EFFECTS OF INTERACTIVE CHAT VERSUS INDEPENDENT WRITING ON L2 LEARNING

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This study examines the importance of interaction for second language (L2) acquisition by analyzing outcomes from two types of out-of-class activities. The study compared: (a) interactive homework, completed via text chat, and (b) individual homework, completed via independent writing. In a between-subjects design, participants in two intermediate-level Russian classes were assigned to the two conditions and completed study tasks three times a week for six weeks. In the interactive condition, student pairs engaged in synchronous text-chat sessions, completing tasks designed to encourage interaction through information-, reasoning-, or opinion-gaps. In the individual condition, students completed comparable writing activities on their own. Both conditions provided the same language input and required production, over an equivalent amount of time. Language gains were assessed through vocabulary, writing, and speaking pre- and post-tests. Students in the interactive condition showed greater gains in vocabulary knowledge and oral production than students in the individual condition; no differences were found in students' writing accuracy or complexity. Students in the interactive condition also produced more Russian types and tokens in their homework assignments than students in the individual condition, both at the beginning and later in the study. These results support the benefits of interactive homework for L2 learning and production.

INTRODUCTION

In order to learn a new language, learners need not only exposure to the language (input) and practice producing the language (output), but also opportunities to communicate with other speakers, that is, interaction. Interactionist research has shown second language (L2) advantages from performing tasks interactively compared to individually (Gass & Varonis, 1994; Mackey, 1999). Technology can provide opportunities for learner interaction (Golonka, Bowles, Frank, Richardson, & Freynik, 2014); specifically, synchronous computer-mediated communication, or text chat, offers a method to make homework, which typically involves independent study, more interactive. Benefits of synchronous text chat for foreign language learning and teaching, many of which stem from its interactivity, have been well established

(Blake, 2009; Kern, 1995; Lin, Huang & Liou, 2013).

Motivated by these empirical findings of the beneficial interactivity of text chat, this study examined how different types of out-of-class assignments affected language development in intermediate-level adult students of Russian in the US. We tested the effects of interactive homework, completed through text chat, compared with independent writing homework on multiple measures of language proficiency including vocabulary knowledge, writing complexity and accuracy, and oral production and fluency.

Interaction Hypothesis

The importance of student interaction in the L2 has been formalized in the Interaction Hypothesis (Long, 1981, 1996), which posits that interaction between speakers often requires negotiation for meaning, or working to achieve mutual comprehension, through requests for clarification or comprehension checks. This process, in turn, results in language modifications that facilitate the language learning process. Specifically, learners indicate communication breakdowns, prompting interlocutors to modify their speech, typically through repeating, elaborating, or simplifying, thus rendering the input comprehensible (Gass & Varonis, 1985). According to Mackey (1999), "when learners are struggling to communicate and are engaged in trying to understand and to be understood, their attention may be on language form as well as meaning" (p. 562). Negotiation for meaning during interaction promotes noticing of target language form, which is a necessary component for acquisition (Schmidt, 1990).

In addition to comprehending the input during interaction with another speaker, a learner must produce the target language. If this output is incomprehensible to a learner's interlocutor, as indicated by clarification requests, it must be modified. Similar to the benefits of modified input discussed above, modifying output in the target language requires the learner to pay attention to grammatical form, again promoting noticing of target language features (Swain, 1985).

A study by Mackey (1999) demonstrated the advantage of participating in tasks interactively, in which the learner engages in both input and output, compared to performing tasks without engaging in interactive communication. Over a period of one week, 34 learners of English performed story completion, picture sequencing, and picture drawing tasks that provided a context for producing the target linguistic structure (question formation) and the opportunity for interaction between interlocutors. Participants were assigned to (a) an interaction group, in which they worked with a native speaker partner to complete the tasks, or (b) a non-interaction group, in which they either completed the task with a native speaker who followed a tightly controlled script, thus preventing negotiations for meaning, or simply observed a participant and native speaker from the interaction group complete the task. A control group did not participate in any of the experimental activities. Participants in the interactive group made significant gains in their English question formations and produced more higher-level questions than participants in the non-interactive groups. Participants who observed interactions, but did not participate in them, showed more limited developmental gains, and participants in the scripted group, who engaged in interaction but had no opportunity to negotiate, did not show any developmental gains, nor did they produce any higher-level questions. The results of this study indicate that performing tasks interactively, specifically, engaging in negotiation for meaning, is beneficial to second language development.

Furthermore, it is not only learner-native speaker interactions that facilitate second language development. Interaction between learners has also been shown to be beneficial. In a study of learners' spoken interaction during a task-based activity, González-Lloret (2003) found that students were committed to completing the task and, as a result, worked to negotiate meaning by asking for clarifications, primarily when one or both of them did not understand a lexical item. There was also evidence that when one speaker knows an L2 form, not only does exposure to an interlocutor's incorrect use of that same form *not* impact the speaker's correct usage, but, the speaker may correct the interlocutor's error or model the correct use (González-Lloret, 2003). In another study, Kawaguchi and Ma (2012) found that corrective feedback and negotiation for meaning happened most often in mixed

proficiency pairs of non-native speakers.

Evidence Supporting the Use of Text Chat

As discussed above, negotiation for meaning is an integral part of foreign language learning during face-to-face interaction with another speaker. However, researchers have also observed this language learning process in text-chat interactions. Smith (2008) found that negotiation for meaning in voice chat and text chat occurs at a similar rate. Furthermore, Kitade (2000) found that students negotiated meaning and self-corrected without teacher supervision during group synchronous text chat. A detailed analysis of the text-chat transcripts of mixed proficiency students of English by Shekary and Tahririan (2006) showed that mini-dialogues about the language itself (e.g., asking a partner for a clarification or definition) offered the opportunity to notice new linguistic items and retain that information.

Several studies have compared the effectiveness of different types of interactive discussion for improving language production, that is, how well students learn when interacting via text chat versus face-to-face conversation. Due to its real-time, conversational nature, researchers have predicted that language production via chat would be at least as beneficial for students as spoken conversation. In fact, these studies showed that students using text chat produced more typed utterances and variety of discourse functions than students in the spoken condition (Beauvois, 1998; Kern, 1995). They also showed increased oral fluency compared to students in the spoken condition (Blake, 2009; Payne & Whitney, 2002; Satar & Özdener, 2008).

Research also shows that participation in text-based chat can ameliorate affect for students who are shy or less confident. In a face-to-face conversation, more confident students usually dominate the conversation, and less confident students can be hesitant to join the conversation. In text-based chat, less confident students are more likely to open up and participate (Kern, 1995; Owen, 1993; Sullivan & Pratt, 1996; Warschauer, 1996). In addition, because the instructor's role is usually diminished in chat discussions, students naturally take more responsibility for the discussion; therefore, speakers share the floor more equally, giving everyone opportunities to learn (Chun, 1994; Ortega, 1997).

The use of chat for out-of-class homework assignments has also been investigated. For example, chat was assigned as homework in a tandem learning situation where 26 pairs of Korean- and English-speaking high-school students in Canada each worked to learn the other's native language (Chung, Graves, Wesche, & Barfurth, 2005; Chung, 2006). Content analysis of the transcripts revealed that participants were able to teach and learn appropriate linguistic and cultural behaviors, such as Korean honorific discourse or chat jargon, and were able to negotiate meaning. Furthermore, students demonstrated gains in vocabulary knowledge after each set of chat activities.

In a study that compared two types of L2 online writing, Razagifard (2013) examined how oral fluency was affected by synchronous interaction using text chat compared to asynchronous postings made on a web bulletin board. The 63 ESL students were randomly assigned to the synchronous or asynchronous experimental conditions, or to a control group that did not complete any out-of-class work. Students in the two experimental groups completed tasks designed to encourage negotiation such as decision-making or problem-solving. Students in the synchronous condition completed the chat tasks during 45-minute sessions, and students in the asynchronous condition posted messages over the course of the week. Post-test measures of oral fluency showed that students in the synchronous text-chat group performed significantly better than both the asynchronous forum discussion group and the control group in the speaking tasks; the asynchronous and control groups did not differ from each other. These results support other findings that have shown a benefit of chat for fluency, likely due to the real-time language production, albeit written, and ability to track the recorded conversation.

A meta-analysis by Lin, Huang, and Liou (2013) summarized the effects of text-based synchronous computer-mediated communication on second language acquisition based on 10 studies conducted

between 1990 and 2012. By calculating the weighted effect sizes for these studies, a significant positive mean effect (m = .33) indicated that chat aided language development for the experimental groups compared to the control and comparison conditions across studies. Certain chat characteristics were found to favorably affect language development: assigning chat to higher proficiency learners as opposed to beginners, including longer and regular chat sessions, and dividing the students into pairs or small groups rather than chatting as a whole class. While the number of studies eligible for the meta-analysis was small, the results demonstrate that participation in chat consistently affords greater gains in language development compared to control groups.

Overall the literature suggests that various types of real-time interaction in the L2, including through text chat, are beneficial for learners. Comparing this type of practice to more traditional forms of homework, which are typically carried out independently, could shed light on the best ways to help students improve various aspects of language proficiency.

Research Questions

In the present study, we build on the literature examining interaction in second language acquisition by comparing two types of out-of-class activities, both of which involve written input and output in the L2, but only one of which also incorporates interaction between learners. We created two assignment conditions: (a) interactive, which required task completion with a partner via text chat, and (b) individual, which required task completion alone via independent writing activities. Participants in two intermediate-level Russian classes were assigned to one of the conditions. Both conditions covered the same language and topic content over an equivalent amount of time. We expected language gains for both groups, but predicted that the interactive chat group would show greater gains due to the benefits of interaction, as described above. In particular, we hypothesized that this group would demonstrate better oral language production and vocabulary learning. Because both conditions involved writing in the target language, we also examined the effects of the two different kinds of L2 practice (chat vs. composition) on writing complexity and accuracy. Finally, we also examined the amount and complexity of students' target language output in the homework assignments themselves with the hypothesis that the benefits of interactive language activities would be evident in the assignments as well.

The primary research questions that guided our analyses were:

1. Do vocabulary knowledge, writing complexity and accuracy, and oral production and fluency differ for students who participated in the individual and interactive conditions, and if so, how?
2. Does language production differ and change over time for students in the interactive and individual groups in later homework assignments compared to the earliest homework assignments, and if so, how?

METHOD

Participants

Students enrolled in two intermediate-level Russian classes at an intensive language training institution in the US participated in this study; classes were assigned as intact groups to one of the conditions. Students in the two classes followed the same school-developed curriculum, and were at similar points in their courses, with proficiency roughly equivalent to three semesters of college-level courses. Students in each class completed the interactive or individual homework tasks, as assigned by their instructors. For analyses of the individual and chat homework data, the individual condition had 20 students (5 female, 15 male; Mean age: 25.7 years; Mean education: 2-3 years of college) and the interactive condition had 25 students (6 female, 19 male; Mean age: 22.3 years; Mean education: 1 year of college). All students but one across both conditions reported being native speakers of English. Due to scheduling constraints, a subset of students in the two classes took part in the pre- and post-testing; for these comparisons, data

from 16 students (5 female; 11 male) from the individual condition and 9 students (2 female; 7 male) from the interactive condition were analyzed.

Measures

Vocabulary Knowledge Scale

Vocabulary knowledge in this study was measured by using a Vocabulary Knowledge Scale (VKS) as a pre- and post-test measure of the breadth and depth of students' vocabulary. The VKS includes self-report responses ranging from "I don't remember having seen this word" to "I can use this word in a sentence." The test was used because it combines self-report and performance items, which provides information about learners' memory of exposure to the words as well as knowledge of their meaning (Paribakht & Wesche, 1997). An example of the VKS is shown in Table 1. The test consisted of 54 Russian words falling into three categories: (1) 18 Control words that students were exposed to in course lessons prior to the start of the study, (2) 18 Course words found in *both* the students' standard course materials and the new activities developed for the experiment, and (3) 18 Experimental words *only* present in the experimental activities (See **APPENDIX** for vocabulary list). Categories (2) and (3) were sets of target words that differed by how much students would be exposed to them; that is, multiple times in the case of the course words and likely only during the study task for the experimental words. These 36 words were a subset of the vocabulary used in the study activities' texts and glossaries. The VKS words were placed in a randomized order into four separate study forms to control for the order of presentation across participants. Students received the same form of the task at the pre-test and the post-test sessions to control for effects of motivation and fatigue when completing the task, which took about 15–20 minutes. Each of the 54 items received a vocabulary knowledge scale score, which took into account students' accuracy in defining the word *and* confidence in their self-report, as well as a binary score indicating whether the correct translation was provided. Two researchers coded a subset of the tests for reliability; their percentage agreement was 96%.

Table 1. An Example of a Vocabulary Knowledge Scale Item (Wesche & Paribakht, 1996)

	Self-report categories
I.	I don't remember having seen this word before.
II.	I have seen this word before, but I don't know what it means.
III.	I have seen this word before, and I think it means _____.
IV.	I know this word. It means _____.
V.	I can use this word in a sentence: _____.

Summary writing

To assess students' writing mechanics, including accuracy and complexity, at the pre-test and the post-test, students read a short article in Russian and wrote a brief summary of the article (50-60 words) in Russian that conveyed the essential information. Two texts of similar difficulty were used as prompts for this task: Article A, which described the new fastest train in Russia, and Article B, which described an Aeroflot airplane crash. Students received either Article A or B at the pre-testing and the opposite article at post-testing. Along with the text, students were provided with a glossary listing potentially unfamiliar Russian words. Participants had 10 minutes to read the Russian text before it was collected and replaced with the English translation, which was provided to help students remember the details. Participants then had 20 minutes to write a summary of the text, and were allowed to use the English translation as well as the Russian-English glossary for reference. Summary writing was used as an elicitation technique to acquire a target language writing sample. Participants' summaries were not evaluated for content such as

whether the main idea was conveyed or major points were captured, instead, the written summaries were analyzed by a native speaker and teacher of Russian to assess grammatical, spelling, and semantic errors. In general, each word with an error was counted as one error, including cases where one grammatical error was carried over multiple words (e.g., subject-verb agreement) as well as multiple occurrences of the same error in the same word in the text. Multiple errors of the same kind in one word were counted as one error. Accuracy was calculated by dividing the number of words with errors by the number of words in the summary. Lexical diversity was determined using the CLAN program (Computerized Language Analysis, MacWhinney, 2000) to calculate the type:token ratio. Type:token ratio is a common measure of lexical diversity and is used as an indication of the complexity of a student's working vocabulary and the quality of the lexical knowledge that is demonstrated (Nation & Webb, 2011). Tokens refer to all running words in the text, and types refer to unique words in the text. A type:token ratio is calculated by dividing the number of types by the number of tokens.

Speaking

A 60-second speaking task was administered to assess oral production and fluency at the pre-test and the post-test. Students were given a prompt in English, after which they had 10 seconds to gather their thoughts. They then responded to the prompt in Russian and were allowed to speak freely for up to 60 seconds; responses were audio recorded. Two prompts were used: "Describe your favorite city" (pre-test), and "Describe your favorite vacation" (post-test); these prompts were chosen because students were expected to be able to talk about these topics unrehearsed based on previous lessons. All sound files were analyzed using Praat version 5.3.16 (Boersma & Weenink, 2012), software that allows transcription and analysis of speech samples. Segments were first marked automatically as silence or speech after which they were labeled manually as silent pauses, filled pauses, or speech segments. A pause was defined as a completely silent segment of at least 200 milliseconds in duration. A filled pause was a sound segment such as "um." The sound segments were defined as runs, (i.e., speech segments) occurring between pauses. Next, a near-native Russian speaker inspected all identified runs, filled pauses, and silent pauses, and transcribed the words, annotating the number of syllables produced.

Several measures of production and fluency were calculated for both the pre- and post-tests based on the duration and number of pauses and syllables produced by the learners. Specifically, the sum and length of syllables, runs, pauses, and filled pauses were counted as measures of speech production, and were also used to calculate the length of all pauses (filled and non-filled), the overall time speaking including all pauses, the overall time speaking excluding all pauses, and the overall time speaking excluding filled pauses. These values were used to calculate three measures of fluency: Mean Length of Run [MLR] (total number of syllables/total number of runs), Average Length of Pauses [ALP] (total length of all pauses/ total number of pauses), and Phonation Time Ratio [PTR] (total length of time speaking excluding filled pauses/total length of time including pauses). These are global measures of fluency that can indicate changes in L2 oral proficiency over time (Blake, 2009; Vercellotti, 2012). Phonation time ratio is a global fluency measure related to speed. Since it includes pauses, improvements on this ratio would reflect more fluid speech with fewer pauses. Mean length of run (MLR) and average length of pauses (ALP) provide information about how much speech they are producing between pauses and how long learners are pausing between words, two complementary measures of oral fluency that change as a learner gains proficiency (Vercellotti, 2012).

Materials

The study materials were designed by near-native speakers of Russian to complement the standard course materials used for the classes. Activities were developed that matched the topics covered in class lessons which would be taught over the course of the study: weather and nature, transportation, housing, hobbies and free time, health, military, and post office. Glossaries accompanied each activity providing students with any new vocabulary needed to understand the information presented and discuss it.

Task-based activities were designed for student dyads in the interactive condition, as these characteristics have been found to encourage interaction (Tudini, 2010). Each homework activity included a specific goal. All chat activities included information-, reasoning-, or opinion-gaps that learners needed to fill to complete the task (Pica, Kanagy, & Falodun, 1993; Prabhu, 1987). In the information-gap tasks, each learner received only part of the information, and they needed to work together to transfer information from one to another. Examples include role-play scenarios, where participants received information relevant to the characters they played (e.g., patient/doctor or victim/policeman) and needed to exchange information with their partner such as diagnosing a patient or taking a police report about an incident. In the reasoning-gap tasks, learners needed to use forms of reasoning, such as deduction or inference, to derive new information from information given to them. Examples include coming up with the best way to arrive at a certain place using metro and street maps and discussing potential solutions to problems such as traffic jams in Moscow. In the opinion-gap tasks, learners were asked to express their personal preferences, opinions, or feelings regarding a given issue. Examples of this type of task include expressing opinions about a controversial medical treatment or voicing preferences when deciding how to spend free time. Some tasks included more than one type of gap. For instance, in a guessing game, participants did not know the guessing object (information-gap) and needed to use available clues to make a final guess (reasoning-gap).

For the individual condition, comparable activities with the same resources were given. These activities were very similar in the content they asked students to consider; however, the written responses were expected to be different. For example, for one activity, interactive condition students were given different sets of authentic Russian apartment rental ads with a budget and a set of criteria and were asked to chat about the apartments and decide together which one to rent. The individual condition students were also given the same ads, budget, and criteria but were asked to write a paragraph of at least five to six sentences describing their choice of apartment and reasons for choosing it. All activities were designed to take approximately 20 minutes to complete.

Procedure

Pre-testing was conducted over two days. During the first pre-testing session, the participants completed consent forms, followed by the Summary Writing task and the Speaking task. In the second pre-testing session, participants completed the Vocabulary Knowledge Scale.

The homework tasks were administered three times a week over a six-week period, beginning the week after the pre-testing sessions. Students in the two Russian classes were assigned to complete the activities for homework. Each Monday, the materials for that week's three tasks were uploaded to the classes' learning management website. For the class assigned to the interactive condition, these materials included partner assignments, instructions for chatting using the site, and the tasks with any supporting files, such as maps or pictures, required for completing the activity. Students in the interactive condition were assigned a new partner each of the six weeks to ensure a variety of interactions and encourage negotiation for meaning (Shekary & Tahririan, 2006). For the class assigned to the individual condition, students were instructed to post their written responses on the site; their materials included tasks and supporting files required for completing the independent writing activity. Students in both conditions were instructed to space out the assignments over a period of five to seven days, rather than completing all three on the same day.

The post-tests were conducted the week after participants completed the homework assignments and were administered in one or two sessions depending on students' schedules. The procedures followed for all tasks were the same as during the pre-test session. The Summary Writing task was conducted first, following by the Vocabulary Knowledge Scale task, and the 60-second Speaking task.

RESULTS

Research Question 1: Do vocabulary knowledge, writing complexity and accuracy, and oral production and fluency differ for students who participated in the individual and interactive conditions, and if so, how?

The following sections outline the results for the three pre- and post-tests administered for the study. Due to various constraints, the number of students who completed each of the three tasks at both the pre-test and the post-test differs by test; therefore, the specific numbers for each analysis are indicated in the results sections below. All examined variables for each of the pre- and post-tests (the VKS, the Summary Writing, and the Speaking task) were tested for normality using the Kolmogorov-Smirnov tests. Since most of the datasets were normal, we report the results of the parametric tests (independent and paired samples *t* tests) in each section. Nonparametric versions of the parametric tests (Mann-Whitney *t* tests and Wilcoxon signed ranks tests, respectively) were also run for all analyses, and the results did not change. In order to correct for multiple comparisons, the False Detection Rate (Benjamini & Hochberg, 1995; Benjamini, 2010) correction was calculated using the statistical program R (R Development Core Team, 2012).

Vocabulary Knowledge Scale

Students' responses to each item on the Vocabulary Knowledge Scale were given a binary score (0–1), which reflects breadth of knowledge through the number of words known, and a scale score (1–5), which reflects depth of knowledge through accuracy and confidence. Although the VKS scoring typically goes up to 5 for students who have provided a correct sentence, we found that students were not completing this section of the items on the post-test as often, and for the same words, as they did on the pre-test, likely due to a lack of motivation and to time constraints. Therefore, we capped the scale scores at 4 in order to more accurately determine the range of knowledge/confidence without the optional sentence section. These scores were summed to give each student scores (see Table 2) for the three categories of words included in the test: 18 target words, each of which were only in the experimental materials (Experimental) or in both experimental and course materials for the lessons covered in the study (Course), and 18 control words which were from earlier lessons (Control).

Table 2. *M and SD for Students' Vocabulary Knowledge Scale Scores by Condition*

Target Word Category	Individual Pre-test**		Individual Post-test		Difference		Interactive Pre-test***		Interactive Post-test		Difference	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Experimental Binary	4.38	1.2	5.00	1.4	.63	1.2*	3.75	1.2	5.88	1.0	2.13	1.4*
Experimental Scale	34.41	4.7	37.81	4.4	3.41	3.3*	31.25	3.1	37.38	2.6	6.13	2.4*
Course Binary	8.06	1.2	13.56	1.7	5.50	1.3*	6.75	1.5	14.00	1.2	7.25	2.0*
Course Scale	44.91	3.1	62.22	4.1	17.31	3.3*	39.63	3.5	61.56	3.3	21.94	5.4*
Control Binary	14.44	2.5	15.38	1.2	.94	1.9	15.25	1.3	14.75	1.0	-.50	1.5
Control Scale	63.34	4.9	66.06	2.8	2.72	3.8	64.19	2.6	63.88	1.6	-.31	3.5

Notes. * *indicates significant change from pre- to post-test within condition, p < .05;* **Individual condition, n=16;* ***Interactive condition, n=8.*

Overall, students in both conditions knew the most Control words (by design), followed by Course words and then Experimental words at both the pre-test and the post-test. Paired samples *t* tests and independent samples *t* tests were run to test differences in mean scores within the groups and between the two groups, respectively. Cohen's *d* was calculated for the *t* tests to calculate effect sizes. Values of 0.20, 0.50, and 0.80 were considered small, medium, and large respectively (Cohen, 1992). The Course and Experimental words were those that were targeted in the study activities; therefore, students were expected to improve on this vocabulary after engaging in the activities. Paired samples *t* tests comparing pre- and post-test binary and scale scores for the three categories of words showed significant improvement for Course and Experimental word knowledge within each condition (*p's* < .05). The *t* tests did not show a significant change in Control word knowledge for either condition for binary scores but did show a significant increase for the individual group for the control scale score, (*p* < .05), indicating somewhat more familiarity with the control words but not complete knowledge.

To compare gains by condition, independent samples *t* tests were conducted comparing the students' difference scores (post-test score minus pre-test score) for the individual and interactive groups. Students in the interactive condition had significantly greater gains in their Experimental binary scores, *t*(22) = -2.85, *p* < .01, *d*=1.22, and scale scores, *t*(22) = -2.09, *p* < .05, *d*=0.89, than students in the individual condition. Students in the interactive condition also had significantly greater gains in their Course binary scores, *t*(22) = -2.64, *p* < .05, *d*=1.13, and scale scores, *t*(22) = -2.60, *p* < .05, *d*=1.11, than students in the individual condition. Differences for Control binary and scale scores were not significantly different (*p's* > .05). In sum, while learners in both conditions showed improvement in breadth of vocabulary knowledge, the gains for the interactive group were greater than those of the individual group for the words targeted in the study, both in the Experimental (limited exposure) category and the Course (multiple exposure) category.

Summary writing

Students' summary writing was analyzed to assess complexity and accuracy. Complexity was analyzed using a type:token ratio of Russian words used in the summary. Accuracy was assessed by examining students' total grammar, lexical, and spelling errors and the ratio of the total number of words with errors to the number of written words. Table 3 presents means for these measures.

Table 3. *M and SD of Types, Tokens, and Errors in the Summary Writing by Condition*

	Individual Pre-test*		Individual Post-test		Interactive Pre-test**		Interactive Post-test	
	M	*SD*	M	*SD*	M	*SD*	M	*SD*
Type:Token Ratio	0.83	.1	0.83	.1	0.79	.1	0.83	.1
Total Errors	16.60	6.6	16.73	7.2	17.33	9.7	16.78	7.5
Errors:Tokens Ratio	.29	.1	.25	.1	.22	.1	.26	.1

*Notes. *Individual condition, n=15; **Interactive condition, n=9*

Paired samples *t* tests and independent samples *t* tests were run to test changes in mean scores within the groups and between the two groups, respectively. Paired samples *t* tests did not show any significant differences between pre- and post-test scores for either condition. All independent sample *t* tests were non-significant for all measures between both groups (*p* > .05). In sum, students' writing samples did not reveal any significant changes with respect to complexity or accuracy within conditions or between conditions.

Speaking

The speaking tasks were analyzed for multiple measures of production and fluency (see Table 4). Students were allowed to speak freely for up to 60 seconds in response to the prompts; time spoken, excluding pauses, on the pre-test and post-test ranged from 6.89 seconds (minimum) to 38.47 seconds (maximum). Paired samples *t* tests and independent samples *t* tests were run to test differences in mean scores within the groups and between the two groups, respectively. Paired samples *t* tests showed significant increases between the pre-test and post-test for the interactive group on number of runs [$t(6) =$ -3.29, $p <.05$, $d=0.83$], number of pauses [$t(6) = -3.18$, $p < .05$, $d=0.97$], and overall time speaking excluding the pauses [$t(6) = -4.09$, $p < .01$ $d=1.22$]. Paired sample *t* tests were non-significant for the individual group *(p > .05)* on all measures except average length of pause, which showed a significant decrease from the pre-test to the post-test, $t(5) = 3.64$, $p < .05$, $d=0.80$. All independent sample *t* tests comparing groups were non-significant for all measures ($p > .05$).

Table 4. *M and SD for Fluency Measures (Time Measured in Seconds) by Condition*

	Individual Pre-test**		Individual Post-test		Difference		Interactive Pre-test***		Interactive Post-test		Difference	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Syllables	81.83	25.0	91.33	17.7	9.50	30.6	75.71	33.1	88.14	20	12.43	15.7
Runs	20.50	6.1	23.00	4.1	2.50	7.1	21.57	4.5	25.29	4.5	3.71	3.0*
Pauses	37.00	10.4	38.67	7.9	1.67	11.3	40.86	6.6	48.86	9.6	8.00	6.7*
****Time speaking	23.85	5.8	27.21	3.8	3.37	7.1	21.87	4.7	26.88	3.4	5.02	3.2*
Run length	4.02	0.9	3.97	0.4	-0.5	0.8	3.44	1.0	3.49	0.4	.04	.7
Pause length	.73	0.2	.57	0.2	-.16	.1*	.59	.1	.50	.1	-.09	.2
Phonation time ratio	.86	0.1	.86	0.1	.00	.0	.83	.1	.83	.1	.00	.0

*Notes. * indicates significant change from pre- to post-test within condition, p < .05; **Individual condition, n=6; ***Interactive condition, n=7; **** Without pauses.*

Statistically, the interactive group produced more runs and spoke for a longer duration of time in Russian on the post-test compared to the pre-test. They also produced more pauses on the post-test, however, their pause:run ratio did not change ($p >.05$). In other words, overall production increased from the pre-test to post-test, including runs and pauses, but number of pauses per run, a measure of general fluency, did not change. In contrast, the individual group only showed a decrease in average length of pauses to a length more comparable to that of the interactive group, indicating that one measure of fluency improved to match that of the interactive group, but their overall production did not increase.

Research Question 2: Does language production change over time for students in the interactive and individual groups in later homework assignments (week 4) compared to the earliest homework assignments (week 1), and if so, how?

The chat transcripts from the interactive condition and the writing assignments from the individual condition were analyzed to compare learners' L2 production by condition and over time. After compiling all of the chat transcripts and written assignments during the six-week period of the study, Weeks 1 and 4 were chosen for detailed analysis because data from the largest number of participants from both conditions were available. All written data were then analyzed using CLAN to obtain counts of Russian

types, (i.e., the number of unique words), and tokens, (i.e., the total number of all running words, including repeated words); data were averaged for each participant across the three assignments that were part of Week 1 and Week 4 (see Table 5).

Table 5. *M and SD for Measures of Language Production per Assignment by Condition*

	Individual Week 1*		Individual Week 4		Difference	Interactive Week 1**		Interactive Week 4		Difference
	M	SD	M	SD		M	SD	M	SD	
Types	33.67	10.9	34.64	9.4	.97	49.61	10.9	42.42	10.5	-7.19
Tokens	42.29	13.3	44.04	12.7	1.75	67.51	15.9	54.68	15.8	-12.83
Type:Token Ratio	.80	.1	.81	.0	.01	.75	.1	.79	.1	.04

*Notes. *Individual condition, n=18 for Week 1 and n=13 for Week 4; **Interactive condition, n=25 for both weeks*

Paired samples and independent samples *t* tests were conducted to investigate whether there were differences in production within or between the two groups over time. Regarding change within the groups between the two time points, the individual group showed little change between Week 1 and Week 4 ($p > .05$), while the interactive group did produce fewer types, $t(24) = 3.04$, $p < .01$, $d=0.67$, and tokens, $t(24) = 4.33$, $p < .01$, $d=0.81$, in Week 4 compared to Week 1. Independent samples *t* tests showed differences between the groups on homework production at Week 1 and Week 4. For Week 1 homework, the students in the interactive group produced significantly more word types, $t(41) = -4.71$, $p < .01$, $d=1.47$, and more tokens than the students in the individual group, $t(41) = -5.48$, $p < .01$, $d=1.71$. These differences carried over into the Week 4 homework, as the interactive group continued to produce significantly more word types, $t(35) = -2.17$, $p < .05$, $d=0.73$, as well as tokens, $t(35) = -2.03$, $p < .05$, $d=0.69$, than the individual group. As for type:token ratio, the individual group had a higher type:token ratio during Week 1, $t(41) = 2.71$, $p < .05$, $d=0.85$, but both groups had a similar ratio during Week 4. In sum, students in the interactive group produced significantly more word types and tokens on the assignments than the individual group during both the first week of homework and the fourth week of homework, although the number of types/tokens they produced decreased over time.

To examine the use of target Russian words (i.e., the specific words assessed on the Vocabulary Knowledge Scale) in the individual and interactive homework assignments, we ran an analysis using CLAN which searched the assignments for the target words (i.e., word roots marked with a wildcard asterisk to capture as many variations as possible) in the Week 1 and Week 4 data. The CLAN output was then reviewed by a Russian expert to ensure correctness. Table 6 provides the average number of target word types and tokens used per assignment.

Table 6. *M and SD for Use of Target Words per Assignment by Condition*

	Individual Week 1*		Individual Week 4		Interactive Week 1**		Interactive Week 4	
	M	SD	M	SD	M	SD	M	SD
Types	.33	.37	.74	.67	.45	.33	.77	.49
Tokens	.35	.42	.90	.94	.46	.33	.88	.53

*Notes. *Individual condition: n=18 for Week 1 and n=13 for Week 4; **Interactive condition: n=25 for both weeks*

Overall, students used less than one target word type and token per assignment of the 54 target words analyzed. There were no differences in target word use by condition. This does not mean that students were not using many words relevant to the topics of the activities or other words from the activity glossaries; this analysis only searched for the relatively small set of items assessed on the VKS.

We further examined the chat transcripts for instances of "modeling" where a student used at least one target word in a chat session that his/her partner did not use. Across the six chat assignments examined, an average of 6.5 students (26%) engaged in modeling target words for their chat partner per assignment.

DISCUSSION

This study examined how different types of out-of-class assignments affected language development in intermediate-level students of Russian. Students were assigned to either the individual condition, where they completed independent writing activities, or the interactive condition, where they completed synchronous text-chat activities. Proficiency gains in vocabulary, and written and oral production, as well as change in language production on the assignments were measured over time.

Overall, students in both the individual and interactive conditions improved their vocabulary knowledge over the course of the study, which was to be expected given that the homework activities were designed to provide students with exposure to the target words. However, students in the interactive condition showed greater gains in vocabulary knowledge than students in the individual condition, on both the words that were unique to the experimental homework activities and the words that were also part of the standard course curriculum. Upon examining the homework assignments for students' use of the target words that were assessed, we did not find significant differences between conditions which may have explained the increased vocabulary scores. However, we did observe that students in the chat condition used or "modeled" target word vocabulary that their partners did not. Working with a partner allows for more opportunity to encounter a vocabulary word, as either the student or his partner may choose to use it in the activity; this type of modeling occurred in the chat interactions, whereas, it could not when students were completing the activities individually. For example, Excerpt 1 shows peer correction involving the target word насморк (runny nose):

Excerpt 1.

Student 1	какие симптомы для насморк
	What are the symptoms of a runny nose
Student 2	насморк это симптом
	Runny nose is a symptom
Student 1	простуда?
	a cold?
Student 2	ооу. да насморк и температура
	oh. yes runny nose and temperature

This type of peer-to-peer scaffolding (e.g., clarifying a definition) has been studied in various aspects of second language acquisition and has been found to improve language learning; researchers suggest that "peers can be concurrently experts and novices…[and] can support learning through, for example, questioning, proposing possible solutions, disagreeing, repeating, and managing activities and behaviors" (Swain, Brooks, & Tocalli-Beller, 2002, pp. 172–173). Whereas both homework conditions in our study provided the students with the same target language input (i.e., background information necessary to complete the activity, a vocabulary list, etc.), and both required student output, only the interactive

condition provided students with additional input from their peers. Consistent with the Interaction Hypothesis (Long, 1981, 1996) and other research on chat (Smith, 2004), the students in this study who had the opportunity to interact showed greater proficiency gains in vocabulary knowledge than students who completed their assignments independently.

The same advantage was found for gains in oral production: students in the interactive condition produced more Russian in a speaking task after engaging in six weeks of text-chat activities than students who completed six weeks of independent writing activities. This finding was predicted given that text chat has properties similar to those of speaking, including real-time production, and the benefits of this type of interaction for speaking skills have been found in previous studies (Payne & Whitney, 2002). Students who participated in the text-chat activities had more practice with speech-like output, and showed a greater increase in oral production, which may also be related to their greater output in the homework assignments, than the students who did not participate in text-chat activities. However, students in our study did not show benefits on the global fluency measures as in Blake (2009).

Interestingly, no differences in the ability to write a summary, measured by accuracy and lexical complexity, were found between the two conditions after the six weeks of either individual or interactive homework activities. Moreover, neither group showed *any* improvement in this ability even though both conditions involved writing in the target language. At least for the chat group, the lack of improvement in writing proficiency is consistent with other research (Kost, 2004). A possible explanation for the lack of improvement may be that writing ability takes more time to develop, and that six weeks was not a long enough period of time to demonstrate gains. However, the finding that participation in the interactive condition, which in many ways is more like speaking than writing, did not disadvantage these students compared to those in the individual condition underscores the fact that engaging in text-chat assignments instead of composition writing assignments did not negatively affect the development of writing ability. In sum, addressing the first research question, the results suggest that engaging in text-chat homework activities is more beneficial than independent writing activities for increasing vocabulary knowledge and oral production, but not improving writing ability; no other prior studies to our knowledge have used such comprehensive measures to determine which areas of second language are affected or not by text chat.

Students who participated in the interactive condition also produced more target language (types and tokens) in their text-chat assignments than students in the individual condition did in their independent writing assignments. Although their production in the chat activities was less in Week 4 than in Week 1, it was still greater than the individual group's writing assignments at both points in time. It may be that students who are engaged in interaction concomitantly produce more in the target language due to interest, motivation, or the nature of the cooperative task. These types of benefits have been found for collaborative pair work for language learning, including pooling of ideas and resources, feedback for language development, and affective support for sustaining task engagement and rapport (Nguyen, 2013). Furthermore, the students in the interactive group, who had a lower type:token ratio than the students in the individual condition in Week 1, increased their type:token ratio to the level of the students in the individual condition in Week 4. In other words, the students who participated in text-chat activities increased their lexical diversity, whereas students who completed independent writing activities did not show any change. It is possible that the nature of the chat homework assignments promoted an increase in lexical diversity. For example, as discussed above, students in the interactive condition were exposed to new vocabulary words through interactions with their peers. This is also demonstrated in Excerpt 2, in which students' negotiation for meaning involves a vocabulary item:

Excerpt 2.

Student 1	вокруг порядка форму?
	number 1 is about the order of the uniform?
Student 2	что?
	what?
Student 1	военную униформу?
	military uniform?
Student 2	ох да. как они решили поменять носки за наматыбанием
	oh yes. how they decided to change socks for bandages

In the above exchange, Student 2 appeared not to understand Student 1's statement containing the word "uniform". This prompted a request for clarification after which Student 1 revised his use of the vocabulary by adding a modifier and another word for "uniform". Then, Student 2 appeared to understand and continued the conversation. In Excerpt 3, two participants reviewed vocabulary together to ensure they both knew the meanings of the words:

Excerpt 3.

Student 1	вы знаете "грипп"?
	do you know "flu"?
Student 2	Да, я знаю грипп
	yes, I know flu
Student 1	Какие слова вы не знаете?
	which words do you not know?
Student 2	Я не знаю "пищевое отравление"
	I don't know "food poisoning"
Student 1	Это food poisoning, я думаю
	this is food poisoning [code switch], I think
Student 2	О, Я сейчас вижу. А что такое "миндалины"?
	oh, I see now. And what is "tonsils"?
Student 1	tonsils
	tonsils [code switch]
Student 2	О, я сейчас знаю все слова.
	oh, now I know all the words

In this situation, one partner helped the other by providing translations of the unknown lexical items. Again, the benefits of peer scaffolding and negotiation for meaning are evident. Students in the interactive condition demonstrated greater language production than did students in the individual condition; further, the opportunity to interact likely facilitated an increase in lexical diversity.

The text-chat transcripts produced in this study provide evidence for the benefits of interactive homework assignments. Based on these results, we are also conducting follow-up analyses of the chat transcripts to identify elements of the interaction, such as negotiation for meaning and peer correction, which may have

supported learning. An informative next step would be to examine which of the chat activities resulted in more language production, and thus, interaction amongst the chat participants. Knowing what types of task-based activities generate more conversation would provide useful pedagogical guidance. Furthermore, expanding the duration of the study and including a delayed post-test would allow us to track language development over time, as well as to examine the durability of language gains in the two conditions.

Two limitations of this study should be acknowledged. First, over the course of the eight weeks of the study, participation in the study declined, due to a variety of factors, e.g., students opted out of participating or dropped the class. The resulting small sample sizes limit the generalizability of the study. Second, the treatment groups were not randomly assigned; rather, the design of the study was quasi-experimental in that intact groups were assigned to one of the two treatment conditions. While using intact groups is common in instructed second language acquisition research, a follow-up study randomly assigning participants to treatment and control groups would be ideal.

On the whole, the gains made by the interactive group compared to the individual group support the benefits of interaction, in the form of text chat, compared to individual output. Communicating with other learners, specifically, the processes of peer collaboration and negotiation for meaning when completing task-based activities, plays a vital role in second language acquisition. Text-chat activities offer the opportunity for such communication outside of the classroom. In the current study, students of Russian who engaged in interactive, text-chat homework assignments over a period of six weeks demonstrated greater gains in vocabulary knowledge and language production than students who completed writing assignments individually. Furthermore, the interactions observed in the text-chat condition showed that students engaged in both modeling and peer correction during their collaborative communication in the target language, which is likely to contribute to students' noticing of important lexical and grammatical features of the target language. The unique features of text chat—synchronous, interactive communication in a written medium—provide students with both target language input and output in a format that can be easily reviewed and monitored, thus facilitating acquisition, particularly for speaking and vocabulary. With increasing Internet access and current technology, including mobile applications, text chat can be easily implemented for out-of-class activities to enhance foreign language learning.

APPENDIX: **Target vocabulary and translations by category.**

Experimental	Translation
Аптека	Pharmacy
Безопасный	Safe
Бытовая техника	Appliances
Взорваться	Explode
Влажно	Humid
Воспаление лёгких	Pneumonia
Заботиться	To care
Зонт	Umbrella
Мёд	Honey
Отделение	Department
Переезжать/переехать	To move
Повернуть	To turn
Погоны	Shoulder loops
Портянки	Foot wraps

Похмелье	Hangover
Режим работы	Hours of operation
Скоростная магистраль	Speedway
Украсть	Steal

Course	Translation
Багажник	Trunk
Выздоравливать/выздороветь	To recover
Защищать/защитить	To defend
Землетрясение	Earthquake
Извещение	Notice
Лекарство	Medicine
Мебель	Furniture
Насморк	Runny nose
Посылка	Parcel
Почтовый ящик	Mailbox
Пригород	Suburb
Природа	Nature
Пробка	Traffic jam
Прохладно	Cool
Ремонт	Repair
Рыбалка	Fishing
Сухопутные войска	Ground forces
Тошнить	Be nauseous

Control	Translation
Бывший	Former
Велосипед	Bicycle
Выигрывать/выиграть	To win
Жениться	To marry
Закуска	Snack
Команда	Team
Мороженое	Ice cream
Осторожно	Careful
Песня	Song
Плавать	To swim
Победа	Victory
Праздник	Holiday
Приглашать/пригласить	To invite
Развод	Divorce
Свадьба	Wedding
Спортзал	Gym
Тарелка	Plate
Хозяин	Host

ACKNOWLEDGEMENTS

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