ARTICLE

Pre-task planning in L2 text-chat: Examining learners' process and performance

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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, Xiaoyue, Qian, & Wang, 2012). However, relatively few studies to date have investigated pre-task planning in a synchronous computer-mediated communication setting (e.g., Lai, Fei, & Roots, 2008; Hsu, 2012, 2015). In addition to a scarcity of computer-assisted language learning 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: (a) to examine the relationship between pre-task planning and learners' production and (b) 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.

Keywords: *Task-Based Language Teaching, Pre-Task Planning, Synchronous Computer-Mediated Communication, L2 Production*

Language(s) Learned in This Study: *English*

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Introduction

A growing body of research has examined various factors impacting second language (L2) task performance, with the role of planning on task performance (for an extensive discussion, see Ellis, 2005) receiving an increasing amount of interest. Theoretically grounded in information processing approaches to second language acquisition (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 can experience difficulty in attending to meaning and form at the same time (VanPatten, 1990). Therefore, 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 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 and the target language (Schmidt, 2001), thereby increasing opportunities for L2

development. In other words, planning is thought to reduce 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 (e.g., Ellis, 2009; Long, 2015), investigations of planning may 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 L2 classroom. In addition, examining planning can provide opportunities to test theoretical claims about the processes of SLA, such as Levelt's model of speaking (Yuan & Ellis, 2003), noticing (Lai, Fei, & Roots, 2008), and models of writing (Ellis & Yuan, 2004).

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.

Literature Review

Types of Task Planning

Two broad types of planning have been identified (Ellis, 2005). A basic distinction is 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 within-task planning not only provides learners with unlimited time to engage in pre- and post-production monitoring (Hsu, 2012), but also supplies opportunities for learners to search and draw on their linguistic resources during the formulation phase of language production (Yuan & Ellis, 2003). 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 when compared to oral interaction (Sauro, 2009). Because the rate of exchange during SCMC may be slower than in face-to-face (FTF) interaction due to variables such 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. Although there has been very little investigation of planning in SCMC to date, results by Sauro and Smith (2010) provide empirical evidence for the efficacy of within-task planning, operationalized as post-production monitoring. Using screen capture, results indicate that learners who engage in post-production monitoring produce 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, defined as planning that occurs before a learner begins the target task, can be further categorized as *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 mental organization or the formulation of 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 (e.g., Ellis & Yuan, 2004; Kawauchi, 2005; Ortega, 1999; Skehan, Xiaoyue, Qian, & Wang, 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 those of no planning time (e.g., Ortega, 1999; Skehan et al., 2012). Few have 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. 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-minute planning condition. Accuracy improved following one minute of planning and declined again with five and 10 minutes of planning time. Scholars have suggested that these differences across developmental constructs may be explained by Skehan's (2007) tradeoff hypothesis, which suggests that as learners' direct attention toward one performance area (e.g., complexity), cognitive resources are drawn away from others (e.g., accuracy). This may then result 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 et al. (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—potentially supporting L2 development. Although these results provide encouragement 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, 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 a pre-task planning (10 minutes) or a no-planning condition. 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 that 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.

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 laboratory environments and consisted of learner–researcher interactions, highlighting the need for further research on learner–learner interactions in a classroom context. In addition, the experimental

conditions of Lai et al. (2008) and Hsu (2012, 2015) included only planning or no planning, where 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). 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. Thus, previous studies using longer pre-task planning times may have measured the effects of rehearsal rather than strategic pre-task planning, underscoring the need to examine the potential effects of different amounts of strategic pre-task planning time in SCMC.

In addition, although previous research in FTF and SCMC 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, 2003), 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 Microsoft Word in combination with screen capture technology, provides opportunities to collect data on how learners use their pre-task planning time, and whether they refer to it during task performance. Ellis (2009) highlights that researchers need measures that can 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 the gaps in the literature by focusing on the differential effects of pre-task planning times on performance in 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 in this study:

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 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 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 (for an example, see Appendix A). All three tasks depicted a set of related pictures, and participants were asked to co-construct a story with their interlocutors 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).

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 the study by Baralt and Gurzynski-Weiss (2011). The survey 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 randomly assigned to an interlocutor. Learners completed three tasks with the same partner in order to account for any differences in performance that might arise from working with different interlocutors. Due to institutional resource constraints, learners remained in the same computer lab as their interlocutor. Care was taken to place interlocutors in different areas of the lab to reduce opportunities for FTF discussion during the task completion phase, with no evidence of FTF communication having been 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. 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, thus preventing the possibility of rehearsal.

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 using Basecamp Campfire (screenshot provided in Appendix C), with the same chat window used for planning and the target tasks. This allowed learners to plan individually or with their partners and to maintain access to their planning throughout the task. Learners 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.

Analysis

Learners' Production

Following Sauro and Smith (2010) and Hsu (2012, 2015), learners' text-chat scripts were converted into video-enhanced chat scripts. 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 established by previous research (e.g., Hsu, 2012, 2015; Smith, 2008), text represented by a strike through (e.g., ~~never~~) indicated text that was produced and then deleted before sending. Text located inside of brackets (e.g., [the bus]) indicated text that was added after the learner had begun to compose a message, but before hitting the *Send message* 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 not only insight into the process, but also data regarding learners' fluency. The 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-chat script only. Following the creation of the corpus of video-enhanced chat scripts, 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). Then, chat scripts were coded for measures of CAF in order to assess whether various pre-task planning times had differential effects on learner production.

Text Chat Script	Video-Enhanced Chat Script
|I listened music :: during jogging or walking|	[~~I went to jogging.~~] |I listened music ~~by my~~ :: during jogging or walking.|

Figure 1. Example of text chat script and video-enhanced chat script.

Complexity

Because complexity is a multi-faceted construct, learners' text-chat production was assessed using a range of general measures, including 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. Excerpt 1 provides an example of one AS unit and independent clause, while Excerpt 2 illustrates an AS unit including one independent clause and one dependent clause.

Excerpt 1.

   \|cat is afraid of dog\|

Excerpt 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 (Révész, Ekiert, & Torgersen, 2014), while lexical complexity was calculated using Guiraud's index (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 (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 (i.e., 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 chat scripts, 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. Chat scripts 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, chat scripts were coded for text that was deleted after the learner had begun to compose a message but before hitting the *Send message* 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

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 tasks 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; Venables & Smith, 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.

Table 1. *Descriptive Statistics for the Effects of Planning Time on Complexity*

	No Planning		1-Minute Planning		3-Minute Planning	
Complexity	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lexical	6.66	1.36	6.56	1.26	7.05	1.38
Phrasal	5.00	0.87	5.04	0.84	4.82	0.85
Syntactic	1.28	0.24	1.26	0.21	1.28	0.19

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's index), indicating a significant effect for planning times on the variety of lexical items produced by learners ($b = 0.15$, $SE = 0.07$, $t = 2.13$, 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. Table 2, Table 3, and Table 4 provide statistics for these MLM analyses.

Table 2. *MLM Testing Interactions With Planning Time and Syntactic Complexity*

Fixed Effects		Estimate	*SE*	*t*-value
Intercept		1.27	0.03	37.36*
Planning Time[a]		0.00	0.01	0.07
Random Effects		**Variance**	***SD***	**Correlation**
Intercept	Participant	0.04	0.19	
Planning Time	Participant	0.00	0.03	-1.00
Intercept	Task	0.00	0.00	
Residual		0.02	0.15	

[a]Models used no planning time as the baseline.
*Significant at < .05 when |t| > 2.00

Table 3. *MLM Testing Interactions With Planning Time and Phrasal Complexity*

Fixed Effects		Estimate	*SE*	*t*-value
Intercept		5.01	0.22	22.60*
Planning Time[a]		-0.04	0.05	-0.85
Random Effects		**Variance**	***SD***	**Correlation**
Intercept	Participant	0.30	0.54	
Planning Time	Participant	0.02	0.13	-.56
Intercept	Task	0.11	0.33	
Residual		0.41	0.64	

[a]Models used no planning time as the baseline.
*Significant at < .05 when |t| > 2.00

Table 4. *MLM Testing Interactions With Planning Time and Lexical Complexity*

Fixed Effects		Estimate	*SE*	*t*-value
Intercept		6.56	0.35	18.95*
Planning Time[a]		0.15	0.07	2.13*
Random Effects		**Variance**	***SD***	**Correlation**
Intercept	Participant	1.04	1.02	
Planning Time	Participant	0.09	0.30	-.26
Intercept	Task	0.26	0.51	
Residual		0.57	0.75	

[a]Models used no planning time as the baseline.
*Significant at < .05 when |t| > 2.00

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 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 ($b = 0.43$, $SE = 0.19$, $t = 2.30$) or no planning time (estimate $= 0.41$, $SE = 0.19$ $t = 2.17$). 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 ($b = 0.00$, $SE = 0.01$, $t = 0.07$, Psuedo $R^2 = .03$) or phrasal complexity ($b = -0.04$, $SE = 0.05$, $t = -0.85$, Psuedo $R^2 = .09$). Table 5 and Table 6 illustrate these findings.

Table 5. *MLM Testing Interactions With No Planning Time and Lexical Complexity*

Fixed Effects		Estimate	SE	t-value
Intercept		6.62	0.29	22.69*
Planning Time (1 Minute)[a]		-0.02	0.19	-0.10
Planning Time (3 Minutes)[a]		0.41	0.19	2.17*
Random Effects		**Variance**	**SD**	**Correlation**
Intercept	| Participant	0.91	0.96	
Intercept	| Task	0.14	0.37	
Residual		0.78	0.88	

[a]The variable of planning time was dummy coded with no planning time as the baseline.
[b]Random slopes were included in this model, although due to the increasing complexity of the model, they did not converge.
*Significant at $< .05$ when $|t| > 2.00$

Table 6. *MLM Testing Interactions With 1-Minute Planning Time and Lexical Complexity*

Fixed Effects		Estimate	SE	t-value
Intercept		6.60	0.27	24.66*
Planning Time (1 Minute)[a]		0.02	0.19	0.11
Planning Time (3 Minutes)[a]		0.43	0.19	2.30*
Random Effects		**Variance**	**SD**	**Correlation**
Intercept	| Participant	0.91	0.95	
Intercept	| Task	0.10	0.32	
Residual		0.76	0.87	

[a]The variable of planning time was dummy coded with no planning time as the baseline.
[b]Random slopes were included in this model, although due to the increasing complexity of the model, they did not converge.
*Significant at $< .05$ when $|t| > 2.00$

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.

Table 7. *Descriptive Statistics for the Effects of Planning Time on Accuracy*

	No Planning		1-Minute Planning		3-Minute Planning	
Accuracy	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lexical	0.84	0.13	0.83	0.14	0.83	0.15
Syntactic	0.56	0.17	0.58	0.15	0.58	0.15

MLM analyses found no significant differences across planning times for grammatical ($b = 0.01$, $SE = 0.01$, $t = 0.92$, Psuedo $R^2 = .06$) or lexical accuracy ($b = -0.01$, $SE = 0.01$, $t = -0.73$, Psuedo $R^2 = .09$), suggesting that pre-task planning did not result in learners' improved accuracy during production. Table 8 and Table 9 provide information regarding these results.

Table 8. *MLM Testing Interactions With Planning Time and Grammatical Accuracy*

Fixed Effects		**Estimate**	**SE**	**t-value**
Intercept		0.56	0.02	24.27*
Planning Time[a]		0.01	0.01	0.92
Random Effects		**Variance**	**SD**	**Correlation**
Intercept	Participant	0.01	0.12	
Planning Time	Participant	0.00	0.02	-.48
Intercept	Task	0.00	0.00	
Residual		0.01	0.12	

[a]Models used no planning time as the baseline.

*Significant at < .05 when |t| > 2.00

Table 9. *MLM Testing Interactions With Planning Time and Lexical Accuracy*

Fixed Effects		**Estimate**	**SE**	**t-value**
Intercept		0.84	0.02	42.05*
Planning Time[a]		-0.01	0.01	-0.73
Random Effects		**Variance**	**SD**	**Correlation**
Intercept	Participant	0.01	0.08	
Planning Time	Participant	0.00	0.02	.26
Intercept	Task	0.00	0.02	
Residual		0.01	0.10	

[a]Models used no planning time as the baseline.

*Significant at < .05 when |t| > 2.00

Fluency

In terms of fluency, MLM analyses indicated that there was no significant effect for pre-task planning time ($b = 0.01$, $SE = 0.01$, $t = 1.42$, 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.

Table 10. *Descriptive Statistics for the Effects of Planning Time on Fluency*

Accuracy	No Planning		1-Minute Planning		3-Minute Planning	
	M	*SD*	*M*	*SD*	*M*	*SD*
Fluency	0.17	0.09	0.18	0.12	0.20	0.13

Table 11. *MLM Testing Interactions With Planning Time and Fluency*

Fixed Effects		Estimate	SE	*t*-value
Intercept		0.17	0.01	12.42*
Planning Time[a]		0.01	0.01	1.42
Random Effects		**Variance**	**SD**	**Correlation**
Intercept	Participant	0.00	0.04	
Planning Time	Participant	0.00	0.02	1.00
Intercept	Task	0.00	0.00	
Residual		0.01	0.10	

[a]Models used no planning time as the baseline.

*Significant at < .05 when |t| > 2.00

Discussion

Overall, statistical analyses indicated 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 may 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 occur during the planning phase, learners may rely 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 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 FTF 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, during which learners engage in the selection and ordering of information to be communicated (Levelt, 1989). This *preverbal message* is what learners may be focused on in terms of processing during initial task performance (Bygate, 1996). Thus, during pre-task planning, learners have the opportunity to first establish familiarity with meaning and content. In the current study,

learners in the 3-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, facilitating the production of 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, the findings of Ortega (2005), in which the most frequently identified benefit of planning time was the opportunity to retrieve and access vocabulary, 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" (p. 7). Instead, learners' cognitive efforts might be directed toward 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. Thus, in the current study, 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.

The lack of differences across learners' accuracy might also be explained by Skehan's (2007) tradeoff hypothesis, which suggests that because learners' attentional capacity is limited, the directing of attention toward one performance area, such as accuracy, may take cognitive resources away from others. In the current study, learners might 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.

Another possible explanation for the lack of impact across conditions on learners' performance might have been due to the unlimited amount of within-task planning time. 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). However, this additional within-task planning time may serve as a substantial resource in terms of linguistic production, thereby negating the effects of pre-task planning by offering learners opportunities to reformulate and produce text within the task as needed (Hsu, 2012). This explanation is supported by the exit surveys, which indicated that 14% of learners felt that pre-task planning was not beneficial or necessary, as they could plan during the task instead. A summary of the most common responses from the exit survey are provided in Table 12.

Previous research indicates mixed findings, with some studies showing no effects for pre-task planning time on any aspect of learners' production (Hsu, 2012) and others demonstrating improved accuracy and no impact on production complexity (Hsu, 2015). In contrast to these results, the current study did not reveal any improvements in accuracy. The video-enhanced chat scripts indicated that some learners were able to reformulate following transmissions of an utterance by 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 were able to evaluate and revise their text after it had been sent, demonstrating a unique opportunity for monitoring and reformulation that would not be available to learners outside of a SCMC context. Finally, 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).

Table 12. *Percentage of Learners' Responses According to Item and Theme*

Questionnaire Item	Most Common Thematic Responses		
	Vocabulary	**Useful or Fun to Chat in SCMC**	**Difficult to Chat in SCMC**
Did you learn anything from this study? If so, what?	30%	25%	11%
	No Particular Feature	**Grammar**	**Vocabulary or Meaning**
Did you focus on any specific grammatical form or vocabulary in this study? If so, what?	52%	30%	18%
	Less Stressful	**More Stressful Than FTF**	**More Difficult, due to Lack of Gesture or FTF**
What is your opinion about English conversation practice via text chat online?	18%	14%	11%
	Shorter	**Longer**	**Same**
Did you think having shorter or longer times to plan your task was more helpful? Why?	36%	34%	30%
	One Minute	**Three Minutes**	**No difference**
Is one amount of planning time (e.g., 1 minute vs. 3 minutes vs. no planning time) more beneficial for practicing language conversation than the other? Or are they the same?	25%	23%	23%

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

The second research question explores how the unique affordances 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.

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. However, the majority of learners did not draw on their plans during task production. For the learners that did appear to access their plans, the corpus of screen capture data revealed some scrolling 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, there was no evidence that the learners in this experiment directly utilized previously produced text from the pre-task planning phase. Although it was possible that learners re-read and referred to their pre-task production in order to facilitate during-task production, thereby drawing on their planning, 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 learners did to pass time while waiting for their interlocutors 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, using screen capture technology 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 Excerpt 3, the learner produced an utterance with multiple errors. Because we were able to follow the process and the sequence of how the learner monitored his production, evidence regarding the benefits of within-task planning time were clearly provided.

Excerpt 3. *Satoshi*

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

Sequence:

One day, Jason, a young man, walk with him dog, ~~hachi~~.

One day, Jason, a young man, walk with ~~him~~ dog, ~~hach~~.

One day, Jason, a young man, walk with his dog, hachi.

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

This excerpt shows how Satoshi[2] revises the same sentence multiple times. He begins by revising the spelling of *hachi* and then modifying 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, where the narrative takes place in the past. This sequence demonstrates the learner's 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 also provided evidence of the multiple opportunities for noticing that learners were afforded in a written text-chat environment.

In another example from within-task planning (Excerpt 4), we are able to see how a learner produced an utterance, but prior to transmitting it, revised the text and then added a clause before the previously produced text. By using screen capture technology, it was possible to clearly see not only what learners produced but also in what order they did so. An example from the video-enhanced chat script below illustrates text that was added to the beginning of the sentence following the original production. Figure 2 and Figure 3 provide screen shots where it is possible to see the cursor mid-sentence after the inclusion of the additional text.

Excerpt 4. *Hyeon*

"[after few minute,] the bus came the bus stopping"
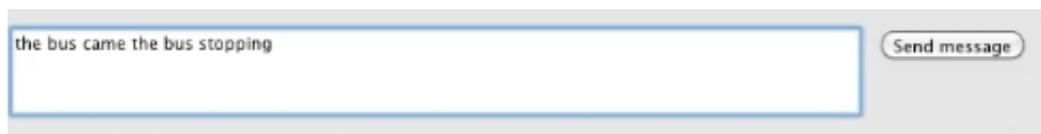
Figure 2. Example of originally produced text.

after few minute, the bus came the bus stopping   [Send message]

Figure 3. Example of revision following post-production monitoring.

Here, it is clear to see that the learner elaborated on the utterance by providing additional temporal data. Overall, learners elaborated on their utterances by adding post-production text 3.40 times (*SD* = 2.33) 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), the current findings demonstrate that without video-enhanced chat scripts, 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 Excerpt 5, it is possible to see how the learner produced a variety of possibilities, deleted them, and instead chose to transmit a word that he might have felt more comfortable or confident using.

Excerpt 5. *Hyeon*

>   "~~safely or confortably~~ well"

cat could sleep safely or confortably | [Send message]

Figure 4. Example of initial production.

In the example from the video-enhanced chat script above, 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 chat scripts indicated that learners avoided structures or vocabulary 1.48 times (*SD* = 1.47) 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 less-interactive learners participate in communicative tasks. For example, learners may delete text because their interlocutors produce content that renders an 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 chat scripts, 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 the delay between interlocutors' message transmission 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. While the combinations of technologies provide important information regarding what learners produce but do not transmit, it is difficult to obtain evidence regarding what a 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 decreased learner production. SCMC data combined with screen capture data, on the other hand, provide information regarding learners' intended production, regardless of whether they transmit the message to their interlocutor.
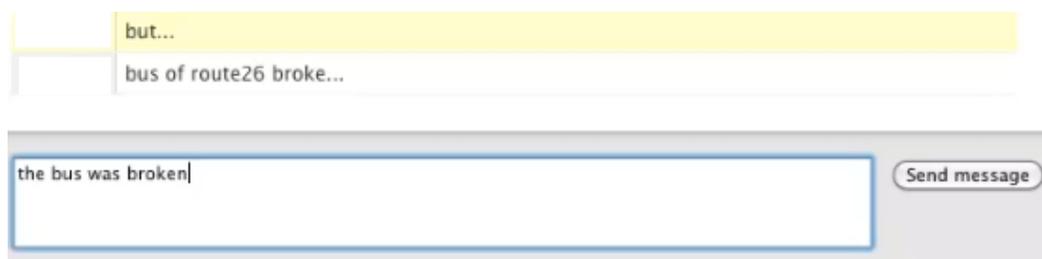
Figure 5. Example of interlocutors' simultaneously produced text.

In the preceding example, Asami had already typed *the bus was broken*, but she 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), 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, with learners' proficiency best predicted by lexical variation. 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 or vocabulary and meaning making as opposed to not focusing on a specific linguistic or communicative aspect of their production. 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. Surveys indicated that learners felt that three minutes of planning time 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.

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 ($N = 44$) was still relatively small. Second, because 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 their 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, retrospective protocols, like stimulated recalls, would provide insight regarding why learners performed certain actions in pre- and within-task planning, 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. 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 (e.g., 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 time limits for task completion (Ellis, 2009), might enhance the benefits of pre-task planning time.

Acknowledgements

Notes

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

2. All learners' names have been replaced with pseudonyms.

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Appendix A. Sample Story-Telling Task


Appendix B. Exit Survey

1. Did you learn anything from this study? If so, what?
2. Did you focus on any specific grammatical forms or vocabulary words during planning? If so, what did you focus on?
3. What is your opinion about English conversation practice via text chat online? Please explain.
4. Did you think having shorter or longer times to plan your task was more helpful? Why?
   Or
   Do you think having shorter or longer times to plan your task are about the same? Why?
5. In your opinion, is one amount of planning time (i.e. 1 minute vs 3 minutes vs no planning time) more beneficial for practicing language conversation than the other? Or are they the same? Why or why not?
6. Do you have any other comments about what you did?

Thank you for your participation!

Appendix C. Screenshot of Chat Program
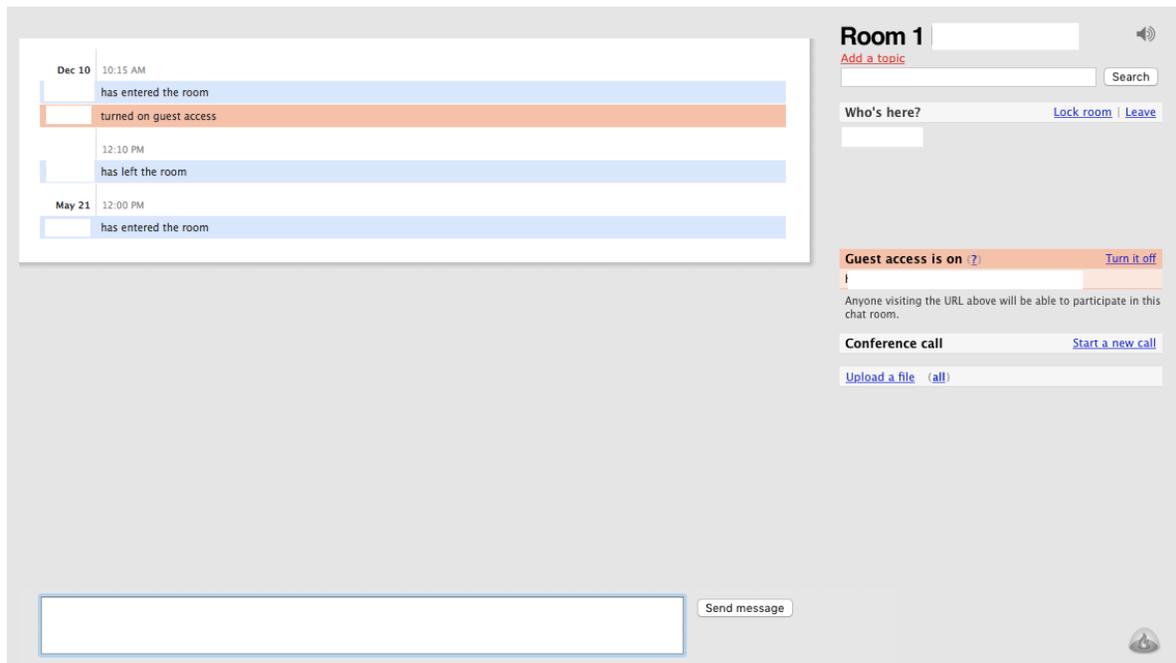
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