Pre-task Planning in L2 Text-Chat: Examining Learners' Process and Performance

Abstract

Research suggests that pre-task planning time provides learners with opportunities to formulate, organize, and mentally store content, thereby freeing up attentional resources during tasks (Skehan et al., 2012). However, relatively few studies to date have investigated pre-task planning in a SCMC setting (although see Lai, Fei, & Roots, 2008; Hsu, 2012, 2015). In addition to a scarcity of CALL research, relatively little is known about what learners do when they plan, or how they use their plans during tasks. The goals of the current study were twofold: 1) to examine the relationship between pre-task planning and learners' production and 2) to explore the affordances offered by computer-mediated contexts to further investigate *how* and *what* learners may (or may not) be planning during pre-task and within-task planning time. Results suggest that three minutes of planning time resulted in increases in lexical complexity (but not phrasal or syntactic), although no significant findings were identified for accuracy or fluency. In addition, findings indicate that technology offers researchers a number of unique methodological affordances, such as the ability to see what learners produce regardless of whether they transmit this information to their interlocutor, thereby providing evidence of L2 knowledge that would otherwise be unobservable.

Introduction

Over the last twenty years, a growing body of research has examined various factors impacting second language (L2) task performance, ranging from task design features, such as task complexity and repetition, to the role of learners' individual differences. One area that has received an increasing amount of interest is the role of planning on task performance (see Ellis, 2005 for an extensive discussion). Theoretically grounded in information processing approaches to SLA, in which learners' cognitive capacities are related to their learning outcomes, the rationale for planning suggests that learners will benefit from specific activities that allow them to redirect their attention between meaning and form in order to support L2 development (Long, 2015). Because learners may possess limited capacity for processing input, they might experience difficulty in attending to meaning and form at the same time (VanPatten, 1990), so they need to make (mostly unconscious) decisions regarding the allocation of their attentional resources, namely, whether to focus on meaning or whether to attend to structure and form (Skehan, 1996). This competition between attentional resources places a cognitive burden on learners, particularly those with limited language proficiency, because they also have to consider and respond to the communicative pressure of the interaction, making it difficult to attend to form and structure (e.g. Ellis, 2009).

In addition, attention and noticing are necessary, beneficial conditions for L2 development (Schmidt, 2001). For these reasons, planning time, either before or during a task, has been hypothesized to provide learners with increased opportunities for focusing on form (Williams, 2005) and noticing the gap between their interlanguage (IL) and the

target language (Schmidt, 2001), thereby increasing opportunities for L2 development. In other words, planning is thought to reduce the cognitive burden by creating a context in which learners can attend to form by drawing on linguistic knowledge that may not yet be automatized (Ellis, 2005).

As many have pointed out (see for example, Ellis, 2009; Long, 2015), investigations of planning might provide a basis for important pedagogical implications, such as informing how task designers and instructors can most efficiently and effectively facilitate learners' multifaceted L2 development in complexity, accuracy, and fluency (CAF) in the language learning classroom. In addition, examining planning can provide opportunities to test theoretical claims about the processes of second language acquisition (SLA), for example, Levelt's model of speaking (Yuan & Ellis, 2003), noticing (Lai et al., 2008), and models of writing (Ellis & Yuan, 2004).

Perhaps surprisingly then, despite these opportunities to examine more closely what we think we know about SLA and to provide helpful input for language professionals, relatively few studies have examined what learners do when they plan, or how they use the products of their planning during task execution. Using the unique affordances offered by synchronous computer-mediated communication (SCMC), this study applies a combination of screen capture technology and text-chat to examine task planning in learner-learner interaction in SCMC contexts, an optimum environment for examining how learners utilize their planning time, and whether, when, and how they refer to their planning when they are carrying out tasks.

Types of Task Planning

Two broad types of planning have been identified (Ellis, 2005), with a basic distinction drawn between *pre-task planning*, often operationalized as planning that occurs before a learner performs a task, and *within-task planning*, which is usually defined as planning that occurs during the time that learners are actually performing the task (Ellis, 2009).

Within-task planning. Within-task planning, which allows learners to plan and reformulate both the content and the form of their output, is the moment-by-moment planning that takes place during task performance (Yuan & Ellis, 2003). The availability of this within-task planning provides learners with the ability to search and draw on their linguistic resources during the formulation phase of language production (Yuan & Ellis, 2003), as well as with unlimited time to engage in pre- and post-production monitoring (Hsu, 2012). In addition, because it provides learners with time to formulate and monitor the output of this formulation more carefully than they might when subjected to time pressure, within-task planning is hypothesized to be particularly effective in terms of supporting accuracy (Ellis, 2005).

Within written SCMC, which refers to real time interaction such as a live text chat, learners may have access to increased within-task planning time compared to oral interaction (Sauro, 2009). Because the rate of exchange during SCMC may be slower than face to face due to such variables as individual typing speed or the speed of the available internet connection, learners participating in text chat may have greater opportunities to review and assess their production during task performance (Lai & Zhao, 2006; Payne & Whitney, 2002), potentially leading to improvements in the quality of L2 production, frequently operationalized as CAF. Although there has been very little

investigation of planning in SCMC to date, Sauro and Smith's (2010) results provide empirical evidence for the efficacy of within-task planning, operationalized in their study as post-production monitoring. Using Camtasia to screen capture learners typing and deletion, results indicate that learners who engaged in post-production monitoring produced more complex language, suggesting that the developmental benefits of within-task planning can and do occur in computer-mediated contexts.

Pre-task planning.

Pre-task planning, which is defined as planning that occurs before a learner begins the target task, can be further categorized according to whether planning time is dedicated to *rehearsal*, where learners have the opportunity to perform the target task to completion before performing it a second time, or *strategic* planning, which is often defined as opportunities for learners to decide what to say or write without completing the task (Ellis, 2009).

The majority of research on planning has focused on the effects of strategic pre-task planning on learners' oral and written production (e.g. Ellis & Yuan, 2004; Foster & Skehan, 1996; Yuan & Ellis, 2003). Research has suggested that strategic pre-task planning may help reduce learners' cognitive burden during a task by providing opportunities for the mental organization and/or formulation of the desired content (Bygate & Samuda, 2005). This formulation is then held in learners' short term working memory, providing access to linguistic resources that may not be fully automatized and freeing up other attentional resources for task performance (Ortega, 1999). Findings indicate that strategic planning may be beneficial to L2 performance, with research suggesting that pre-task planning may lead to improvements in complexity (Ellis &

Yuan, 2004; Kawauchi, 2005; Ortega, 1999; Skehan et al., 2012; Yuan & Ellis, 2003) and fluency (Foster & Skehan, 1996; Skehan et al., 2012). The majority of studies have compared the effects of 10 minutes of planning time to no planning time (e.g. Ortega, 1999; Skehan et al., 2012), with few having investigated whether the amount of planning time is proportionally related to improvements in performance. For example, Wigglesworth (1997) examined the impact of one minute of planning with results indicating positive benefits for learners' speech performance, while Mehnert (1998) examined the effects of one, five, and 10 minutes of planning time, finding that while oral fluency improved following all three amounts of planning time, complexity increased only for learners in the 10 minutes planning condition. Accuracy improved following one minute of planning and declined again with five and 10 minutes of planning time. These results highlight the inconsistency of findings in terms of accuracy, with some studies finding benefits (Skehan & Foster, 1997; Ortega, 1999) and others yielding no significant impact (Gilabert, 2007; Park, 2010; Yuan & Ellis, 2003). Scholars have suggested that these differences across developmental constructs may be explained by Skehan's Tradeoff Hypothesis (2007), which suggests that as learners' direct attention towards one performance area (e.g. complexity), this may take cognitive resources away from others (e.g. accuracy), resulting in a trade-off in terms of cognitive resources across constructs.

Pre-task Planning in Computer-Mediated Communication.

Despite suggestions that L2 learners should be encouraged to plan before engaging in tasks in SCMC (Skehan, 2003), only a handful of studies to date have examined the effects of pre-task planning in computer-mediated environments. Focusing on whether pre-task planning might mediate learners' noticing of recasts, Lai, Fei, and

Roots (2008) provided learners with 10 minutes of pre-writing to produce a description of their picture before performing a spot-the-differences task with the researcher. Results indicated that prewriting had a significant effect on the noticing of contingent recasts, suggesting that pre-task planning may have served to highlight the gap between learners' production and the target form indicated by the interactional feedback, thereby potentially supporting L2 development. Although these results provide support for the use of pre-task planning, performance and production were not addressed, highlighting the need for further research on the effects of pre-task planning on learners' L2 development.

Seeking to address this gap in the literature, Hsu (2012) investigated the effects of pre-task planning time on learners' CAF in written text chat. Thirty intermediate learners of English were randomly assigned to one of two conditions, pre-task planning or no planning. Learners in the planning group were given 10 minutes of pre-task planning time, operationalized as note-taking on a piece of paper that was later removed when the target task began. All learners were allowed unlimited within-task planning time, and interacted one-on-one with the researcher to complete a narrative story-telling task based on a series of pictures. Findings indicated that there were no significant differences across measures of CAF between the two groups, suggesting that strategic pre-task planning did not impact learners' performance in meaningful ways. More recently, Hsu (2015) compared the effects of rehearsal combined with within-task planning to within-task planning only. Similar to Hsu (2012), learners in the rehearsal condition were provided with 10 minutes of planning time, in which they were permitted to take notes which were later removed, and unlimited time to complete the task. Findings indicated that both

conditions resulted in greater complexity, although learners in the rehearsal condition had more accurate use of grammatical verb forms.

Importantly, in both of Hsu's studies, the researcher limited feedback to backchannels, such as *Ok* and *I see*, potentially constraining learners' opportunities for noticing and post-production monitoring. In addition, one might argue that this restriction, although implemented to elicit freely constructed responses from the participants (Hsu, 2012, 2015), limited the efficacy of the interaction as learners were not provided with any indication that their utterances had been understood, therefore opportunities for negotiation and feedback were not available. In Lai et al. (2008), on the other hand, the researcher provided feedback to the learner during task interactions, a potentially mediating factor that might have impacted the effects of task planning on learners' CAF (Cerezo, 2016). The provision of feedback in Lai et al. (2008), for example, may have helped highlight gaps between learners' erroneous productions and target-like productions, possibly impacting the quality of their subsequent performance (although this was not the focus of their research).

Although Lai et al. (2008) and Hsu (2012, 2015) provide important information regarding pre-task planning in written text chat, there are still a number of areas that warrant further investigation. These studies took place in a laboratory environment and consisted of learner-researcher interactions, highlighting the need for further research on learner-learner interaction in a classroom context. For instance, a more ecologically valid approach to task interaction is needed in order to see how learners might focus on form or meaning given the response of their interlocutors. In addition, the experimental conditions of Lai et al. and Hsu included only planning or no planning, in which planning

time was operationalized as 10 minutes. This amount of planning may have provided learners with the opportunity to perform the target task to completion before performing it a second time, acting as a form of rehearsal (Ellis, 2009). In other words, the initial performance of the task in these studies (Lai et al., 2008; Hsu, 2012, 2015) could be interpreted as an opportunity for planning the subsequent performance of the same task (Ellis, 2009). Indeed, Hsu (2012) reports that learners in the planning condition spent 11 minutes completing the task, while Hsu (2015) refers to the availability of planning as a rehearsal condition, suggesting that 10 minutes of planning time was sufficient to complete the task once before completing it a second time. Thus, previous studies using longer pre-task planning times may have measured the effects of rehearsal rather than strategic pre-task planning, defined as opportunities for learners to decide what to say or write without direct repetition of the task (Ellis, 2009), thus underscoring the need to examine the potential effects of different amounts of strategic pre-task planning time. In addition, as Mehnert (1998) pointed out, it would be interesting to investigate whether increasing amounts of planning time have a systematically increasing effect on L2 production. To date, however, Mehnert remains one of the only studies to investigate differential amounts of pre-task planning time in FTF (see also Wigglesworth, 1997), with no studies currently having examined the impact of differential effects of planning time in SCMC, highlighting the need to examine this line of inquiry further. In order to more directly target strategic planning and to further examine the differential benefits found by Mehnert (1998) and Wigglesworth (1997), pre-task planning time was limited in the current study (no planning time, one minute of planning time, and three minutes of planning time) in order to constrain learners' opportunities for rehearsal.

In addition, although previous research in FTF and SCMC contexts has aimed to make planning an observable activity by using paper and pencil note-taking (e.g. Hsu, 2012; Lai et al., 2008; Yuan & Ellis, 2004), this approach provides a limited sense of how and when learners may draw on this planning *during* task performance. Furthermore, most previous research has restricted learners' access to their plans during task completion. Allowing learners to retain access to their plans and using computer-mediated tools, such as text chat or MS Word in combination with screen capture technology, provides opportunities to collect data on *how* learners used their pre-task planning time, and whether they referred to it during task performance. Ellis (2009) also highlights that researchers need measures that demonstrate that within-task planning is taking place. The methodological affordances offered by the combination of text chat and screen capture software provide the means to obtain evidence of within-task planning, particularly in terms of self-repair (e.g. Smith, 2008) and post-production monitoring (e.g. Sauro & Smith, 2010).

The Current Research

This study seeks to address these gaps in the literature by focusing on the differential effects of pre-task planning times on performance in authentic learner-learner interactions in the L2 classroom. In addition, this research takes advantage of the unique methodological affordances of SCMC, thereby making pre- and within-task planning a more observable phenomenon by providing a record of the composition processes and subsequent products.

The following research questions were addressed:

1. How do different pre-task planning times (no planning time, one minute of planning time, and three minutes of planning time) impact learners' L2 production in terms of complexity, accuracy, and fluency (CAF)?
2. How might the affordances of SCMC support researchers' understanding of the composition processes involved in pre- and within-task planning and in L2 production?

Methods

Participants

Participants were 44 intermediate learners of English (approximately B2 level in terms of the Common European Framework) enrolled in an intensive language learning program at a mid-size university. Learners had a mean age of 23.28 (SD = 5.86) and had been learning English for an average of 9.74 years (SD = 4.44). A variety of first language (L1) backgrounds were represented, including Chinese, Japanese, Korean, Khmer, and Spanish. All learners reported familiarity with using computers, typing, and using instant messaging to communicate. Intact classes were used for this study, with participants scheduled as a group for an additional class session outside of their regularly scheduled course time. Learners were provided with a $10 gift card as compensation for their time.

Materials

Tasks. Three picture-narrative tasks were used for this study (see Appendix A for an example). All three tasks depicted a set of related pictures, and participants were asked to co-construct a story with their interlocutor based on the pictures using text chat. Picture-narrative tasks were selected in order to facilitate comparability with previous

research, both in SCMC (Hsu, 2012), as well as in the planning literature in general (Ellis & Yuan, 2004; Ortega, 1999; Yuan & Ellis, 2003). Tasks were extensively pilot-tested to ensure that they were of comparable difficulty and scene familiarity.

Questionnaires. Learners completed a survey on their language background, language learning experiences, and comfort and familiarity with technology. Following the completion of the tasks, learners were asked to complete an exit survey (Appendix B) adapted from Gurzynski-Weiss and Baralt (2011), which was designed to obtain information on participants' opinions regarding the various planning times as well as their general perceptions of learning English using SCMC.

Procedure

After completing the background questionnaire, participants were then randomly assigned to an interlocutor. Learners completed all three tasks with the same partner in order to account for any differences in performance that might arise from working with a different interlocutor. Due to institutional resource constraints, learners remained in the same computer lab as their interlocutor. Because a few instances of face-to-face discussion were noted during piloting, care was taken to place interlocutors in different areas of the lab to reduce any opportunities for face-to-face discussion during the task completion phase. When learners were on computers in different areas of the lab, no evidence of face-to-face communication was noted.

Following a within-subject, repeated-measures design, all learners completed three consecutive picture-narrative tasks with different pre-task planning times. Following a Latin squares design, tasks were counter-balanced for task and planning time in order to mitigate any possible task or ordering effect. Three levels of pre-task planning

time were used for this study: no planning time, one minute of planning time, and three minutes of planning time. Extending Mehnert (1998) to the context of SCMC, one minute of planning time was selected as the minimum planning time. A maximum of three minutes, rather than five minutes as in previous FTF research (Mehnert, 1998), was selected as piloting indicated that this was insufficient time for learners to complete the task.

Learners were not given any specific guidelines regarding how to use the planning time. Rather, following Hsu (2012, 2015), learners were encouraged to plan for their task performance in the way that they felt would best help them achieve their goals, whether this involved focusing on content, form, or discourse structure. All planning was conducted in the same text chat software, Basecamp Campfire (screenshot provided in Appendix C), and the same chat window that was used for the target tasks, allowing learners to plan individually or with their partner, and to maintain access to their planning throughout the task. Learners kept the pictures while performing the tasks and were given unlimited real-time within-task planning time to complete each task. Apple Quicktime screen capture software was used to video-record planning and text chat production, thereby providing a real-time record of all typing and mouse movements that took place on the computer screen during the experiment. Each interlocutor's screen capture video was saved at the end of the final task.

Analysis

Learners' Production: Complexity, Accuracy, and Fluency

Following Sauro and Smith (2010) and Hsu (2012, 2015), learners' text chatscripts were converted into video-enhanced chat scripts. Quicktime screen capture

videos from each interlocutor were played back and coded for text that was typed and deleted or added before message transmission. Following the conventions of video-enhanced chatscripts established by previous research (e.g. Hsu, 2012, 2015; Smith, 2008), text represented by a strike through (e.g. ~~never)~~ indicates text that was produced and then deleted before sending. Text located inside of brackets (e.g. [the bus]) indicates text that was added after the learner had begun to compose a message, but before hitting the 'send' button. Text inside of brackets with a strike through (e.g. [~~the bus~~]) indicates text that was deleted after the learner had composed a message but prior to sending. This provided important information regarding what each learner produced, but may not have transmitted, during the interaction, providing insight not only into the process but also data regarding learners' fluency. This deleted and added text was included as data for the coding of CAF features as it was considered valuable information regarding planning and monitoring (Hsu, 2012). Figure 1 provides an example of video enhanced data compared to text chatscript only. Following the creation of this corpus of video-enhanced chatscripts, learners' production was coded for Analysis of Speech (AS) units (Foster, Tonkyn, & Wigglesworth, 2000), which have been used commonly in SCMC research (e.g., Hsu, 2012, 2015; Sauro, 2012).

<<Figure 1 here>>

Then, chatscripts were coded for measures of CAF in order to assess whether various pre-task planning times had differential effects on learner production.

Complexity. Because complexity is a multi-faceted construct, learners' text chat production was assessed using a range of general measures in order to obtain a more comprehensive understanding. Three indices were used: syntactic, phrasal, and lexical complexity.

Syntactic complexity was operationalized as the total number of clauses divided by the total number of AS units. Following Foster et al. (2000), an AS unit was defined as an independent clause together with any subordinate clauses associated with it. AS units allow multi-clause units, providing the means to measure production not just in number of words or turns, but in clausal units related to topics and ideas. Examples of AS units from the current study are illustrated below. The first example provides an example of one AS unit and independent clause, while example two illustrates an AS unit including one independent clause and one dependent clause.

Example 1:

|cat is afraid of dog|

Example 2:

|I think :: the dog is really stronger than pet own|

Phrasal complexity was defined as the number of words divided by the number of clauses (e.g. Revesz, Ekiert, & Torgersen, 2014), while lexical complexity was calculated using Guiraud's index (e.g. Hsu, 2012). This index, which mitigates the impact of the length of produced text on complexity, is calculated by dividing the total number of types by the square root of the total number of tokens. Types and tokens were calculated using the concordancing software, AntConc (Anthony, 2014).

Accuracy. Accuracy was also measured by multiple indices, including overall accuracy, grammatical accuracy, and lexical accuracy. Overall accuracy was operationalized as the percentage of error-free clauses (e.g. Foster & Skehan, 1996), which were defined as clauses that did not contain any grammatical or lexical errors (excluding typographical errors). Grammatical and lexical accuracy focused on the percentage of clauses without any errors in morphosyntax or lexis, respectively.

Fluency. Much of the research on planning has operationalized fluency as a multifaceted construct consisting of silence, repair, and speed, which has been frequently defined as the number of syllables produced per minute (e.g. Ellis & Yuan, 2004; Tavakoli & Skehan, 2005). However, due to the unique environment of SCMC, where learners may type at different rates and where typing errors might have an outsized adverse impact on assessments of speed and silence, an alternative measurement of fluency was needed. Following Hsu (2012), fluency was operationalized as the number of dysfluencies produced during each task. Dysfluency was calculated by dividing the total number of words reformulated, that is, those words that were typed and then deleted before transmission of the message or those that were added or deleted later in the message composition phase, by the total number of words produced. Self-repair of spelling or typing errors were not included in this calculation.

Revisions, Additions, and Deletions in the Composition Phase

Following the creation of the video-enhanced chatscripts, data were coded for a number of features regarding learners' composition process. For example, multiple revisions, as indicated by an utterance followed by one or more immediate deletions and modified utterances, were coded as evidence of within-task planning. Chatscripts were

also coded for text that was added post-production but prior to sending, as this was considered evidence of post-production monitoring. In addition, chatscripts were coded for text that was deleted after the learner had begun to compose a message but before hitting the 'send' button. These instances of deleted text were further categorized according to whether they indicated avoidance, operationalized as deletion and a novel reformulation preceded by two or more attempts to produce a target form or word, or overtyping, defined here as text that was deleted prior to sending in reaction to an interlocutor's message.

Results and Discussion

Statistical Analysis: Complexity, Accuracy, and Fluency

In order to address the effects of different planning times on multiple measures of learners' performance, a series of multilevel models (MLM; also known as mixed effects models) was conducted where the dependent variables of complexity, accuracy, and fluency were nested within participants and nested within-tasks for each analysis. In other words, participants and task served as random intercepts. Pre-task planning time served as the only fixed effect (centered at 0), and slopes were allowed to vary randomly by participant. The selection of planning time as the fixed effect was selected a priori, as this was the theoretically motivated variable of interest to the current study. Using these cross-classified models, in which every participant completed all tasks and all tasks were completed by all participants, random intercepts for participant and task were entered into the model. Z-score analyses did not identify any extreme outliers, and because the data met the underlying assumptions, no adjustments or log transformations were performed. The lme4 package within the R statistical programming environment (Bates, Maechler,

Bolker, & Walker, 2015; R Development Core Team, 2010) was used for all multilevel modeling. A fixed effect was considered significant if the absolute value of the *t* statistic was greater than or equal to 2.00 (Gelman & Hill, 2007).

Complexity. Complexity was measured according to three dimensions: lexical variation, phrasal complexity, and subordination (or syntactic complexity), Table 1 provides the descriptive statistics for all three measures of complexity.

<<Insert Table 1>>

Results from the MLM analyses indicate that there was no significant effect of differential pre-task planning times for syntactic complexity, operationalized as the ratio of clauses to AS-units, or for phrasal complexity, defined here as the number of words divided by the number of clauses. A significant difference, however, was found for lexical complexity (Guiraud Index), indicating a significant effect for planning times on the variety of lexical items produced by learners (b = .149, SE = .070, t = 2.133, Pseudo R^2 =.15). A Pseudo R^2 value of .15 suggests a large effect size for the predictor of planning time on learners' lexical complexity (Cohen, 1988), explaining approximately 15% of the variance. Tables 2-4 provide statistics for these MLM analyses.

<<Insert Table 2>>

<<Insert Table 3>>

<<Insert Table 4>>

Given that the current research compared three levels of planning time, follow up MLM analyses with pre-task planning time as dummy-coded fixed effects were conducted in order to determine where the significant differences occurred. Random intercepts for participant and task were included in these models, although the models would not converge with random slopes, leading to the selection of a simplified structure. Findings demonstrate that three minutes of planning time resulted in significantly more lexical variation than one minute (b = .431, SE = .187, t = 2.304) or no planning time (estimate = .410, SE = .189 t = 2.171). No significant differences were found between no planning time and one minute of planning time. Overall, these results suggest that three minutes of planning time led to more lexically complex production, although there was no impact on syntactic (b = .001, SE = .011, t = .07, Psuedo R^2 =.03) or phrasal complexity (b = -.041, SE = .049, t = -.853, Psuedo R^2 =.09). Tables 5 and 6 illustrate these findings.

<<Insert Table 5>>

<<Insert Table 6>>

Accuracy. Accuracy was assessed using measures of overall grammatical and lexical accuracy, operationalized as the percentage of clauses with no grammatical or lexical errors, respectively. Table 7 provides the descriptive statistics for all measures of accuracy.

<<Insert Table 7>>

MLM analyses found no significant differences across planning times for grammatical (*b* = .007, *SE* = .008, *t* = .917, Psuedo R^2 =.06) or lexical accuracy (*b* = -.005, *SE* = .008, *t* = -.73, Psuedo R^2 = .09), suggesting that pre-task planning did not result in learners' improved accuracy during production. Tables 8 and 9 provide information regarding these results.

<<Insert Table 8>>

<<Insert Table 9>>

Fluency. In terms of fluency, MLM analyses indicated that there was no significant effect for pre-task planning time (*b* = .010, *SE* = .007, *t* =1.417, Psuedo R^2 = .04), although trends for a positive effect of pre-task planning can be observed based on the *t* value. Descriptive statistics for the measure of fluency are provided in Table 10 while the results of the MLM analysis are provided in Table 11.

<<Insert Table 10>>

<<Insert Table 11>>

Overall, then, these statistical analyses indicate that there were no significant effects across different pre-task planning times for accuracy, fluency, or syntactic or phrasal complexity. However, three minutes of pre-task planning yielded greater lexical variety than one minute and no planning time, suggesting limited but positive benefits for L2 production. This finding might be explained in a number of ways. For example, although

pre-task planning time is hypothesized to reduce learners' cognitive burden by freeing up attentional resources, the current results suggest that learners may be attending to meaning and content more than form or other linguistic aspects, including subordination. In other words, if complex syntactic or phrasal forms occurred during the planning phase, learners may have relied on more simple syntactic or phrasal constructions, directing attention instead to the production of more lexically rich language. This finding is also partially supported by the exit surveys, in which 11% of learners stated they focused specifically on vocabulary and 7% of learners stated that they focused on meaning. However, it should be noted that 30% of learners indicated that they focused on grammar, suggesting a possible mismatch in learners' perceptions of their allocation of attention and their subsequent performance[1].

Learners' attention to vocabulary and meaning may also have been driven by the types of tasks used in the current research, as story-telling tasks are meaning oriented by their nature. VanPatten (1999) argues that lexis is the most meaning-oriented linguistic feature, suggesting that the task requirements may have encouraged learners to use their planning time to focus on meaning, via vocabulary choices, rather than form. These findings are similar to previous research examining pre-task planning in face-to-face contexts (Park, 2010), suggesting that task type might play a role in what learners choose to focus on during planning opportunities.

Three minutes of pre-task planning time may also have provided learners with additional time to complete the conceptualization phase of production. According to Levelt's speech production model (1989), during the conceptualization stage, learners

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[1] The majority of learners (52%) did not indicate focusing on any specific aspect of their production.

engage in the selection and ordering of information to be communicated, as well as keeping track of recent production. This 'preverbal message' is the overall meaning that is to be communicated, and is what learners may be focused on in terms of processing during initial task performance (Bygate, 1996). In other words, during pre-task planning, learners have the opportunity to first establish familiarity with meaning and content. In the current study, learners in the three minute planning condition had the longest amount of time to build message familiarity, therefore potentially freeing up their cognitive resources for the selection and monitoring of language during the task performance phase, potentially producing more lexically complex forms (which may or may not have been produced in pre-task planning). Increased lexical complexity may have been the result of more efficient message planning and quicker lexical access and selection (Levelt, 1989). Results from the exit survey seem to support this explanation, with 23% of learners stating that longer pre-task planning times provided them with more time to think and plan their narratives, suggesting positive benefits for pre-task planning both in terms of L2 production and learners' perceptions.

In addition, although learner interviews were not included in the current study, the findings of Ortega (2005), in which the most frequently identified benefit of planning time was the opportunity to retrieve and access vocabulary that might have otherwise not been available, might also help to explain the increased lexical variation following the longest available pre-task planning. Providing learners with greater amounts of pre-task planning time may have allowed them to more carefully consider their lexical choices, thereby providing opportunities for learners to take more risks with and expand their choice of vocabulary during task performance, supporting their L2 development.

The lack of impact of pre-task planning time on the complexity and accuracy of features beyond the lexicon might also be explained by the lack of directed focus during planning time. Less than half of the learners (47%) in the current research indicated that they focused on grammar (N=13), vocabulary (N=5), or meaning (N=3), suggesting that the majority of learners were not focused on form or specific target features. For example, as Yuan and Ellis (2003) point out, pre-task planning may not 'greatly assist formulation, especially of grammatical morphology.' Instead, learners' cognitive efforts might be directed towards the construction of more meaning or content-based production. Furthermore, as Gilabert (2007) suggests, although pre-task planning can and does direct learners to attend to form, it does not focus learners on form in a specific way. The current results might indicate that although planning time may have somewhat reduced learners' cognitive burden, as indicated by their increased lexical variety, the planning time may have been insufficient to reduce the cognitive load enough to facilitate deeper levels of processing in the form of improved grammatical complexity or accuracy.

Although learners did not produce more syntactically complex language following three minutes of planning, it may be possible that additional planning time would result in more grammatically complex language as has been noted in previous studies on oral production (e.g. Ortega, 1999). In addition, because planning was immediately followed by task performance, learners may have opted to rely on within-task planning. Exit surveys indicated that 14% of learners felt that pre-task planning was not beneficial or necessary as they could plan during the task instead.

The lack of differences across learners' accuracy might also be explained by Skehan's Tradeoff Hypothesis (2007), which suggests that because learners' attentional

capacity is limited, as they direct attention towards one performance area, such as accuracy, that this may take cognitive resources away from others. In the current study, then, learners may have struggled to use a richer range of vocabulary, leading to greater lexical complexity at the expense of phrasal and syntactic complexity, as well as accuracy and fluency. These findings also support previous research demonstrating improvement in either linguistic complexity or accuracy, but not both (e.g. Skehan, 2009, 2014).

Another possible explanation for the lack of impact across conditions on learners' performance may have been due to the unlimited amount of within-task planning time that learners were provided with. In other words, the unlimited online planning time may have negated any of the effects of pre-task planning by offering learners opportunities to reformulate and produce text within-task as needed (Hsu, 2012). Previous research has suggested that learners be given more time to plan both content and form during tasks when using written text chat as there is a natural delay between interlocutors' transmission of data (Payne & Whitney, 2002; Sauro, 2012; Sauro & Smith, 2010). This additional within-task planning time may serve as a substantial resource in terms of linguistic production, thereby negating the hypothesized benefits of pre-task planning.

The current findings also stand in contrast to recent research (Hsu, 2015) where pre-task planning time resulted in improved accuracy, although there was no impact on production complexity, and Hsu (2012) where no effects were found for pre-task planning time on any aspect of learners' production. Although the current study did not reveal any improvements in accuracy, the video-enhanced chat scripts indicated that some learners were in fact able to reformulate following transmission of an utterance by using the copy and paste function available on most computers. Learners' were observed

copying and pasting previously sent text from the real-time chat script into the text box, where they then proceeded to add or delete text as necessary. This suggests that learners are able to evaluate and revise their text after it has been sent, demonstrating a unique opportunity for monitoring and reformulation that would not be available to learners outside of a SCMC context.

No significant differences in fluency were found, providing additional evidence for the lack of benefits of either pre-task planning in terms of rehearsal (Hsu, 2012) or strategic planning (the current research). Although learners were not directed to plan for any specific feature, some learners focused their planning on grammatical features (30%) or vocabulary (11%), suggesting that they may have had to plan and re-plan content within-task performance, thus resulting in no differences across conditions. A summary of the most common responses from the exit survey are provided in Table 12.

<<Insert Table 12>>

Methodological Affordances of SCMC in Pre- and Within-Task Planning

The second research question asks how the unique affordances that of SCMC can contribute to our understanding of learners' composition processes and subsequent production during planning and task completion. This section examines the ways in which the combination of text chat and screen capture technologies provide valuable evidence on the processes and products of learners' pre-task and within-task planning and production.

Screen-capture. The current study required learners to plan using chat software, thereby making planning more observable. Screen capture software also provided a record of learners' activity, such as mouse movements and scrolling, in terms of accessing their pre-task planning during the target task. For example, the corpus of screen capture data revealed that some learners scrolled up to text produced during pre-task planning when composing messages, suggesting that they may have been referring to their plans in order to support their production. However, without direct input from learners about how they used these various features, one must interpret these findings cautiously and in terms of their potential rather than their generalizability. For instance, although learners may have scrolled up to previously produced text, it is not clear whether this action occurred to support task completion or was simply something the learner did to pass time while waiting for their interlocutor to compose a message. By including retrospective protocols in future research, such as stimulated recall protocols or interviews, we may gain a better understanding of how learners make use of their plans during SCMC task-based interactions.

In addition to potentially providing important information regarding learners' use of pre-task planning, the use of screen capture technology also provides researchers with a more detailed view of how learners might monitor their production and test out their linguistic hypotheses during within-task planning. In the excerpt below, the learner produces an utterance with multiple errors. Because we are able to follow the process and the sequence of how the learner monitors his production, evidence regarding the benefits of within-task planning time is clearly provided.

Excerpt from Satoshi

"One day, Jason, a young man, walk[ed] with ~~him~~ [his] dog, ~~hachi~~ ~~hach~~ hachi."

Sequence:

1. One day, Jason, a young man, walk with him dog, ~~hachi~~.
2. One day, Jason, a young man, walk with ~~him~~ dog, ~~hach~~.
3. One day, Jason, a young man, walk with his dog, hachi.
4. One day, Jason, a young man, walk[ed] with his dog, hachi.

This excerpt shows how Satoshi revises the same sentence multiple times. He begins by revising the spelling of "hachi," followed by a modification of the possessive determiner, indicating his use of the message composition phase to focus on forms. Next, Satoshi revises the verb tense for "walk," repairing his erroneous utterance and producing the correct form for the context, in which the narrative takes place in the past. This sequence demonstrates the learners' ability to identify and repair grammatical errors (Smith, 2008), leading to more target-like production in the final sentence that is transmitted to his interlocutor. Overall, video-enhanced chat scripts indicate that learners produced multiple revisions approximately 2.90 (SD=2.66) times during task-based interactions, suggesting that learners were actively involved in within-task planning. These sequences of monitoring and self-repair provide evidence of the multiple opportunities for noticing that learners are afforded in a written text chat environment.

In another example from within-task planning, we are able to see how a learner produces an utterance, but before transmitting to her interlocutor, she revises the text and adds in a clause prior to the previously produced text. By using screen capture

technology, it is possible to clearly see not only what learners produce but also in what order. An example from the video enhanced chatscript below illustrates text that is added to the beginning of the sentence following the original production. Figures 2 and 3 provide screen shots where it is possible to see the cursor mid-sentence after the inclusion of the additional text.

Excerpt from Hyeon

"[after few minute,] the bus came the bus stopping"

<<Insert Figure 2>>

<<Insert Figure 3>>

Here, it is clear to see that the learner elaborates on the utterance by providing additional temporal data. Overall, learners elaborated on their utterances by adding post-production text 3.4 (SD = 2.33) times during task-based interactions, illustrating learners' post-production monitoring and within-task planning. Providing further support for previous research (e.g. Lai & Zhao, 2006; Sauro, 2012; Sauro & Smith, 2010; Smith, 2008, 2009; Smith & Gorsuch, 2004), the current findings demonstrate that without video-enhanced chatscripts, it would have only been possible to see the learner's final transmission, thereby obscuring the information regarding how the utterance was produced and limiting the potential contributions of this rich environment.

In addition to providing insight into how learners construct a transmitted utterance during within-task planning, the combination of written text chat and screen capture

software also provides evidence regarding what learners produce but do not send to their interlocutor. In other words, the use of this unique technology provides researchers with information regarding learners' avoidance of target items. As avoidance is a particularly difficult construct to examine, given that it focuses on what learners do not produce, there is great potential for investigating this phenomenon using the dynamic video-recordings of written text chat. For instance, in the excerpt below, it is possible to see how the learner produces a variety of possibilities, deletes them, and instead chooses to transmit a word that they may feel more comfortable or confident using.

Excerpt from Hyeon

"~~safely or confortably~~ well"

<<Insert Figure 4>>

In this example from the video enhanced chatscript, the learner first writes 'safely or confortably,' as illustrated in Figure 4, then deletes the misspelled version of comfortably. Next, he reformulates the erroneous utterance, but continues to spell it wrong. Finally, he elects to delete both of these choices to instead transmit 'well' to his interlocutor. Video-enhanced chatscripts indicated that learners avoided structures or vocabulary 1.48 (SD=1.47) times during their interactions, highlighting the unique methodological advantages of being able to record and track not only what each learner contributes to the interaction, but also what learners produced but did not send during written text chat.

The ability to track what learners produce but do not transmit to their interlocutors also raises interesting questions about how less dominant or interactive learners participate in communicative tasks. For example, learners may delete text because their interlocutor may produce content that renders their in-progress utterance irrelevant or obsolete. Although there is no traditional "overlapping speech" in terms of what is typical of oral interaction, due to varying degrees of typing speed or linguistic proficiency, some learners are able to produce target-like utterances but are not quick enough to share the message with their interlocutors. In other words, their interlocutors may be able to 'overtype' them, producing utterances that have the result of drowning out an in progress utterance. In reviewing the video-enhanced chatscripts, these instances of deletion due to 'overtyping' occurred an average of 1.95 (SD=1.77) times during learners' task-based interactions, highlighting the output that learners intended to contribute but did not in response to content produced by their interlocutor.

Although previous research has highlighted the potential benefits of this lag time for planning and production purposes (Sauro & Smith, 2010), there may also be unintended consequences of the delay for learners that take longer to produce text than their interlocutor is willing to wait for a response. However, although the combinations of technologies provide important information regarding what a learner produces but does not transmit, it is difficult to obtain evidence regarding what the less productive learner may have intended to produce, but did not, as well as why they may not have transmitted the information. This lack of production may be interpreted as linguistic difficulty or lack of knowledge, and without the use of retrospective protocols, it would be challenging to develop a deeper understanding of the causes underlying the less productive learner.

SCMC data combined with screen capture data, on the other hand, provides information regarding learners' intended production, regardless of whether they transmit the message to their interlocutor.

<<Insert Figure 5>>

In this example, Asami had already typed "the bus was broken" but was not as quick as her partner Hyeon, whose text is indicated in white in Figure 5, so she had to erase it. Even though Asami did not contribute her idea to the interaction, it is possible to see that she produced the utterance, demonstrating evidence of her linguistic ability and knowledge. In other words, using traditional methods, such as relying solely on written text chats (without the video enhanced information), we are constrained in our ability to observe what learners are capable of doing rather than only what they choose to contribute to an interaction.

Pedagogical Implications

Results of the current research suggest that three minutes of pre-task planning time positively benefits learners' lexical complexity. Previous research has shown a significant relationship between ratings of intermediate ESL learners' writing skills and lexical variation (e.g. Engber, 1995; Laufer, 1994), suggesting that the positive effects of three minutes of planning time extend beyond vocabulary development. In addition, Lu's (2012) recent meta-analysis provided evidence for a strong relationship between lexical variation and the quality of learners' oral task performance, finding only a weak relationship between lexical fluency and oral narratives. In other words, learners'

proficiency was best predicted by lexical variation. Similarly, Saito, Webb, Trofimovich, and Isaacs (2015) found that comprehensibility, as judged by native English speaking raters, was moderately related to lexical variation, highlighting the importance of breadth of vocabulary to both oral and written L2 performance. Taken together with the current findings, these results suggest that instructors may wish to allow opportunities for the development of lexical range, a feature of production that may be enhanced by providing short amounts of pre-task planning time.

Furthermore, learners' opinions of pre-task planning, as reported in the exit surveys, indicated that 34% of learners felt that longer planning times were better because they provided more time to think and organize for the task. Exit surveys also demonstrated that learners felt that pre-task planning time benefited their production of English, with 41% of learners reporting that they focused specifically on grammar and/or vocabulary and meaning making as opposed to not focusing on a specific linguistic or communicative aspect of their production. For example, one learner stated that pre-task planning allowed them to 'think more deeply and imagine sentence forms correctly," suggesting that even a few minutes of planning time may assist some learners in focusing on form. In addition, when compared to no planning time (N=4) or one minute of planning time (N=7), more learners (N=12) indicated that they felt three minutes of planning time was most beneficial as it provided time for them to consider their production and organize their story, suggesting that learners' perceptions of the efficacy of pre-task planning time aligns with the current results. Furthermore, exit surveys indicated that 23% of learners felt that SCMC was less stressful than traditional FTF interaction. When taken together with other findings from CALL research, including

studies that suggest SCMC might reduce anxiety (e.g. Kelm, 1992; Sullivan & Pratt, 1996) or allow learners additional time to produce and monitor their production (e.g. Hsu, 2012; Pelletieri, 2000), the results suggest that pre-task planning time might provide learners with both linguistic and affective benefits.

Limitations and future research

There are a number of limitations that must be acknowledged for the current study. First, although post-hoc power analyses revealed power of .80 or above for all statistical tests, the sample size (N=44) is still relatively small. Second, although this study was exploratory in nature, learners were not provided with explicit instructions in how to use their pre-task planning time, which may have impacted the learners' focus on form. Future research may wish to examine the role of explicit guidelines, such as those used by Ellis and Yuan (2004), on learners' processes and learning outcomes by comparing pre-task planning conditions with and without instructions. In addition, the strategic pre-task planning time of three minutes or less may not have been enough time for learners to fully take advantage of their planning opportunities, particularly in terms of complexity and accuracy. Future research may wish to further investigate different pre-task planning times, thereby capturing differences that might occur across strategic planning time and rehearsal. Learners in this study were also provided with unlimited within-task planning time, a condition consistent across much of the research (e.g. Hsu, 2012, 2015; Sauro & Smith, 2010). As has been suggested by previous scholars (Hsu, 2012), the use of unlimited within-task planning may negate any substantial effects from pre-task planning. Therefore, future research should consider examining whether limiting within-task planning time, such as by applying pressure through strict time limits for task

completion (Ellis, 2009), might enhance the benefits of pre-task planning time. In addition, focused tasks targeted a specific linguistic feature or more fine-grained measures of CAF, such as examining the accuracy of individual grammatical structures, might reveal improvements or changes across specific features that might remain undetected by the more global measures used in the current research. Further insights could also be gained by combining the current technologies with other available methodologies. For example, eye-tracking could be used to obtain information on what and for how long learners are attending to in certain areas of text (e.g. Smith, 2010, 2012; Smith & Renaud, 2013). Retrospective protocols, like stimulated recalls, would provide insight regarding why learners performed certain actions, as the use of screen capture videos would provide researchers with a strong stimulus in which to support learners' memory of their decisions and process during language learning tasks.

References

Anthony, L. (2014). AntConc (Version 3.4.3) [Computer Software]. Tokyo, Japan: Waseda University. Available from http://www.laurenceanthony.net/

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Package 'lme4'.

Bygate, M. (1996). Effects of task repetition: Appraising the developing language of learners. *Challenge and change in language teaching*, 136-146.

Bygate, M., & Samuda, V. (2005) Integrative planning through the use of task repetition. In R. Ellis (Ed.), *Planning and task performance in a second language,* (pp. 37-74). Amsterdam: John Benjamins.

Cerezo, L. (2016). Type and amount of input-based practice in CALI: The revelations of

a triangulated research design. *Language Learning & Technology*, *20*, 100–123.

Ellis, R. (Ed.). (2005). *Planning and task performance in a second language*. Amsterdam: John Benjamins.

Ellis, R. (2009). The differential effects of three types of task planning on the fluency, complexity, and accuracy in L2 oral production. *Applied Linguistics*, *30*, 474-509.

Ellis, R., & Yuan, F. (2004). The effects of planning on fluency, complexity, and accuracy in second language narrative writing. *Studies in Second Language Acquisition*, *26*, 59-84.

Engber, C. A. (1995). The relationship of lexical proficiency to the quality of ESL compositions. *Journal of Second Language Writing*, *4*, 139-155.

Foster, P., & Skehan, P. (1996). The influence of planning and task type on second language performance. *Studies in Second Language Acquisition*, *18*, 299-323.

Foster, P., Tonkyn, A., & Wigglesworth, G. (2000). Measuring spoken language: A unit for all reasons. *Applied Linguistics, 21,* 354-375.

Gelman, A., & Hill, J. (2007). Data analysis using regression and hierarchical/multilevel models.

Gilabert, R. (2007). The simultaneous manipulation of task complexity along planning time and [+/-Here-and-Now]: Effects on L2 oral production. *Investigating tasks in formal language learning*, 44-68.

Hsu, H. C. (2012). Investigating the effects of planning on L2 text-chat performance. *CALICO Journal*, *29*, 619-638.

Hsu, H. C. (2015). The effect of task planning on L2 performance and L2 development

in text-based synchronous computer-mediated communication. *Applied Linguistics,* 1-28.

Kawauchi, C. (2005). The effects of strategic planning on the oral narratives of learners with low and high intermediate proficiency. In R. Ellis (Ed.), *Planning and task-performance in a second language.* Amsterdam: John Benjamins..

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

Lai, C., & Zhao, Y. (2006). Noticing and text-based chat. *Language Learning & Technology, 10*, 102-120.

Laufer, B. (1994). The lexical profile of second language writing: Does it change over time? *RELC Journal*, *25*, 21-33.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. MIT: Cambridge, MA.

Lu, X. (2012). The relationship of lexical richness to the quality of ESL learners' oral narratives. *The Modern Language Journal*, *96*(2), 190-208.

Mehnert, U. (1998). The effects of different lengths of time for planning on second language performance. *Studies in Second Language Acquisition*, *20*, 83−108.

Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, *30*, 555-578.

Ortega, L. (1999). Planning and focus on form in L2 oral performance. *Studies in Second Language Acquisition*, *21*, 109-148.

Ortega, L. (2005). What do learners plan? Learner-driven attention to form during pre-task planning. *Planning and task performance in a second language*, 77-109.

Park, S. (2010). The influence of pretask instructions and pretask planning on focus on form during Korean EFL task-based interaction. *Language Teaching Research*, *14*, 9-26.

Payne, J. S. & Whitney, P. J. (2002). Developing L2 oral proficiency through synchronous CMC: Output, working memory, and interlanguage development. *CALICO Journal, 20*, 7-32.

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: Cambridge University Press

Saito, K., Webb, S., Trofimovich, P., & Isaacs, T. (2015). Lexical correlates of comprehensibility versus accentedness in second language speech. *Bilingualism: Language and Cognition*, 1-13.

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning and Technology, 13,* 96–120.

Sauro, S. (2012). L2 performance in text-chat and spoken discourse. *System*, *40*, 335-348.

Sauro, S., & Smith, B. (2010). Investigating L2 performance in text chat. *Applied Linguistics*, *31*(4), 554-577.

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3–32). Cambridge, UK: Cambridge University Press.

Skehan, P. (1996). A framework for the implementation of task-based instruction. *Applied linguistics*, *17*, 38-62.

Skehan, P. (2003). Focus on form, tasks, and technology. *Computer Assisted Language*

Learning, *16*, 391-411.

Skehan, P. (2009). Modelling second language performance: Integrating complexity, accuracy, fluency, and lexis. *Applied Linguistics*, *30*, 510-532.

Skehan, P. (2014). Limited attentional capacity, second language performance and task-based pedagogy. In P. Skehan (Ed.), *Processing perspectives on task performance.* (pp. 211-262). Amsterdam: John Benjamins.

Skehan, P., & Foster, P. (1997). Task type and task processing conditions as influences on foreign language performance. *Language Teaching Research*, *1*, 185-211.

Skehan, P., & Foster, P. (2005). Strategic and on-line planning: The influence of surprise information and task time on second language performance. In R. Ellis (Ed.), *Planning and task performance in a second language*, (pp. 193-216). Amsterdam: John Benjamins.

Skehan, P., Xiaoyue, B., Qian, L., & Wang, Z. (2012). The task is not enough: Processing approaches to task-based performance. *Language Teaching Research*, *16*, 170-187.

Smith, B. (2008). Methodological hurdles in capturing CMC data: The case of the missing self-repair. *Language Learning and Technology, 12,* 85-103.

Smith, B. (2009). The relationship between scrolling, negotiation, and self-initiated self-repair in a SCMC environment. *CALICO Journal, 26,* 231-45.

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*, 53-81.

Smith, B. & Gorsuch, G. (2004). Synchronous computer mediated communication captured by usability lab technologies: New interpretations. *System, 32,* 553-75.

Smith, B., & Renaud, C. (2013). Using eye tracking as a measure of foreign language learners' noticing of recasts during computer-mediated writing conferences. In K. McDonough & A. Mackey (Eds.), *Second language interaction in diverse educational contexts* (pp. 147-166). Amsterdam: John Benjamins.

Tavakoli, P., & Skehan, P. (2005). Strategic planning, task structure, and performance testing. *Planning and task performance in a second language*, *239273*.

VanPatten, B. (1990). Attending to form and content in the input. *Studies in Second Language Acquisition*, *12*, 287-301.

Venables, W. N., & Smith, D. M. (2010). the R Development Core Team. An Introduction to R. *Network Theory Limited, Bristol*.

Williams, J. (2005). Form-focused instruction. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 671-691). New York: Routledge.

Yuan, F., & Ellis, R. (2003). The effects of pre‐task planning and on‐line planning on fluency, complexity and accuracy in L2 monologic oral production. *Applied Linguistics*, *24*, 1-27.