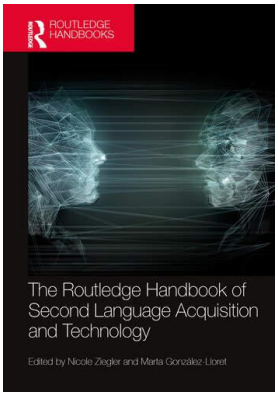

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INTERACTIONIST PERSPECTIVES AND THE ROLE OF COMPUTER-MEDIATED COMMUNICATION IN SLA

Nicole Ziegler, Özgür Parlak & Huy Phung

Introduction

The interactionist approach to second language acquisition (SLA) posits that receiving input (Long, 1981, 1996), engaging in negotiation for meaning (Varonis & Gass, 1985), and producing output (Swain, 1985) during meaning-focused interaction facilitates second language (L2) development. Through negotiation and corrective feedback, learners' attention may be drawn to noticing the gap between their own production and target forms (Gass, 1997). Furthermore, learners have the opportunity to monitor their production (Swain, 1995, 2005), as well as test their hypotheses about the L2, when they produce output. Together with learners' cognitive capacity, these factors work jointly during conversational interaction and facilitate L2 development (Long, 1996). This particular link between communicative interaction and L2 development is supported by empirical and synthetic research conducted over the last three decades (e.g., Mackey, 2020; Mackey & Goo, 2007; Ziegler, 2016).

In parallel to the advancements in computer technology and the growing use of computers in education during the past few decades, the topic of language learning through computer-mediated communication (CMC) has become an area of increasing interest for SLA researchers. For example, Chun (2016) and Chun et al. (2016) noted that CMC is one of the most researched areas within technology-mediated language learning, with the interactionist approach serving as one of the leading theoretical frameworks grounding this work. An important goal of CMC research has been to investigate to what extent interactional features are present in technology-mediated contexts, and whether they may yield similar results in computerized/technology-mediated environments as those found in traditional, face-to-face contexts. Research findings demonstrate that interaction, negotiation for meaning, and attention to form are present in CMC environments (e.g., Michel & Cappellini, 2019; Yilmaz, 2011), with synthetic research indicating positive effects for interaction on a range of L2 learning outcomes (e.g., Lin, 2015; Sauro, 2011; Ziegler, 2016). Overall, then, research has shown that interaction in CMC environments provides learners with valuable developmental opportunities. Taking this view as a point of departure, this chapter provides an overview of the productive relationship between SLA and CMC within the interactionist approach.

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Historical Perspectives

The interactionist approach to SLA can be traced back to the late 1970s as the confluence of several concomitant lines of research, which highlighted the role of conversation as a venue for language acquisition. Hatch (1978) suggested that communicative, as well as linguistic knowledge, "evolves out of learning how to carry on conversations, out of learning how to communicate" (p. 63). Grounded in this research, Long (1981, 1983) examined how native speakers (NSs) and non-native speakers (NNSs) modified their conversational structures to facilitate communication, leading to his proposal for the earlier concepts of negotiation for meaning and interactional modifications. He argued that interactional adjustments provide learners with opportunities to receive comprehensible input through negotiation, a necessary condition for SLA (Long, 1981). Subsequent research identified different types of conversational modifications and their potential impact on learners' comprehension (e.g., Gass & Varonis, 1985). Adding to this work, Swain (1985) argued that input was necessary but insufficient for language development and that through the production of output, learners would have the opportunity to test their current L2 knowledge as well as monitor their production (Swain, 1995, 2005). Researchers also recognized the importance of attention and noticing for intake and subsequent learning, particularly in terms of learners' recognition of mismatches between their utterances and the target language (Schmidt, 2001). Therefore, Long (1996) updated his earlier version of the Interaction Hypothesis to incorporate these constructs, arguing that "negotiation for meaning, and especially negotiation that triggers interactional adjustments by the native speaker or more competent interlocutor, facilitates acquisition because it connects input, internal learner capacities, particularly selective attention, and output in productive ways" (p. 451). Studies investigating the impact of interaction on L2 development and performance grew over the following decades, with hundreds of empirical studies providing direct and indirect evidence for the efficacy of interaction for SLA (see Mackey, 2012; Mackey & Abbuhl, 2005). This growing body of empirical work resulted in a number of subsequent meta-analyses confirming the developmental benefits of interaction for L2 learning outcomes across contexts, ages, settings, and modalities (e.g., Bryfonski & McKay, 2017; Mackey & Goo, 2007; Ziegler, 2016).

Likewise, there was an increasing interest in how computers might support language teaching and learning, with educators and scholars exploring the potential role of technology for a variety of topics in Computer-Assisted Language Learning (CALL; see Chapter 1 and Chapter 2, this volume). As this diverse body of research grew, Chapelle (1998, 1990, 2001) encouraged the use of SLA theories and research methods as a foundation for empirical exploration, as well as the need to investigate the efficacy of computers and technology for pedagogical applications. Interest in CMC research grew quickly, as it offered a wide range of alternative learning environments to traditional face-to-face (FTF) communication by removing spatial and temporal boundaries, thus making it possible for learners to interact with interlocutors beyond the physical classroom context. Beyond these advantages for expanding interactional opportunities, findings from interactionist CMC research suggest a number of affordances for language learning (Doughty & Long, 2003; Ortega, 1997), such as encouraging learners to be highly active participants compared to the traditional classroom context (Beauvois, 1992; Chun, 1994; Warschauer, 1996), equalizing the role of the teacher and more participatory learners with learners who may be more hesitant to communicate (Kelm, 1992; Tudini 2003), providing extra time for processing input or producing output (Kitade, 2000; Pellettieri, 2000), allowing for scrolling back to earlier parts of the conversation and thus potentially supporting noticing of feedback and target language features (e.g., Lai & Zhao, 2006), reducing anxiety levels (Abrams, 2003; Kern, 1995; Satar & Özdener, 2008), and promoting positive attitudes toward language learning (Yanguas, 2012). Recent studies, such as Michel and Smith's (2018) use of eye-tracking to examine alignment in SCMC or York et al.'s (2020) comparison of interaction in the modes of voice, video, and virtual reality, have since continued to evolve beyond descriptive research and comparisons across FTF and CMC, focusing

instead on the affordances offered by technology to support and facilitate the benefits associated with interaction.

Critical Issues and Topics

Numerous studies have demonstrated the efficacy of interaction for L2 development, with research during the last few decades examining the role of interactional features on L2 performance and developmental outcomes in text, voice, and video CMC environments (e.g., Blake, 2000; Smith, 2003; Yilmaz, 2011).

Negotiation and corrective feedback, which can be provided by learners, teachers, or NSs of a target language, may occur in response to learners' erroneous L2 utterances. Negotiation provides opportunities for both positive and negative evidence through enhancement of the salience of the input, potentially drawing learners' attention to differences in their production and that of the target language, thereby creating an ideal environment for L2 development (Gass & Mackey, 2006; Mackey, 2020). Initial research examining interaction in CMC environments demonstrated the occurrence of negotiation and feedback in response to misunderstandings (e.g., Chun, 1994), with studies suggesting text-based CMC may provide unique affordances due to the written format of the interaction. For example, by providing learners with a written record of their conversational interaction, text chat offers extended opportunities for learners to juxtapose their output with the input they receive. The unique environment of text chat may also help increase the salience of the input through visual representation, potentially enabling learners to "practice and gain control over more cognitively demanding aspects of grammar that otherwise might not be so frequently practiced in classroom oral interaction" (Pellettieri, 2000, p. 82).

Learners interacting in text chat may also benefit from greater processing times when compared to FTF interaction. Studies suggest that text chat provides learners with additional processing time, potentially reducing working memory load and promoting monitoring of their output and noticing erroneous production (e.g., Pellettieri, 2000; Smith, 2004; Yilmaz, 2012), allowing learners to produce more complex language (e.g., Payne & Ross, 2005; Pellettieri, 2000). These potential benefits are partially a result of the slower turn taking between learners (Beauvois, 1992), as typing speed is relatively slow compared to real-time verbal interaction (Fuente, 2003). There is also a short delay between sending and receiving utterances, which may be used by the learner to further analyze the input or their output. Importantly, Smith (2003) identified differences in negotiation patterns across CMC and FTF interaction, with results demonstrating split negotiation routines in text chat, in which there were delays between a trigger and subsequent response. Introspective methods, such as stimulated recall, provide support for learners' utilization of this extra time through learner comments that mention opportunities for scrolling to previous lines, reviewing output, and attempting self-repair (Lai & Zhao, 2006). Learners' ability to scroll through the chat script may also impact the quantity and quality of negotiation, with Smith (2009) finding that while scrolling facilitates self-repair, it can also reduce the amount of negotiation as learners correct their errors without having to negotiate for them. Similarly, split negotiation routines, and the non-contingent corrective feedback associated with these patterns, may reduce noticing of implicit feedback moves such as recasts (Lai et al., 2008; Loewen & Erlam, 2006; Ortega, 2009; Ziegler, 2018a; however, see Yanguas, 2010 for an alternative perspective).

Scholars have also explored the potential affordances of CMC for noticing, a necessary condition for SLA (Schmidt, 2001). Findings demonstrate the benefits of text chat for encouraging learners to reflect on their interactions (Beauvois, 1992) as well as attend to the input and their errors in the L2 (e.g., Payne & Whitney, 2002), thus supporting learners' noticing of target-language features. For example, Smith (2012) used eye tracking and stimulated recall to measure noticing of recasts during text chat, finding that learners noticed more than half of the recasts. More recently, Ziegler (2018a) explored the role of modality on the effects of recasts and salience on learners'

noticing in video-chat, text-chat, and FTF environments. Results demonstrated that modified output predicted noticing of recasts in the video-chat and FTF conditions but not in the text-chat condition, highlighting the need for further research exploring noticing across multiple modalities.

CMC may also promote an increase in the quantity of language output, particularly for less communicative students, by providing "an anonymous, less pressured environment that tends to lower the affective filter" (Beauvois, 1992, p. 171). Increased output could potentially occur in the form of more turns and/or longer utterances. Higher output production may create opportunities to benefit more from the interaction through increased negotiation and noticing. Thus, researchers investigated to what extent interaction in technology-mediated environments might offer a less-stressful environment in which learners can produce and modify output with reduced social pressure (e.g., Côté & Gaffney, 2018; Lee 2002; Payne & Whitney, 2002). Findings were mixed, with some research demonstrating that interaction in CMC may encourage more equitable participation across learners than in FTF interaction (e.g., Kern, 1995), as well as increase learners' practice time outside of the classroom (Bueno-Alastuey, 2011), while others found little differences in anxiety across modality (e.g., Baralt & Gurzynski-Weiss, 2011). In addition, a growing body of research in FTF interaction has examined the effects of meta-cognitive instruction on learners' production of interactional features, including the quantity and quality of corrective feedback learners provide to their interlocutors during interaction (e.g., Fujii et al., 2016). Building on this work, Ziegler et al. (2020) examined how metacognitive instruction influenced learners' interactional behaviors in text chat. Results provided encouraging evidence, with learners increasing the number and resolution of LREs during CMC.

Current Contributions and Research

The Role of Modality

Research has continued to examine interactional features and constructs across different modes, with studies exploring the affordances of both individual and combined technologies. Although the majority of research in CMC interaction has investigated text-based contexts, a growing body of research has sought to expand beyond text-based CMC by examining oral modes of technology-mediated interaction. For example, research comparing voice-chat and FTF interaction demonstrated a greater occurrence of repair moves in the voice-chat condition (e.g., Blake, 2009; Jepson, 2005). Comparing learners' negotiation of target and non-target lexical items in voice-chat, video-chat, and FTF environments, Yanguas (2010) found that video-chat and FTF communication yielded similar amounts of overall negation moves, while the voice-chat condition demonstrated a higher percentage of negotiated turns. Importantly, while learners in the voice-chat group responded to an overwhelming number of negotiation triggers through elaboration, the video-chat and FTF groups used gestures roughly half of the time, suggesting that the lack of visual support encouraged more elaboration and output, a point that has also been raised as a potential affordance for text-chat CMC (e.g., Blake, 2009; Lee 2002) or voice-chat CMC (e.g., Bueno-Alastuey, 2011).

Bueno-Alastuey (2010) found that learner dyads engaged in voice chat were able to improve their pronunciation regardless of their conversation partner's L1 background. Similarly, comparing oral interaction in FTF and voice-chat environments, Bueno-Alastuey (2011) found that although learners in both modalities improved their oral proficiency, those who carried out tasks in a voice-chat environment showed significantly higher gains. Longer time on task and the lack of visual cues in the voice-chat environment may have potentially contributed to the higher gains. In other words, receiving solely audio input, as opposed to both visual and audio input, may have reduced learners' cognitive load, thus potentially supporting a greater focus on form (Mayer & Moreno, 2003; Yanguas, 2010).

Additionally, language-related episodes (LREs), defined as "any part of a dialogue where the students talk about the language they are producing, question their language use, or correct

themselves or others" (Swain & Lapkin, 1998, p. 326), focusing on pronunciation were found to occur more often than those focused on lexico-grammar in voice-chat conditions (e.g., Bueno-Alastuey, 2010; Jepson, 2005), while Loewen and Isbell (2017) found lower occurrences of pronunciation-related LREs in voice chat than in FTF. Loewen and Wolffe's (2016) investigation of interaction in FTF, video-chat, and text-chat modes demonstrated that FTF and video-chat conditions yielded similar patterns of interaction, with findings demonstrating that more LREs and confirmation checks occurred in these modalities than in text chat. More recently, Yanguas and Bergin (2018) found no differences in terms of the numbers of LREs across voice-chat and video-chat CMC conditions, although there were a greater number of unresolved LREs in the voice-chat condition. Overall, these findings highlight the need for additional research exploring how voice chat may impact the quality of learners' production and interaction.

Empirical evidence has also shown that interaction in video-chat and FTF environments may yield different L2 learning outcomes. Canto and Jauregi Ondarra (2017) compared communication over video-chat, FTF, and the virtual world *Second Life* conditions. Results demonstrated that participants in the video-chat and Second Life conditions improved their oral proficiency significantly on the posttest, whereas FTF group did not show significant gains. In addition, the number of negotiations in the FTF condition was much fewer (n = 2) when compared to the video-chat (n = 23) or the Second Life (n = 27) conditions. However, the differences may have occurred due to the study design, as the FTF group did not have the opportunity to interact with a NS interlocutor but only with other learners. Although the study design prevents the drawing of robust conclusions regarding the impact of modality on the amount of negotiation, results suggest that video chat may be a promising modality for promoting oral proficiency. Further research is necessary for a fine-grained understanding of the role of modality on the quality and amount of interaction, as findings thus far indicate that video-chat and FTF conditions yield similar types of interactional patterns whereas text-chat and voice-chat communication may yield different interactional patterns with different levels of language development.

Corrective Feedback and Modality

Corrective feedback plays a central role within the interactionist framework as it provides L2 learners with negative evidence that may direct their attention to differences between their erroneous utterances and more targetlike production, thus facilitating L2 development. Building on previous studies which confirmed the efficacy of corrective feedback in FTF interaction (e.g., Li, 2010), research on interaction in technology-mediated environments has investigated the impact of different types of corrective feedback on L2 development and learning. For example, Monteiro's (2014) partial replication of Ellis et al. (2006) found that groups receiving recasts and metalinguistic feedback, as well as the group who did not receive feedback but only completed focused tasks, were all able to improve their implicit and explicit knowledge of grammar with no statistical difference between any two groups over time. Unlike the precursor study, which indicated an advantage for explicit corrective feedback, Monteiro found that video-chat interaction may potentially promote L2 development regardless of feedback type. Similarly, Rassaei (2017) examined the effects of recasts on learners' oral production in video-chat and FTF conditions, with results demonstrating no differences across modalities. Comparing FTF and SCMC interactions, Gurzynski-Weiss and Baralt (2014) investigated learners' perceptions and use of corrective feedback, finding similar amounts of noticing across modalities. However, learners provided more modified output opportunities in FTF interactions, and also took advantage of these production opportunities more often in FTF than in SCMC contexts. In a similar line of inquiry, Gurzynski-Weiss and Baralt (2015) found that modified output predicted learners' noticing, with results suggesting differences in predictive power across modalities.

SLA researchers have also examined the ways in which corrective feedback provided in CMC environments affects L2 pronunciation development. Parlak and Ziegler (2017) explored the effects of corrective feedback on the development of lexical stress in video-chat CMC and FTF environments. Results indicated that a smaller set of target words identified through auditory judgments demonstrated significantly improved stress patterns, although no statistical gains were found using acoustic analyses for either the FTF or video-chat CMC group. More recently, Bryfonski and Ma (2020) focused on perceptual and productive development of pronunciation by providing learners with implicit and explicit oral corrective feedback during video-chat interactions. Their results showed that both types of feedback moves had a significantly positive impact on perceptual and productive development; however, receiving recasts led to higher scores on the posttest. Bryfonski and Ma (2020) was also bimodal in nature, which allowed corrective feedback provision on grammatical errors through text chat. Although the focus of the study was pronunciation development, the technological tools adopted in this study demonstrate the affordances provided by bimodal communication, in which written or oral feedback may be provided in an alternating manner depending on learner needs.

Research has also explored beyond FTF interaction and text-based CMC, extending to other modes of interaction, such as voice-, video- and multimodal interaction. For example, Ziegler and Phung (2019) compared interactional features across four modes of interaction. They highlight the contributive role of each mode of interaction on learners' interactional behaviors and perceptions, particularly the role of multimodal interaction when learners and interlocutors employed various affordances in order to complete a task together. As these studies show, particularly multimodal CMC allows for more flexibility in terms of corrective feedback provision compared to traditional classroom environments. However, the effectiveness of corrective feedback provided during CMC interaction is an area that requires more research.

Task-Related Factors

The relationship between the features of interactional tasks, such as task complexity and modality, has also been found to mediate the effectiveness of interaction for L2 development. For example, Baralt (2013) found that learners engaging in complex tasks and receiving recasts improved on grammar measurements. However, this was true only for the FTF group. Interaction through text chat was most effective when learners carried out simple tasks. Similar results have been found for learners' L2 writing. For example, Adams and Nik's (2014) findings indicate that as task complexity decreased, learners' production increased. In a similar line of research, the results of Adams et al. (2015) demonstrated that task complexity impacted learners' L2 accuracy but not the complexity of their production. In addition to complexity, task type has also been identified as an influencing factor on the benefits of interaction. For example, Yilmaz's (2011) results indicated that the number of LREs that learners engaged in was mediated by type of task. For example, the dictogloss task, which required learner dyads to listen to a story and reconstruct it in written form, led to greater production of LREs than the jigsaw task, which required learner dyads to organize a series of pictures and construct the story in written form. Although the tasks in the study were carefully controlled for complexity, Yilmaz suggests that the jigsaw task may have required more attention, making it potentially more complex than the dictogloss task. Zeng's (2017) examination of collaborative dialogue in text-chat and FTF conditions yielded similar results, with findings demonstrating that a significantly higher number of LREs were produced during the dictogloss task than in the jigsaw task in both modalities. Research has also investigated pre-task planning in CMC, with findings demonstrating limited benefits for learners' L2 production (e.g., Adams et al., 2014; Ziegler, 2018b). Overall, these findings suggest that task features, such as complexity and planning time, may not have the same effects on learners' performance and production in technology-mediated environments as they might in FTF interaction (Baralt, 2013; Collentine, 2010, 2013).

Linguistic Alignment, CMC, and Interaction

Developing in parallel with interaction research in FTF contexts, research on conversational alignment in CMC is a relatively recent topic of exploration. Defined as the "automatic tendency of interactants to reuse each other's morphosyntactic structures and lexical choices in natural dialogue" (Michel & Cappellini, 2019, p. 1), conversational alignment refers to the repetition of a form used in previous discourse. Research by McDonough and colleagues (e.g., Kim & McDonough, 2016; McDonough & Mackey, 2006) suggests that alignment might be used to prime learners to produce more target-like utterances or elicit forms found to be infrequent or previously avoided.

Examining how the affordances of interaction in technology-mediated contexts might mediate learners' use of alignment, Dao et al. (2018) and Michel and Stiefenhöfer (2019) found differences in terms of task type and its influence on how learners aligned with their interlocutors, suggesting that task type impacts how receptive learners may be to alignment. Drawing on eye-tracking methodology to examine learners' alignment on lexical items, Michel and Smith (2018) and Michel and O'Rourke (2019) found that higher numbers of eye-gaze fixations on lexical chunks indicated likelihood of later alignment. However, findings also demonstrated that alignment occurred with lexical units that did not register high numbers of fixations. In other words, the evidence regarding the relationship between alignment and gaze remained unclear. Rather, learners' responses from post-task interviews suggested that type of interlocutor, as well as their own proficiency, influenced whether they elected to align with their interlocutor's production (Michel & O'Rourke, 2019). Michel and Cappellini (2019) also found that lexical and grammatical alignment can occur in interaction in CMC, although learners' alignment was influenced by interlocutor type and target structure.

Extending this line of research to draw direct comparisons across mode of interaction, Kim et al. (2019) compared linguistic alignment across FTF and CMC contexts. In addition, the relationship between learners' working memory capacity, prior knowledge of and proficiency in the target structure (English) was examined. Results demonstrated alignment in both FTF and CMC interactions, providing additional support for previous research. CMC, however, was found to facilitate alignment more frequently, highlighting the need to further explore whether the affordances associated with text chat, such as longer processing times (Smith, 2004), the ability to review a visual representation of learners' production (Pellettieri, 2000), and to scroll up and down to facilitate self-repair (Smith, 2005), may have influenced learners' alignment. Kim et al. (2019) suggest that CMC may have facilitated greater alignment due to the potentially enhanced saliency, and thus opportunities for noticing, available in text-chat. In terms of development, results indicated that both treatment conditions performed better on immediate posttest measures than the control group, with the CMC group also outperforming the control group on delayed posttest measures. Most recently, Kim et al. (2020) found that learners in FTF and CMC interactions produced target structures more often following alignment, further supporting previous research (e.g., McDonough & Kim, 2009). The results of this research indicated greater alignment in CMC than in FTF interaction for direct questions, suggesting that modality influences the degree to which learners will align with their interlocutors. Type of target structure also played a role; however, no significant differences were found for indirect questions across modes of interaction. Taken together, these findings underscore the potential for alignment to further support L2 development during interaction, particularly in computer-mediated contexts.

Research Methods

Interaction researchers employ a variety of methodological approaches reflecting the wide range of research questions being investigated (for detailed information on research methods for interaction,

see Mackey, 2020). That said, CMC environments provide researchers with unique methodological advantages, particularly in terms of data collection, which are absent in FTF environments. One such methodological feature unique to text-chat environments is the ability to create video-enhanced chat scripts (Sauro & Smith, 2010; Smith, 2008). Using screen capture software, researchers can record learners' online language production in real time. The software records each key stroke, allowing for the recording of partial or complete language that learners produce, even the language that was produced but deleted before being transmitted to an interlocutor. In other words, this technology allows researchers to "observe what learners are capable of doing, rather than only what they choose to contribute to an interaction" (Ziegler, 2018b, p. 208).

Video-enhanced chat scripts also potentially provide a window into a range of cognitive processes. For example, they show scroll movements, which may provide information about what learners focus on in the input or their output, including the instances of their self-repair (Smith, 2009). Ziegler (2018b) highlighted the potential of screen capture and video-enhanced transcripts for capturing behaviors that are otherwise difficult to observe, such as avoidance of lexical and grammatical items. Also, when used in conjunction with eye-tracking technology, such as in Smith (2010), video-enhanced chat-scripts can provide valuable information about how learners notice, process, and produce target-language features. For instance, Smith (2010) used heat maps created with the help of an eye-tracking device to determine whether learners noticed the recasts that they received during text-chat communication. As these examples show, CMC can be an ideal platform for collecting cognitive data that may not be obtainable during FTF interaction.

Bimodal interaction is another unique methodological feature of CMC environments (Blake, 2005). Unlike the traditional FTF environment or the singular text, voice, or video-chat environments, the bimodal environment allows learners to interact through a combination of two or more modes simultaneously as in voice-and-text or video-and-text modes. The voice-text mode provides a venue for communication where the advantages of text chat exist side-by-side with elements of verbal communication. In the video-text mode, there is also the added possibility of utilizing paralinguistic features to aid communication. Bimodal interaction provides learners with the opportunity to produce output and receive input in various forms. For example, researchers can utilize written and oral corrective feedback to address different target language features during the same bimodal communication session (e.g., Bryfonski & Ma, 2020). In the same way, learners can utilize bimodal communication to produce output in different forms, which not only provides opportunities for receiving feedback on both pronunciation and grammar but may also increase the amount of feedback received.

Recommendations for Practice

The contribution of interaction to L2 development has been confirmed in both FTF modes and CMC (e.g., Keck et al., 2006; Mackey & Goo, 2007; Ziegler, 2016). However, these effects may be moderated differently depending on the mode of interaction, highlighting the need for instructions and educators to consider the potential benefits of individual technologies for their classroom. For example, the extended time for processing afforded by text-chat may reduce working memory load and promote noticing, as learners have opportunities to revisit the chat script during the interaction (supporting self-repair) or at a later time, offering additional opportunities to compare their or their interlocutors' production with the target language (e.g., Sauro & Smith, 2010). Educators may also wish to consider that text-based CMC seems to be most facilitative of L2 development when learners engage in simple, rather than complex, tasks (e.g., Baralt, 2013). Findings suggest that voice or video chat is particularly supportive of pronunciation, as learners may generate more repairs than in other modalities. Because their input is constrained to voice only, learners will need to rely more on articulatory and auditory skills to deliver and receive messages. Video chat, on the other hand, offers similar advantages as FTF interaction, particularly in terms of learners' use of

gestures and facial expressions for meaning negotiation. The selection of mode of interaction may have important implications for classroom performance and should be considered when integrating technology for online teaching, online interaction, and materials development.

Teachers can also make use of different modes of interaction strategically to maximize L2 learning. For example, based on the research findings discussed above, instructors might consider using text chat to focus on lexical and grammatical items, voice chat to focus on pronunciation, and combining multimodal interaction to support a range of developmental outcomes (e.g., Bryfonski & Ma, 2020). Using SCMC, either independently or alongside traditional FTF teaching, may also increase learner motivation, reduce anxiety, and encourage hesitant students to participate more in communication (e.g., Côté & Gaffney, 2018; Reinders & Wattana, 2015; Satar & Özdener, 2008). As such, learners should be encouraged to take advantage of the developmental opportunities interaction in CMC may provide, such as through awareness raising and practice tasks following metacognitive instruction (Ziegler et al., 2020), and to interact with peers and more competent speakers beyond their classrooms through chat groups or language exchange programs.

Based on the research findings discussed in this chapter, CMC provides a rich environment for communicative interaction, providing a range of unique affordances that can be adapted to the diverse needs of language learners. Language instructors who are interested in utilizing CMC technologies to enrich their students' learning experience may wish to consider their learners' developmental and performance goals, and the ways in which technology can be used to support them by offering alternative contexts for meaning focused interaction, input, output, and negotiation to occur (Chun et al., 2016).

Future Directions

Overall, research suggests that interaction in CMC can be equally beneficial for L2 development, production, and performance as interaction in FTF settings (e.g., Ziegler, 2016), and may offer affordances, such as extra processing time, increased salience, opportunities for juxtaposing corrective feedback and erroneous output, that facilitate L2 development. In addition, findings indicate that interaction in CMC may support higher motivation and reduced anxiety, highlighting the potential for creating more equitable participation and increased production. However, there remain contradictory findings in CMC literature that may be attributed to methodological choices as task type, treatment length, and measurement tools (Lin, 2015). As such, further research is needed to gain a deeper understanding of the ways in which CMC environments can promote the developmental benefits associated with interaction, as well as influence affective variables, such as motivation and anxiety. In addition, many studies focus on short-term interventions, underscoring the need to conduct more longitudinal research examining the effects of technology-mediated interaction on learners' development and performance.

A large number of CMC studies to date have focused on interaction through text chat, with fewer studies investigating oral or multi-modal CMC (although see York et al. 2020 for a recent comparison). This is a gap that should be addressed by future research studies. Given that many language instructors around the world were suddenly required to use video chat and virtual classrooms due to the COVID-19 pandemic, it should be prioritized by future researchers to better our understanding of the affordances of these modalities. As virtual classrooms become more common in many parts of the world, future research that investigates interaction situated in bimodal and virtual technologies would yield valuable pedagogical implications (see also Chapter 3 this volume, for a discussion of technology-mediated TBLT). Additional research examining the relationship between types of technology and the efficacy of different types of corrective feedback is also needed, as research thus far has yielded mixed results.

Researchers should also consider expanding the contexts in which interaction might be explored. For example, instant messaging on mobile devices provides learners with a CMC interactional opportunity. While interest in mobile-assisted language learning has continued to grow (see Chapter 24, this volume), studies may benefit from grounding future empirical investigations in robust, theoretical frameworks (Peng et al., 2020), such as the interactionist approach. Expanding interactional research to include new and emerging technologies, such as augmented reality and chat bots, will help deepen our understanding of not only how technology might facilitate the benefits associated with interaction, but also how the interactionist approach may serve as a framework for examining technology-mediated language learning.

Further Reading

Mackey, A. (2020). *Interaction, feedback and task research in second language learning: Methods and design.* Cambridge University Press

Providing a comprehensive overview of both theory and practice, this text offers readers in-depth information on the foundations and applications of interaction and task-based research. Readers will find information on how to design interaction studies, including materials development and procedures, as well as detailed descriptions of a range of methods, such as eye-tracking and meta-analysis, for both classroom and laboratory contexts.

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology*, *13*(1), 96–120. http://dx.doi.org/10125/44170

Comparing recasts and metalinguistic prompts, this empirical research investigated the effects of type of corrective feedback on learners' L2 grammar in both FTF and SCMC interactions. One of the earlier studies to compare the efficacy of feedback across modalities, this study will provide readers with a firm foundation upon which to build their understanding of more recent articles.

Smith, B. (2003). Computer–mediated negotiated interaction: An expanded model. *The Modern Language Journal*, *87*(1), 38–57. https://doi.org/10.1111/1540-4781.00177

This seminal article examined the patterns of learner-learner negotiation in SCMC, as well as the role of task type, on the quantity and quality of negotiation. Importantly, Smith also proposed a more accurate model for describing interactions in computer-mediated contexts, building the foundation for improved methodological design in future research.

Ziegler, N. (2016). Synchronous computer-mediated communication and interaction: A meta-analysis. *Studies in Second Language Acquisition*, *38*(3), 553–586. http://dx.doi.org/10.1017/S027226311500025X

This meta-analysis quantitatively synthesizes the research examining FTF and CMC research on L2 learning outcomes, providing readers with information on the comparative efficacy of these contexts. Mediating variables and methodological implications are also explored.

References

Abrams, Z. I. (2003). The effect of synchronous and asynchronous CMC on oral performance in German. *The Modern Language Journal*, *87*(2), 157–167. https://doi.org/10.1111/1540-4781.00184

Adams, R., Amani, S., Newton, J., & Nik, N. (2014). Planning and production in computer-mediated communication (CMC) writing. In H. Byrnes & R. M. Manchón (Eds.), *Task-based language learning: insights from and for L2 writing* (Vol. 7, pp. 137–161). John Benjamins Publishing Company. https://doi.org/10.1075/tblt.7.06ada

Adams, R., & Nik, N. (2014). Prior knowledge and second language task production in text chat. In M. González-Lloret & L. Ortega (Eds.), *Technology-mediated TBLT: researching technology and tasks* (pp. 51–78). John Benjamins. https://doi.org/10.1075/tblt.6.03ada

Adams, R., Nik, N. & Newton, J. (2015). Task complexity effects on the complexity and accuracy of writing via chat. *Second Language Writing*, *29*, 64–81. https://doi.org/10.1016/j.jslw.2015.06.002

Baralt, M. (2013). The impact of cognitive complexity on feedback efficacy during online versus face-to-face interactive tasks. *Studies in Second Language Acquisition*, *35*(4), 689–725. https://doi.org/10.1017/S0272263113000429

Baralt, M., & Gurzynski-Weiss, L. (2011). Comparing learners' state anxiety during task-based interaction in computer-mediated and face-to-face communication. *Language Teaching Research*, *15*(2), 201–229. https://doi.org/10.1177/0265532210388717

Beauvois, M. H. (1992). Computer-assisted classroom discussion in the foreign language classroom: Conversation in slow motion. *Foreign Language Annals*, *25*(5), 455–464. https://doi.org/10.1111/j.1944-9720.1992.tb01128.x

Blake, R. J. (2005). Bimodal CMC: The glue of language learning at a distance. *CALICO Journal*, *22*(3) 497–511. https://doi.org/10.1558/cj.v22i3.497-511

Blake, R. (2000). Computer mediated communication: A window on L2 Spanish interlanguage. *Language Learning & Technology*, *4*(1), 111–125. http://dx.doi.org/10125/25089

Blake, C. (2009). Potential of text-based internet chats for improving oral fluency in a second language. *The Modern Language Journal*, *93*(2), 227–240. https://doi.org/10.1111/j.1540-4781.2009.00858.x

Bryfonski, L., & McKay, T. H. (2019). TBLT implementation and evaluation: A meta-analysis. *Language Teaching Research*, *23*(5), 603–632. https://doi.org/10.1177/1362168817744389

Bryfonski, L., & Ma, X. (2020). The effect of implicit versus explicit corrective feedback on Mandarin tone acquisition in a SCMC learning environment. *Studies in Second Language Acquisition*, *42*(1), 61–88. https://doi.org/10.1017/S0272263119000317

Bueno-Alastuey, M. C. (2011). Perceived benefits and drawbacks of synchronous voice-based computer-mediated communication in the foreign language classroom. *Computer Assisted Language Learning*, *24*(5), 419–432. https://doi.org/10.1080/09588221.2011.574639

Bueno-Alastuey, M. C. (2010). Synchronous-voice computer-mediated communication: Effects on pronunciation. *CALICO Journal*, *28*(1), 1–20. https://doi.org/10.1558/cj.28.1.1-20

Canto, S., & Jauregi Ondarra, K. (2017). Language learning effects through the integration of synchronous online communication: The case of video communication and Second Life. *Language Learning in Higher Education*, *7*(1), 21–53. https://doi.org/10.1515/cercles-2017-0004

Chapelle, C. (1990). The discourse of computer-assisted language learning: Toward a context for descriptive research. *TESOL Quarterly*, *24*(2), 199–225. https://doi.org/10.2307/3586899

Chapelle, C. A. (1998). Multimedia CALL: Lessons to be learned from research on instructed SLA. *Language Learning & Technology*, *2*(1), 22–34. http://dx.doi.org/10125/25030

Chapelle, C. A. (2001). *Computer applications in Second Language Acquisition*. Cambridge University Press. https://doi.org/10.1017/CBO9781139524681

Chun, D. M. (1994). Using computer networking to facilitate the acquisition of interactive competence. *System*, *22*(1), 17–31. https://doi.org/10.1016/0346-251X(94)90037-X

Chun, D. (2016). The role of technology in SLA research. *Language Learning & Technology*, *20*(2), 98–115. http://dx.doi.org/10125/44463

Chun, D., Kern, R., & Smith, B. (2016). Technology in language use, language teaching, and language learning. *The Modern Language Journal*, *100*, 64–80. https://doi.org/10.1111/modl.12302

Collentine, K. (2010). Measuring complexity in task-based synchronous computer-mediated communication. In M. Thomas & H. Reinders (Eds.), *Task-based language learning and teaching with technology* (pp. 105–130). Continuum.

Collentine, K. (2013). Using tracking technologies to study the effects of linguistic complexity in CALL input and SCMC output. *CALICO Journal*, *30*(1), 46–65. https://doi.org/10.1558/cj.v30i0.46-65

Côté, S., & Gaffney, C. (2018). The effect of synchronous computer-mediated communication on beginner L2 learners' foreign language anxiety and participation. *The Language Learning Journal*, *49*(1), 105–116. https://doi.org/10.1080/09571736.2018.1484935

Dao, P., Trofimovich, P., & Kennedy, S. (2018). Structural alignment in L2 task-based interaction. *ITL-International Journal of Applied Linguistics*, *169*(2), 293–320. https://doi.org/10.1075/itl.17021.dao

Doughty, C. J., & Long, M. H. (2003). Optimal psycholinguistic environments for distance foreign language learning. *Language Learning & Technology*, *7*(3), 50–80. http://dx.doi.org/10125/25214

Ellis, R., Loewen, S., & Erlam, R. (2006). Implicit and explicit corrective feedback and the acquisition of L2 grammar. *Studies in Second Language Acquisition*, *28*(2), 339–368. https://doi.org/10.1017/S0272263106060141

Fuente, M. J. (2003). Is SLA interactionist theory relevant to CALL? A study on the effects of computer-mediated interaction in L2 vocabulary acquisition. *Computer Assisted Language Learning*, *16*(1), 47–81. http://dx.doi.org/10.1076/call.16.1.47.15526

Fujii, A., Ziegler, N., & Mackey, A. (2016). Peer interaction and metacognitive instruction in the EFL classroom. In M. Sato & S. Ballinger (Eds.), *Peer interaction and second language learning: Pedagogical potential and research agenda* (Vol. 45, pp. 63–90). John Benjamins Publishing Company. https://doi.org/10.1075/lllt.45.10gar

Gass, S. M. (1997). *Input, interaction, and the second language learner*. Lawrence Erlbaum Associates.

Gass, S. M., & Mackey, A. (2006). Input, interaction and output: An overview. *AILA Review*, *19*(1), 3–17. https://doi.org/10.1075/aila.19.03gas

Gass, S. M., & Varonis, E. (1985). Task variation and nonnative/nonnative negotiation of meaning. In S. M. Gass & C. Madden (Eds.), *Input in second language acquisition* (pp. 149–161). Newbury House.

Gurzynski-Weiss, L., & Baralt, M. (2014). Exploring learner perception and use of task-based interactional feedback in FTF and CMC modes. *Studies in Second Language Acquisition*, *36*(1), 1–37. https://doi.org/10.1017/S0272263113000363

Gurzynski-Weiss, L., & Baralt, M. (2015). Does type of modified output correspond to learner noticing of feedback? A closer look in face-to-face and computer-mediated task-based interaction. *Applied Psycholinguistics*, *36*(6), 1393. https://doi.org/10.1017/S0142716414000320

Hatch, E. M. (1978). Discourse analysis and second language acquisition. In E. M. Hatch (Ed.), *Second language acquisition: A book of readings* (pp. 401–436). Newbury House.

Jepson, K. (2005). Conversations—and negotiated interaction—in text and voice chat rooms. *Language Learning & Technology*, *9*(3), 79–98. http://dx.doi.org/10125/44033

Keck, C. M., Iberri-Shea, G., Tracy-Ventura, N., & Wa-Mbaleka, S. (2006). Investigating the empirical link between task-based interaction and acquisition: A meta-analysis. In J. M. Norris & L. Ortega (Eds.), *Synthesizing research on language learning and teaching* (Vol. 13, pp. 91–131). John Benjamins Publishing Company. https://doi.org/10.1075/lllt.13.08kec

Kelm, O. R. (1992). The use of synchronous computer networks in second language instruction: A preliminary report. *Foreign Language Annals*, *25*(5), 441–454. https://doi.org/10.1111/j.1944-9720.1992.tb01127.x

Kern, R. G. (1995). Restructuring classroom interaction with networked computers: Effects on quantity and characteristics of language production. *The Modern Language Journal*, *79*(4), 457–476. https://doi.org/10.1111/j.1540-4781.1995.tb05445.x

Kim, Y. & McDonough, K. (2016). Prime repetition and Korean EFL learners' comprehension and production of passives. *International Review of Applied Linguistics in Language Teaching*, *54*(4), 319–346. https://doi.org/10.1515/iral-2015-0028

Kim, Y., Jung, Y., & Skalicky, S. (2019). Linguistic alignment, learner characteristics, and the production of stranded prepositions in relative clauses: Comparing FTF and SCMC contexts. *Studies in Second Language Acquisition*, *41*(5), 937–969. https://doi.org/10.1017/S0272263119000093

Kim, Y., Skalicky, S., & Jung, Y. (2020). The role of linguistic alignment on question development in face-to-face and synchronous computer-mediated communication contexts: A conceptual replication study. *Language Learning*, *70*(3), 643–684. https://doi.org/10.1111/lang.12393

Kitade, K. (2000). L2 learners' discourse and SLA theories in CMC: Collaborative interaction in Internet chat. *Computer Assisted Language Learning*, *13*(2), 143–166. https://doi.org/10.1076/0958-8221(200004)13:2;1-D;FT143

Lai, C., & Zhao, Y. (2006). Noticing and text-based chat. *Language Learning & Technology*, *10*(3), 102–120. http://dx.doi.org/10125/44077

Lai, C., Fei, F., & Roots, R. (2008). The contingency of recasts and noticing. *CALICO Journal, 26*(1)*,* 70–90.

Lee, L. (2002). Synchronous online exchanges: A study of modification devices on non-native discourse. *System*, *30*(3), 275–288. https://doi.org/10.1016/S0346-251X(02)00015-5

Li, S. (2010). The effectiveness of corrective feedback in SLA: A meta-analysis. *Language Learning*, *60*(2), 309–365. https://doi.org/10.1111/j.1467-9922.2010.00561.x

Lin, H. (2015). Computer-mediated communication (CMC) in L2 oral proficiency development: A meta-analysis. *ReCALL*, *27*(3), 261. https://doi.org/10.1017/S095834401400041X

Loewen, S., & Erlam, R. (2006). Corrective feedback in the chatroom: An experimental study. *Computer Assisted Language Learning*, *19*(1), 1–14. https://doi.org/10.1080/09588220600803311

Loewen, S., & Isbell, D. R. (2017). Pronunciation in face-to-face and audio-only synchronous computer-mediated learner interactions. *Studies in Second Language Acquisition*, *39*(2), 225–256. https://doi.org/10.1017/S0272263116000449

Loewen, S., & Wolff, D. (2016). Peer interaction in F2F and CMC contexts. In M. Sato & S. Ballinger (Eds.), *Peer interaction and second language learning: Pedagogical potential and research agenda* (Vol. 45, pp. 163–184). John Benjamins Publishing Company. https://doi.org/10.1075/lllt.45.07loe

Long, M. H. (1981). Input, interaction, and second language acquisition. *Annals of the New York Academy of Sciences*, *379*(1), 259–278. https://doi.org/10.1111/j.1749-6632.1981.tb42014.x

Long, M. H. (1983). Native speaker/non-native speaker conversation and the negotiation of comprehensible input1. *Applied Linguistics*, *4*(2), 126–141. https://doi.org/10.1093/applin/4.2.126

Long, M. H. (1996). The role of the linguistic environment in second language acquisition. In W. C. Ritchie, & T. K. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 413–468). Academic Press.

Mackey, A. (2012). *Input, interaction and corrective feedback in L2 classrooms*. Oxford University Press.

Mackey, A. (2020). *Interaction, feedback and task research in second language learning: Methods and design*. Cambridge University Press.

Mackey, A. J., & Abbuhl, R. (2005). Input and interaction. In C. Sanz (Ed.), Mind and context in adult second language acquisition: Methods, theory, and practice (pp. 207–233). Georgetown University Press

Mackey, A., & Goo, J. (2007). Interaction research in SLA: A meta-analysis and research synthesis. In A. Mackey (Ed.), *Conversational interaction in second language acquisition: A series of empirical studies* (pp. 407–453). Oxford University Press.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, *38*(1), 43–52. https://doi.org/10.1207/S15326985EP3801_6

McDonough, K., & Kim, Y. (2009). Syntactic priming, type frequency, and EFL learners' production of wh-questions. *The Modern Language Journal*, *93*(3), 386–398. https://doi.org/10.1111/j.1540-4781.2009.00897.x

McDonough, K., & Mackey, A. (2006). Responses to recasts: Repetitions, primed production, and linguistic development. *Language Learning*, *56*(4), 693–720. https://doi.org/10.1111/j.1467-9922.2006.00393.x

Michel, M., & Cappellini, M. (2019). Alignment during synchronous video versus written chat L2 interactions: A methodological exploration. *Annual Review of Applied Linguistics*, *39*, 189–216. https://doi.org/10.1017/S0267190519000072

Michel, M., & O'Rourke, B. (2019). What drives alignment during text chat with a peer vs. a tutor? Insights from cued interviews and eye-tracking. *System*, *83*, 50–63. https://doi.org/10.1016/j.system.2019.02.009

Michel, M., & Stiefenhofer, L. (2019). Priming Spanish subjunctives during synchronous computer-mediated communication: German peers' classroom-based and homework interactions. In M. Sato & S. Loewen (Eds.), *Evidence-based second language pedagogy: A collection of instructed second language acquisition studies* (pp. 191–218). Routledge.

Monteiro, K. (2014). An experimental study of corrective feedback during video conferencing. *Language Learning & Technology*, *18*(3), 56–79. http://dx.doi.org/10125/44384

Michel, M., & Smith, B. (2018). Measuring lexical alignment during L2 chat interaction: An eye-tracking study. In S. M. Gass, P. Spinner, & J. Behney (Eds.), *Salience in second language acquisition* (pp. 246–266). Routledge.

Ortega, L. (1997). Processes and outcomes in network classroom interaction: Defining the research agenda for L2 computer-assisted classroom discussion. *Language Learning & Technology*, *1*(1), 82–93. http://dx.doi.org/10125/25005

Ortega, L. (2009). Interaction and attention to form in L2 text-based computer-mediated communication. In A. Mackey & C. Polio (Eds.), *Multiple perspectives on interaction in SLA: Research in honor of Susan M. Gass* (pp. 226–253). Erlbaum/Routledge/Taylor & Francis.

Parlak, Ö., & Ziegler, N. (2017). The impact of recasts on the development of primary stress in a synchronous computer-mediated environment. *Studies in Second Language Acquisition*, *39*(2), 257–285. https://doi.org/10.1017/S0272263116000310

Payne, J. S., & Whitney, P. J. (2002). Developing L2 oral proficiency through synchronous CMC: Output, working memory, and interlanguage development. *CALICO Journal*, 7–32. https://doi.org/10.1558/cj.v20i1.7-32

Payne, S., & Ross, B. (2005). Synchronous CMC, working memory, and L2 oral proficiency development. *Language Learning & Technology*, *9*(3), 35–54. http://dx.doi.org/10125/44031

Pellettieri, J. (2000). Negotiation in cyberspace: The role of chatting in the development of grammatical competence in the virtual foreign language classroom. In M. Warschauer & R. Kern, (Eds.), *Network-based language teaching: Concepts and practice* (pp. 59–86). Cambridge University Press.

Peng, H., Jager, S., & Lowie, W. (2021). Narrative review and meta-analysis of MALL research on L2 skills. *ReCALL*, *33*(3), 278–295. https://doi.org/10.1017/S0958344020000221

Rassaei, E. (2017). Video chat vs. face-to-face recasts, learners' interpretations and L2 development: A case of Persian EFL learners. *Computer Assisted Language Learning*, *30*(1–2), 133–148. https://doi.org/10.1080/09588221.2016.1275702

Reinders, H., & Wattana, S. (2015). Affect and willingness to communicate in digital game-based learning. *ReCALL*, *27*(1), 38–57. https://doi.org/10.1017/S0958344014000226

Satar, H. M., & Özdener, N. (2008). The effects of synchronous CMC on speaking proficiency and anxiety: Text versus voice chat. *The Modern Language Journal*, *92*(4), 595–613. https://doi.org/10.1111/j.1540-4781.2008.00789.x

Sauro, S. (2011). SCMC for SLA: A research synthesis. *CALICO Journal*, *28*(2), 369–391. https://doi.org/10.11139/cj.28.2.369-391

Sauro, S., & Smith, B. (2010). Investigating L2 performance in text chat. *Applied Linguistics*, *31*(4), 554–577. https://doi.org/10.1093/applin/amq007

Schmidt, R. W. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 1–32). Cambridge University Press.

Smith, B. (2003). Computer–mediated negotiated interaction: An expanded model. *The Modern Language Journal*, *87*(1), 38–57. https://doi.org/10.1111/1540-4781.00177

Smith, B. (2004). Computer-mediated negotiated interaction and lexical acquisition. *Studies in Second Language Acquisition*, *26*(3), 365–398. https://doi.org/10.1017/S027226310426301X

Smith, B. (2005). The relationship between negotiated interaction, learner uptake, and lexical acquisition in task-based computer-mediated communication. *TESOL Quarterly*, *39*(1), 33–58. https://doi.org/10.2307/3588451

Smith, B. (2008). Methodological hurdles in capturing CMC data: The case of the missing self-repair. *Language Learning & Technology*, *12*(1), 85–103. http://dx.doi.org/10125/44132

Smith, B. (2009). The relationship between scrolling, negotiation, and self-initiated self-repair in an SCMC environment. *CALICO Journal*, *26*(2), 231–245. 10.1558/cj.v26i2.231-245

Smith, B. (2010). Employing eye-tracking technology in researching the effectiveness of recasts in CMC. In F. M. Hult (Ed.), *Directions and prospects for educational linguistics* (pp. 79–97). Springer.

Smith, B. (2012). Eye tracking as a measure of noticing: A study of explicit recasts in SCMC. *Language Learning & Technology*, *16*(3), 53–81. http://dx.doi.org/10125/44300

Swain, M. (1985) Communicative competence: Some roles of comprehensible input and comprehensible output in its development. In S. M. Gass & C. Madden (Eds.), *Input and second language acquisition* (pp. 235–253). Newbury House.

Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), *Principle and practice in applied linguistics: Studies in honor of H. G. Widdowson* (pp. 125–144). Oxford University Press.

Swain, M. (2005). The output hypothesis: Theory and research. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 471–483). Lawrence Erlbaum Associates.

Swain, M., & Lapkin, S. (1998). Interaction and second language learning: Two adolescent French immersion students working together. *The Modern Language Journal*, *82*(3), 320–337. https://doi.org/10.1111/j.1540-4781.1998.tb01209.x

Tudini, V. (2003). Using native speakers in chat. *Language Learning & Technology*, *7*(3), 141–159. http://dx.doi.org/10125/25218

Varonis, E. M., & Gass, S. (1985). Non-native/non-native conversations: A model for negotiation of meaning. *Applied Linguistics*, *6*(1), 71–90. https://doi.org/10.1093/applin/6.1.71

Warschauer, M. (1996). Comparing face-to-face and electronic discussion in the second language classroom. *CALICO Journal, 13,* 7–26. https://doi.org/10.1558/cj.v13i2-3.7-26

Yanguas, Í. (2010). Oral computer-mediated interaction between L2 learners: It's about time! *Language Learning & Technology*, *14*(3), 72–93. http://dx.doi.org/10125/44227

Yanguas, I. (2012). Task-based oral computer-mediated communication and L2 vocabulary acquisition. *CALICO Journal*, *29*(3), 507–531. https://doi.org/10.11139/cj.29.3.507-531

Yanguas, I., & Bergin, T. (2018). Focus on form in task-based L2 oral computer-mediated communication. *Language Learning & Technology*, *22*(3), 65–81. https://doi.org/10125/44657

Yilmaz, Y. (2011). Task effects on focus on form in synchronous computer-mediated communication. *The Modern Language Journal*, *95*(1), 115–132. https://doi.org/10.1111/j.1540-4781.2010.01143.x

Yilmaz, Y. (2012). The relative effects of explicit correction and recasts on two target structures via two communication modes. *Language Learning*, *62*(4), 1134–1169. https://doi.org/10.1111/j.1467-9922.2012.00726.x

York, J., Shibata, K., Tokutake, H., & Nakayama, H. (2020). Effect of SCMC on foreign language anxiety and learning experience: A comparison of voice, video, and VR-based oral interaction. *ReCALL*, *33*(1), 49–70. https://doi.org/10.1017/S0958344020000154

Zeng, G. (2017). Collaborative dialogue in synchronous computer-mediated communication and face-to-face communication. *ReCALL*, *29*(3), 257–275. https://doi.org/10.1017/S0958344017000118

Ziegler, N. (2016). Synchronous computer-mediated communication and interaction: A meta-analysis. *Studies in Second Language Acquisition*, *38*(3), 553–586. http://dx.doi.org/10.1017/S027226311500025X

Ziegler, N. (2018a). Task modality, noticing, and the contingency of recasts: Insights on salience from multiple modalities. In S. M. Gass, P. Spinner, & J. Behney (Eds.), *Salience in second language acquisition* (pp. 269–290). Routledge.

Ziegler, N. (2018b). Pre-task planning in L2 text-chat: Examining learners' process and performance. *Language Learning & Technology*, *22*(3), 193–213. https://doi.org/10125/44664

Ziegler, N., Moranski, K., Smith, G., & Phung, H. (2020). Metacognitive instruction and interactional feedback in a computer-mediated environment. *TESL Canada Journal*, *37*(2), 210–233. https://doi.org/10.18806/tesl.v37i2.1337

Ziegler, N., & Phung, H. (2019). Technology-mediated task-based interaction: The role of modality. *ITL – International Journal of Applied Linguistics*, *170*(2), 252–277. https://doi.org/10.1075/itl.19014.zie