Figure 1, the most commonly used learning theory is Social Constructivism, with a percentage of 29%. This finding can be interpreted as the researchers embraced Social Constructivism as the theoretical framework of their studies in almost one-third of articles between 1997 and 2010. Social Constructivism was followed by Interactionist SLA, with a percentage of 19%. In these studies, the most commonly used technique for data analysis was discourse analysis, and the interaction patterns were described as a result of the data analysis. The third most widely used theory was the Sociocultural Theory, and the researchers preferred to include cultural values in the social interactions of the learners. The other theoretical

frameworks were Computer Supported Collaborative Learning (CSCL), Learners' Characteristics, Activity Theory, the Community of Inquiry Model, and Student Engagement with the percentages of 14%, 8%, 5%, 5%, and 4%, respectively. Student engagement can be considered as one of the major premises of all learning theories. That is, it is one of the educators' objectives to engage students during the learning tasks; however, student engagement was taken as a theoretical framework in a minimal number of studies.

2.2. From 2011 to 2018

After determining the theories between 1997 and 2010, the articles between 2011 and 2018 were also downloaded, added to Mendeley and analyzed in the same way. After the analysis of the articles, it was found that 130 articles included an explicit theoretical framework and 12 main theories were observed in the data, as presented in Figure 2.

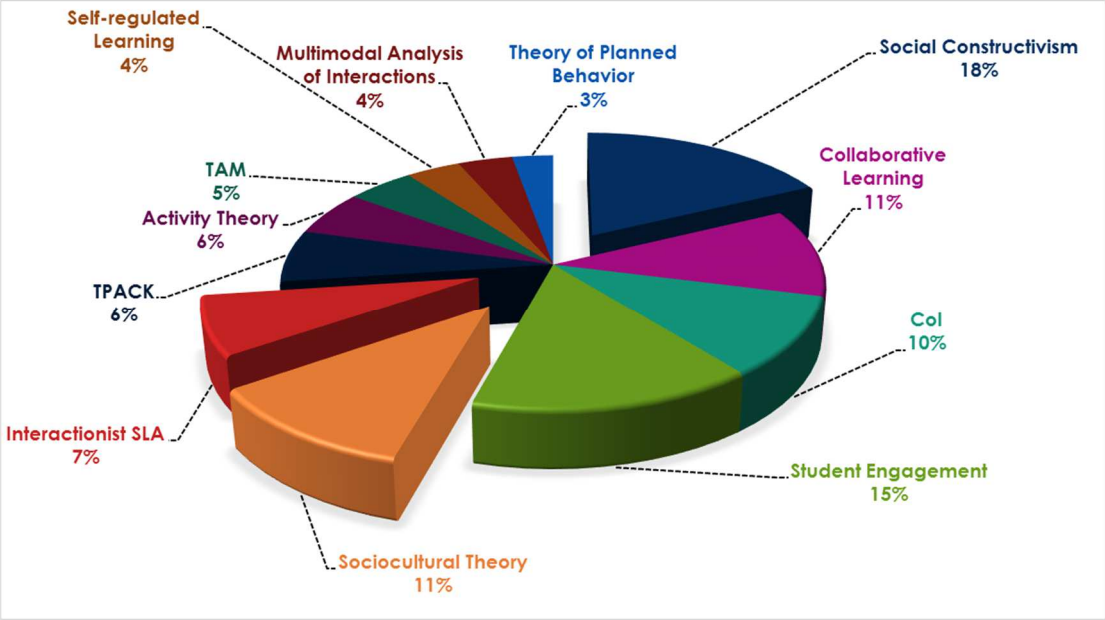

Figure 2. The theoretical framework between the years 2011-2018

As seen in Figure 2, the most commonly mentioned theory is Social Constructivism, with a percentage of 18%, which is similar to the results of the theories used in the articles between 1997 and 2010. Although the percentage of references to Social Constructivism seems lower between 2011-2018, the variety of theories increased in the second phase. Student engagement was mentioned as a theory with a percentage of 15%, and it increased remarkably when compared with the previous period. The proportions of articles that adopted the Sociocultural Theory and CSCL Theory were similar. Although the Sociocultural Theory was estimated, CSCL Theory

interestingly increased in the second phase of the data. These theories were followed by the Community of Inquiry Model (CoI), Interactionist SLA, Technological Pedagogical and Content Knowledge (TPACK), Activity Theory, Technology Acceptance Model (TAM), Self-regulated Learning, Multimodal Analysis of Interactions, and Theory of Planned Behavior with percentages of 10%, 7%, 6%, 6%, 5%, 5%, 4%, 4%, and 3%, respectively.

When the results of two different periods were compared, it can easily be noticed that there are some differences and similarities between the phases covered in this study. These differences can be listed as the diversity of the theories, the decrease of articles with learning styles and strategies theories, the increase in the number of studies mentioning student engagement as the theoretical framework, and continuous reference to Social Constructivism, the Interactionist SLA, and the Sociocultural Theory.

The first difference was in the diversity of the learning theories. In the first phase, the number of theories mentioned in the theoretical framework was 8. However, this number increased to 12 in the second phase, which means that more theories emerged in the field of CALL. The newly developed theories after 2011 were TPACK, TAM, Self-Regulated Learning, Multimodal Analysis of Interactions and the Theory of Planned Behavior. The TPACK Model was firstly mentioned by Punya Mishra and Matthew J. Koehler in 2006 and it can easily be guessed that the first studies using TPACK as the theoretical framework are dated after 2010.

Another difference concerned the articles with learning styles and strategies. Although there was a study with a theoretical framework mentioning learning styles and strategies (Tsai & Talley, 2014), it was not common to use them as the theoretical framework of the studies after 2010. This shift can be explained by another result, which is the increase in CoI and CSCL learning theories. There is a move towards collaborative and cooperative work rather than focusing on individual learning. With the widespread use of the Internet, telecollaboration studies have recently attracted the attention of researchers dramatically, which leads to online communities, collaborative learning and shared networking.

Also, there was a great emphasis on student engagement in the second phase. The main reason for this might be the increase in the studies on educational games and M-learning. The studies on educational games and M-learning mostly focus on student engagement. The researchers hypothesize that if students are engaged in the learning process actively, they learn better. Considering the number of studies on educational games and M-learning increased in the second phase, it was understandable to see the increase in student engagement as the theoretical framework.

Finally, as for the similarity between these two phases, it can be stated that there is a continuous reference to Social Constructivism, the Sociocultural Theory, and Interactionist SLA. These three theories were found to be the most appropriate theories by Chapelle (2005), Kern (2006), as well as Hubbard and Levy (2016). They analyzed the theories used in CALL studies and found that they mostly focused on these three theories. As Hubbard and Levy (2016) mentioned, "Vygotsky's [sociocultural] theory supports a collaborative approach and cooperative learning" (p. 30). Since the importance of social interaction increased in the last decade, collaborative approach and cooperative learning have been focused on more recently.

3. The integration of prominent theories in CALL research studies

As one of the results of this study, some of the leading theories which were quite influential in the research studies of the last two decades were determined: Social Constructivism, the Sociocultural Theory, the Interactionist Theory. In this section, these prominent theories are to be discussed in terms of their implementation in research studies.

Social Constructivism

As mentioned above, this theory proposes that learning occurs through social interaction, and the learners construct new knowledge through combining their previous experience with what they are currently learning. This theory was found to be the most frequently used one in both 1997-2010 articles and 2011-2018 articles. The research articles specifically focus on some critical points related to Social Constructivism. For example, in a research study on undergraduate students' perceptions of an online course, the researchers claimed that "online learning, learner training, learner autonomy, and motivation" (Thang & Bidmeshki, 2010, p.3) are supported by Social Constructivism, and because of the focus of the study, they preferred to implement this theory as their theoretical framework. In another study, Wang, Lin and Liao (2012) explained their preference for Social Constructivism as the theoretical framework, stating that "… educational of use of Web (e.g., weblogs) can support and improve highly effective types of learner-to-learner interactions based upon social constructivist learning theory" (p. 140). Finally, Magogwe, Ntereke and Phetlhe (2015) used the concepts of "independent learning, group work, interaction, and communication" while explaining the rationale of their theoretical framework (p.1315).

From these perspectives, it can be claimed that the Internet environments could provide active social interaction, group work and communication opportunities for learners; and researchers prefer to use Social Constructivism as a theoretical framework of their studies. When

the potential educational use of technology for teaching is considered, it is not surprising to see that Social Constructivism has been the most influential theory in the last two decades. More studies based on this theory can be expected in the following years.

Sociocultural Theory

Vygotskyan Sociocultural Theory posits that higher mental functions of humans develop by participating in culturally organized activities using cultural artifacts and by interacting with more experienced others (Lantolf & Thorne, 2009). In addition to social interaction, culture is another relevant term in this theory. Moreover, the communication with a more experienced partner, which was supported by the Zone of Proximal Development Theory (Vygotsky, 1987), gained importance in this framework.

When the studies in this paper are considered, interaction in collaborative writing (Li & Zhu, 2017), collaborative interaction (Peterson, 2009), collaborative dialogue (Zeng & Takatsuka, 2009), and negotiating and constructing meaning (Tan, Ng & Saw, 2010) were among the main concepts of research studies which claimed that their theoretical framework was the Sociocultural Theory. These studies mostly deal with the interaction among the learners and sometimes between the teacher and the learners, and they specifically focus on learning from each other. However, in the Sociocultural Theory, the interaction is expected to occur between a novice and a more experienced partner. It was observed that some researchers analyzed the interaction data among the learners at the same level (Nishioka, 2016). This point should be taken into account for further studies. Moreover, technological facilities allow the researchers to carry out telecollaboration studies more efficiently, and culture is among the essential issues in telecollaboration studies. Based on the Sociocultural Theory, more online intercultural exchange studies can be expected.

Interactionist SLA

Another essential theory observed in the data of this study is Interactionist SLA. Long (1996) emphasized the role of integration in second language development. Then, Chapelle (2003) acknowledged that this theory was appropriate for CALL research. This theory focuses on the importance of interaction for developing language skills, and the researchers mostly analyze the discourse patterns in the interactions of the learners. However, this approach was criticized since it only focuses on the linguistic dimension of communication and ignores the social and cultural elements during the interaction. However, this theory is still widely used as the theoretical framework of the research studies on CALL.

In the light of the present data, the studies within the interactionist SLA theory mostly focus on Task-Based Language Teaching (TBLT) (Rosell-Aguilar, 2005; Danan, 2010), and the negotiation of meaning (Grgurovic & Hegelheimer, 2007; Yanguas, 2010; Gilbert & Dabbagh, 2005). The researchers believed that learning occurs when learners use the negotiation of meaning functions in their conversation. Since computer-mediated communication studies have increased in number, the body of research on the negotiation of meaning and Interactionist SLA continues to grow. Another dimension in these studies is the TBLT approach and the interaction patterns while completing the tasks are considered as opportunities for language development. Since TBLT is among the current approaches in language teaching, it is not surprising to design studies in accordance with TBLT. However, as criticized by Kern (2006), the studies adopting the Interactionist SLA theory address the linguistic elements ignoring the cultural and social factors. Hence, in the following years, the studies using the Interactionist SLA theory could also integrate cultural dimensions into the studies.

4. Future directions

After reviewing the articles on CALL, it was found that there are still three essential theories, which are quite influential in designing research studies; and this result is consistent with the previous state-of-art articles (Kern, 2006; Chapelle, 2005; Hubbard and Levy, 2016). These three theories – Social Constructivism, the Sociocultural Theory, and Interactionist SLA – have the potential to provide theoretical frameworks for further studies.

It is inevitable for the field of CALL that new technologies and new online platforms emerge for both educational purposes and personal purposes. For example, mobile technologies, educational games, augmented reality, 3D virtual worlds and telecollaboration exchanges between the users of the Internet can be considered as the recently emerged tools and platforms that could be used in educational settings. The literature shows that these new tools and platforms provided a meaningful interaction among learners, increased student engagement level, and support the use of negotiation of meaning functions for the learners (Akayoğlu & Seferoğlu, 2019; Allen, Crosskey, Snow & McNamara, 2014; Baydas & Yilmaz, 2016; Huang, Jang, Machtmes & Deggs, 2012; Reese, Tabachnick & Kosko, 2015, Reinders, 2014; Şad & Göktaş, 2014; Üzüm, Yazan, Avineri & Akayoğlu, 2019). In the following years, it is evident that the studies on the integration of the recently emerged platforms and tools in education will attract the attention of the researchers; however, the researchers will continue to adopt the Sociocultural Theory, Social Constructivism, and the interactionist view of SLA as their central theoretical frameworks.

5. Limitations of this study

This study is limited to the articles published in four journals – *British Journal of Educational Technology, System, Computer Assisted Language Learning,* and *Language Learning and Technology* – indexed in SSCI. Additionally, the articles which explicitly used theoretical framework are taken into account. Although theoretical frameworks in the articles are not expressly mentioned, many studies provide background information, and this might provide a theoretical basis for the study. They might be taken into consideration for further research.

Moreover, research studies on CALL are also published in other journals in educational sciences; however, they were not analyzed in this study. These studies can be searched and analyzed based on specific databases. This kind of analysis can be considered for further research studies, which will provide a broader spectrum for the researchers of CALL.

Finally, although the researchers mentioned that they used a specific theoretical framework for their studies, it could be seen that the context of the research and theoretical framework mentioned in the study might not be consistent with each other. In this review, it was not examined in detail, and the declarations of the authors were taken into consideration.

6. Conclusion

This study was conducted to evaluate the theoretical frameworks embraced by the researchers in the field of CALL. As a result of the study, it was found that the prominent theoretical frameworks used in the last two decades were mostly the same despite rapid technological developments. Social Constructivism, the Sociocultural Theory and Interactionist SLA are found to be the most commonly used theories in CALL studies. It can be claimed that these theories are expected to continue to provide a theoretical framework for research studies in the following years. The main reason for the dominance of these theories is that the CALL researchers mainly concentrate on interaction, negotiation of meaning, cultural exchanges, socially constructed knowledge, communication, collaboration and cooperation in their studies, and the theories mentioned above take these terms as the basis for learning. It is very likely that there will be more studies focusing on educational games, mobile learning, augmented reality, telecollaboration exchanges and 3D virtual worlds in the following years. These tools and platforms will be used for educational purposes more commonly; however, the dominant theories will remain the same because the main concepts will shape CALL studies and they are not likely to change.

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