

Computer assisted language learning and theory: A review of four theories

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Introduction

As stated by Richards and Rodgers (1982), research ought to have a connection to theory, thereby allowing researchers to focus on specific aspects of a study while potentially ignoring. While computer-assisted language learning (CALL) research often refers to theory, no single theory dominates CALL literature (Hubbard, 2008). Rather, Hubbard notes that the subfield of CALL reflects a wide range of theoretical perspectives, which is similar to its parent, second language acquisition (SLA). In this vein, this paper describes four theories—sociocultural theory, multimodal theory, self-determination theory, and the cognitive theory of multimedia learning—and details how these theories have been utilized in CALL research.

Method

All studies reviewed met the following criteria: (1) focused on the use of technology to promote FL development; (2) published within the past 10 years; and (3) explicitly mentioned the theory underpinning the research.

Sociocultural theory

The term *literacy* plays an important role in sociocultural theory. In contrast to dominant views of the term which associate it with cognitive skills, literacy and literacy practices in sociocultural theory are “particular ways of thinking about and doing reading and writing in cultural contexts” (Street, 2003, p. 79). This is significant as literacy practices are reflections of identity. As Mills (2016) points out, sociocultural theory is well-suited for CALL research as advancements in technology are constantly transforming how we communicate with others. Relatedly, research informed by sociocultural theory emphasizes the social practices that occur in everyday life.

Sociocultural theory in CALL literature

An example of a CALL study grounded in sociocultural theory is Peterson's (2012) examination of multiplayer online gaming among four second language (L2) English students at a Japanese university. In the study, Peterson collected chat data from four weekly gaming sessions. In addition to this textual data, he also conducted one-on-one interviews with the participants to gain more insight into their views towards L2 English learning through multiplayer online gaming. According to the chat data, Peterson found that the L2 English students used greetings and informal language to express politeness. Additionally, they established and maintained intersubjectivity (i.e., a shared context for interaction and communication) by making friends and forming teams with other players. Several other important findings were gleaned from the interview data. To be specific, although the students had initial difficulty learning how to navigate the game, they enjoyed playing and thought it reduced FL anxiety and promoted risk-taking. They also thought being able to chat with English native speakers was a useful experience. The results from this study highlight that the everyday practice of gaming can be a beneficial FL learning opportunity for students, particularly in the context of communication with other L2 speakers.

In an additional CALL study which utilized the sociocultural approach, Mroz (2015) examined how critical thinking skills in L2 French were promoted through participation in a virtual environment called Second Life. The participants in her study were comprised of five American university students studying L2 French. During the study, the learners' traditional classroom-based curriculum was replaced for ten days with a Second Life-based intervention informed by sociocultural principles such as learner-centeredness, authenticity, collaboration, and contextualization. Data collected and analyzed from the study consisted of three interviews conducted with the students, observational notes taken by the researcher, students' written notes, as well as video screen recordings. Similar to Peterson (2012), Mroz found that Second Life afforded the learners anonymity, which in turn, led to decreased anxiety and greater eagerness to engage in risk-taking in the FL. Another similarity between Peterson (2012) and this study by Mroz is that learners in both studies had some trouble learning how to navigate their respective virtual worlds. What sets this study apart from Peterson (2012) is that the learners were able to gradually improve their critical thinking skills in L2 French through their interactions in Second Life. Specifically, the learners progressed from lower-level critical thinking processes such as directing instruction and sharing

information to higher-level processes including negotiation and co-construction. These findings by Mroz illustrate that digital tools and virtual environments not only encourage social interaction in a FL, but they also can improve students' critical thinking skills.

While Peterson (2012) and Mroz (2015) examined gaming and virtual environments respectively, Blattner and Fiori (2011) investigated social media using a sociocultural lens. Their study looked at how Facebook could be used to enhance sociopragmatic awareness and multiliteracy skills among 13 L2 Spanish students at an American college. Blattner and Fiori emphasize one of the key tenants of sociocultural theory, namely, that literacy includes a wide range of social practices including digital literacies. The students in the study and their teacher all were members of a class Facebook group and were tasked with finding other public Facebook groups that centered on the themes covered in their Spanish textbook. The students then shared the group with the other members while also describing it in the L2. Finally, the students had to analyze a Facebook group of their choice, paying special attention to the L2 Spanish language used in the group's posts. According to an analysis of the students' verbal and written reports, Blattner and Fiori concluded that the learners' sociopragmatic skills were promoted due to the fact they better understood cultural norms (greeting and leave-taking) and learned colloquial expressions in the FL. These results align with Peterson (2012) who also found that learners gained a better understanding of greetings and informal language through digital tools. Furthermore, Blattner and Fiori found that the students' multiliteracy skills were enhanced via the Facebook project. Specifically, analysis revealed that the learners found the project to be empowering and learned several cultural norms. These results found by Blattner and Fiori underscore that social media can be a valuable resource for FL learners.

In a study on eTandem learning, Yang (2018) explored the perceptions of Korean L2 English learners and American L2 Korean learners on the technology. Similar to the other CALL studies informed by sociocultural theory, this study stressed the importance of social interaction. In that vein, Yang grouped the L2 Korean and L2 English learners in pairs, with students of each FL grouped together. During the study, each pair was assigned four weekly tasks with the aim of enhancing their L2 skills and cultural knowledge. The learners also took part in one group writing activity through a blog. Data collection consisted of two questionnaires, a face-to-face interview, online chat interviews, and the students' blog posts. Yang concluded that each interactional

context provided complementary benefits. Specifically, the students perceived that the weaknesses in one context was compensated for in the other context. For example, one learner stated that she felt the pair work provided her with adequate feedback, while the group blog discussions introduced her to multiple perspectives. However, drawbacks to eTandem and online group learning were noted too, namely, that some learners felt too shy to participate in discussions. These findings show that some learners may not be fully comfortable interacting in a FL, regardless of environment.

Multimodality theory

Multimodality pedagogy centers on meaning-making in both linguistic and non-linguistic forms. According to Kress and van Leeuwen (2001), multimodality is “the use of several semiotic modes in the design of a semiotic product or event, together with the particular way in which these modes are combined” (p. 20). In other words, there is an explicit focus on how different modes affect each other and the differing roles of modes in the meaning-making process. The concept of transmediation, that is, how knowledge is transformed from one mode to another, is one of the key principles in the multimodality perspective. Given that CALL systems often incorporate multiple modes, multimodality is a frequently used theoretical framework in the field.

Multimodality theory in CALL literature

Using a multimodality approach, Oskoz and Elola (2016) studied the impact of multimodal digital stories on L2 Spanish learning. Their study involved six American university students who were majoring in Spanish. After writing essays in the FL, the students created digital stories which incorporated multiple modes (text, image, sound) based on their written texts. Three types of data were collected to understand how modality influenced the FL learning process: online journal entries, student reflections on their work, and a questionnaire. Oskoz and Elola determined that the students recognized that they could use image and sound to amplify the meaning of their written work. Moreover, the process of transforming their essays into digital stories helped them understand the relationship between modes and how they could be manipulated in order to express themselves. These results demonstrate that incorporating multimodality into the classroom can promote an increased understanding of how modes can be used to convey meaning in a FL.

Yeh (2018) also examined how multimodality could facilitate FL learning in a

video-based project she conducted with 69 L2 English students at a university in Taiwan. During the project, students were put into groups and tasked with creating multimodal videos (i.e., videos with visuals, audio, movies, and text) that highlighted local culture in the country. Based on the data she collected, which was made up of reflective essays and the students' videos, Yeh identified several positive themes. Notably, the students remarked that the process of making multimodal videos promoted language learning, especially vocabulary and speaking skills. The learners also indicated that they learned more about their own culture and gained valuable editing skills for multimodality. Similar to Oskoz and Elola (2016), Yeh's study illustrates the benefits of having students engage in tasks that emphasize multiple modes.

In an additional study grounded in the multimodality approach, Abrams (2016) investigated how well L2 learners of German used online multimodal resources focused on a German-language TV show. Thirty undergraduate students at an American university participated in the study. While watching the show and using the online resources connected with the series, the researcher encouraged the learners to take note of how multimodality was utilized, including background images, clothing preferences, music, and hierarchy as indicated through verbal/non-verbal communication. Several forms of data were collected in the study: a survey, comprehension worksheets, focus group discussions, and multiple written assignments. After analyzing the data, Abrams gleaned three pertinent themes: engagement with authentic materials, semiotic awareness, and access to referential knowledge and multimedia literacy. Like the other multimodality studies mentioned, the results from this research highlight that tasks that stress multimodality afford learners meaningful engagement in the FL.

In a study that has implications for the current online teaching situation due to the pandemic, Hampel and Stickler (2012) explored how teachers and students interacted through a multimodal videoconferencing tool. A total of 20 L2 German students at The Open University in the U.K. participated in the study. Data collected included pre- and post-course questionnaires, online feedback forms, videoconference session recordings, interviews, and focus groups with both the teachers and students involved. According to the researchers' analysis, the videoconferencing tool afforded students opportunities for synchronous communication and helped maintain student motivation and relationship building. Several discourse functions were commonly used in the both written and spoken modes: social conversations, negotiation of meaning, teacher feedback, and off-task conversations amongst students. Nevertheless, it was found that the teacher

dominated the interactions, producing nearly half of all output in either mode (speaking or written chat). Therefore, this study informs teachers that they must be conscious about their own output and actively encourage learners to participate in whatever mode they feel most comfortable expressing themselves in.

Self-determination theory

According to Lou et al. (2017), self-determination theory focuses on how learning environments support the development of students' self-regulation, that is, "learning in which students manage their own learning strategies, thoughts, and feeling in the learning context" (p. 215). Given this, learner motivation plays a large role in self-determination theory. Also important in self-determination theory is the idea that certain psychological needs should be met in order for autonomy to be fostered. If not, learners will not have much interest in learning activities even if they are provided with many opportunities for learning. Unsurprisingly, this theory has been used extensively to examine the impact of technology, both in out-of-class and in-school contexts on FL learner autonomy.

Self-determination theory in CALL literature

In an exploratory study, Ockert (2018) looked at how iPad tablet computers could promote positive self-review. A total of 18 L2 English students at a junior high school in Japan participated in the study. The students were split into two groups: a control group and an experimental group which underwent an iPad-based intervention. The intervention consisted of students giving presentations in English while being recorded via iPad. The students then watched the video recordings of their presentations through the tablet. According to the results of pre- and post-surveys, the iPad-based intervention had significantly positive effects on the students' identified regulation (i.e., ideal L2 selves) and intrinsic motivation, both key factors in self-determination theory. These results demonstrate that the use of technology can have a positive influence on learner autonomy, particular in terms of motivation.

Another study which has employed self-determination theory is Fathali and Okada's (2018) study on learners out-of-class use of technology for language learning. The researchers used a survey-based design to determine the relationship between three self-determination theory-based constructs (perceived competence, perceived autonomy, and perceived relatedness) and the students' out-of-class language learning

through the use of technology. A group of 162 Japanese university students who were studying English participated in the study. Based on a statistical analysis of the results, Fathali and Okada found that the students' perceived competence, perceived autonomy, and perceived relatedness positively predicted their intention to take part in out-of-class language learning activities via technology. These findings illustrate that key principles in self-determination theory correlate with students' out-of-school use of technology for FL learning.

Similar to Ockert (2018) and Fathali and Okada (2018), Sergis et al. (2018) also examined CALL using quantitative methods in the context of self-determination theory. Their research consisted of three action research studies conducted in K-12 settings. Each study utilized a quasi-experimental design in which two groups of students participated: (1) an experimental group which was taught under the flipped classroom model, that is, in-class time was devoted to collaborative activities while out-of-school tasks focused on self-learning and self-assessment via digital technologies and (2) a control group which used traditional approaches to teaching and learning. The primary goal of Sergis et al. was to discover how the flipped classroom model affected three self-determination theory constructs, namely, autonomy, relatedness, and competence. Questionnaires and test scores accounted for the data collected in the three studies. According to statistical analyses, the researchers found that the students in the experimental groups in all three studies reported significantly higher levels of autonomy, competence, and relatedness, thus demonstrating that a flipped classroom approached based on digital technologies can have a positive influence on learner needs in the context of self-determination theory.

Compared to the three previously detailed studies which were grounded in self-determination theory, Escobar-Fandino et al. (2018) took a qualitative approach to studying CALL using self-determination theory. Their study focused on the motivational factors related to learning L2 English in virtual environments among students in Columbia. A total of 19 undergraduate students volunteered in the study and were interviewed individually. According to a content and discourse analysis of the interview data, Escobar-Fandino et al. came up with several pertinent conclusions. They found that several external factors influenced student motivation to use technology for L2 English learning such as course resources and CALL methodology. Other factors such as socio-economic stability and personal responsibilities also affected students' motivation. This study highlights the role of external forces in promoting or inhibiting

students' motivation to utilize technology for FL learning.

Cognitive theory of multimedia learning

The cognitive theory of multimedia learning by Mayer (2001) stresses that learners understand information when dual channels are used: a verbal channel which processes written input and a visual channel which processes video and images. According to the theory, if one of these channels is missing, then learning is inhibited. Due to its nature, the cognitive theory of multimedia learning has been featured predominantly in CALL research, particularly in studies involving video (e.g., Gass et al., 2019), thus its inclusion in this paper.

Cognitive theory of multimedia learning in CALL literature

Informed by the cognitive theory of multimedia learning, Lwo and Lin (2012) conducted a mixed-methods study which examined the effects of L2 captions (on-screen text in a FL) among 32 junior high school students in Taiwan. The learners were split into four groups and underwent a multimedia reading program, each under a different captioning condition: no captions, native language captions, L2 captions, and dual captions (L1 and L2 captions). Qualitative data in the form of interviews and quantitative data in the form of answers to vocabulary-related questions were collected. Analysis of the quantitative results indicated that caption type had no effect on vocabulary learning. The qualitative data indicated that the animated images made it easier for the learners to understand the L2 content. Another interesting finding was that the majority of those in the no captions group wanted captions along with the animations. These findings underscore the importance of visual information when learners process FL input.

In a quasi-experimental study grounded in Mayer's theory (2001) and also centered on vocabulary learning, Samur (2012) investigated the role of captions on the acquisition of L2 Turkish vocabulary. A total of 22 American undergraduate students participated and were divided into two groups: one which viewed an animation with aural narration and on-screen text and another which viewed the same animation with aural narration only. A multiple-choice vocabulary test was used for data collection. It was found that the group which viewed the animation with both narration and on-screen text outperformed the group which viewed it with narration only. This study illustrates the importance of multiple channels in promoting L2 learning, thereby

aligning with Mayer's theory.

Gass et al. (2019) investigated the use of captions on L2 video comprehension. They also examined if working memory, which also plays an important role in Mayer's theory (2001), impacted caption use and/or comprehension. The researchers conducted two experiments to achieve their research aims: one involving L2 English learners and another involving L2 Spanish learners. All the participants were adult FL learners at a large American university. In both experiments, the same video was used; however, the L2 Spanish learners were split into two groups (no captions and L2 captions) while all the L2 English learners viewed the target video with captions. Among other findings, the researchers discovered that L2 captions promoted comprehension and that working memory had a little to medium effect on video comprehension. The results by Gass et al. show that individual differences in working memory can influence how L2 learners use and process captions in multimedia programs.

Similar to the other studies influenced by Mayer's theory, Vasconcelos's (2012) research focused on multimedia activities. The goal of his study was to evaluate students' preferences and behaviors when utilizing L2 websites which were designed to raise interest in cultural topics related to the FL (Portuguese). Undergraduate students at an American university participated in the study and were assigned to complete five online modules. Surveys were also administered to gain a better understanding of the students' views and behaviors when navigating the websites. Vasconcelos found that students preferred to read the FL texts of the modules compared to reading annotated versions of the texts which included glossaries to increase understanding. In addition, it was found that the video activities helped supplement the text, thereby increasing comprehension. The results also indicated that the websites promoted interest in Portuguese culture. Specifically, the students stated that the online modules motivated them to learn more about topics that were not covered in the classroom. These findings illustrate that the integration of different multimedia (audio, video, and text) can enhance understanding of a FL and its culture, which aligns with Mayer's cognitive theory of multimedia learning.

Conclusion

Four theories were covered in this paper in the context of CALL research: sociocultural theory, multimodal theory, self-determination theory, and the cognitive theory of multimedia learning. While each theory has its merits, I believe sociocultural

theory would be the most appropriate framework for my research. First, sociocultural theory is a commonly used approach to examine learners' digital practices (Mills, 2016). Given that I plan to focus on students' use of video streaming for informal FL learning, sociocultural theory would be a good fit. Moreover, sociocultural theory takes a very broad view of literacy practices. Similarly, I would like to investigate how video streaming, a practice that is typically associated with entertainment, can help contribute to literacy development. To the best of my knowledge, only two studies (Dizon, 2018; Wang & Chen, 2019) have specifically investigated video streaming in the context of FL learning. My research would build upon these previous studies and explore how both formal and autonomous FL learners (i.e., self-directed learners who do not receive formal instruction in the FL) use video streaming to enhance their own FL development.

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