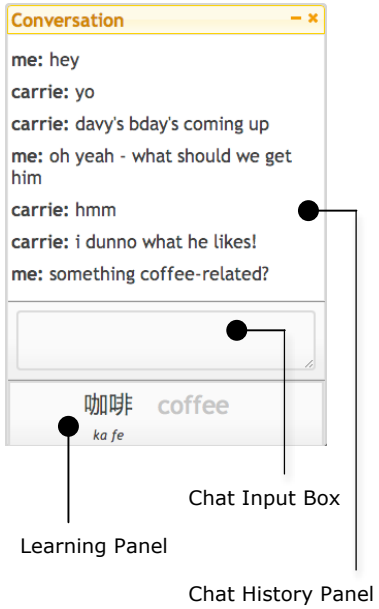


**Figure 1**: Instant messaging interface augmented with a learning panel for second language education.

# Wait-Learning: Leveraging Conversational Dead Time for Second Language Education

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## Abstract
Second-language learners are often unable to find time for language practice due to constraints in their daily lives. In this paper, we examine how brief moments of waiting during a person's existing social conversations can be leveraged for second language practice, even if the conversation is exchanged in the first language. We present an instant messaging (IM) prototype, WaitChatter, that supports the notion of *wait-learning* by displaying contextually relevant foreign language vocabulary and micro-quizzes while the user awaits a response from her conversant. The foreign translations are displayed just-in-time in the context of the conversation to promote incidental learning. In a preliminary study of WaitChatter, we found that participants were able to integrate second language learning into their existing instant messaging activities, and that a particularly opportune time to embed foreign language elements may be immediately after the learner sends a chat message.

## Author Keywords
Design; Education

**ACM Classification Keywords**
H.5.2. [Information interfaces and presentation]: User Interfaces – Interaction styles; K.3.1. [Computers and Education]: Computer Uses in Education – Computer-assisted Instruction (CAI)

## Introduction

Learning a second language is often difficult due to competing demands in daily life. Learners must maintain the *executive motivation* [5] necessary to spend time practicing the second language (L2) on a recurring basis. There is growing evidence that learning is more effective when items are studied in brief intervals spaced over time [1], and when the material is relevant to the learner's context [3, 10].

Recent work on *micro-learning* has explored ways to distribute learning into many micro moments throughout a person's day-to-day life. For example, one such system [7] activates a learning program after a learner's computer screen becomes idle, similar to a screen saver. Others have argued for *contextual* micro-learning through the creation of location-aware mobile applications that provide contextually relevant vocabulary for the learner [6, 4]. However, one limitation is that even location-relevant vocabulary may not map to what a user actually wants to say [6].

Another approach to contextual micro-learning augments texts written in the user's native language (L1) by replacing them with occasional L2 translations [9, 2]. Because users have a rich L1 context from which they can infer the meaning of foreign words, incidental learning of vocabulary can occur through repeated exposure to L2 vocabulary. Despite the promising learning benefits of one such web-based system [9], researchers found that some users discontinued usage due to the slower rate at which they could perform their normal tasks on the Web.

Challenges raised in prior work point to the necessity that micro-learning be both non-intrusive and relevant to a learner's current conversations. Even micro-diversions may be perceived as disruptive if the user feels that his regular tasks are being delayed. In this work, we extend micro-learning to include the notion of *wait-learning*. The novelty of this approach lies in the targeted use of time that users would ordinarily spend waiting, even if they were not learning a language.

Instant messaging (IM) offers a powerful opportunity for *wait-learning* due to its semi-asynchronous nature. Because messages being typed are unseen by the conversant and can be revised before being sent, a user must often wait for a brief moment in anticipation of a response, with no guarantee that the other party will in fact reply [8]. As a result, IM users multitask significantly more than phone users, and multitasking during IM is also more socially accepted [8].

In this paper, we present the design and evaluation of WaitChatter, an instant messaging prototype that enables users to learn while they await a response from their conversant. The interaction is asymmetric, meaning that the user can engage in learning activities without any knowledge of this activity by the other party. The proposed benefits are two-fold: first, because IM conversations are already rich with linguistic content, users learn words that are personalized to the actual words they have recently exchanged in the conversation. Second, learning occurs during dead-time, minimizing the likelihood that these

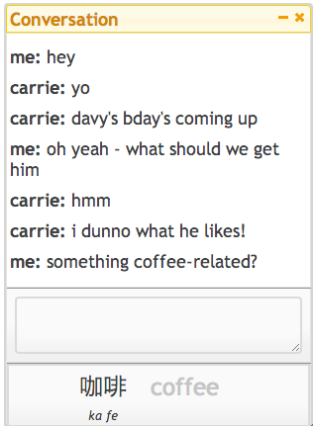


**Figure 2a**: In study mode, vocabulary is displayed in an L2/L1 language pair.

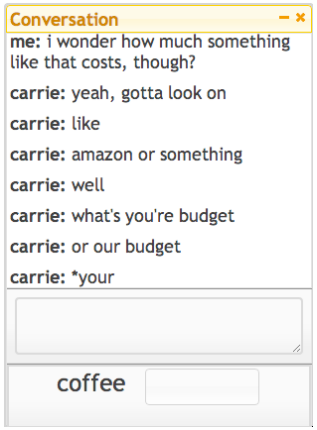


**Figure 2b**: In quiz mode, the learner must enter a translation given the prompt.

activities will be perceived by users as intrusive or time-consuming. In this context, *dead-time* is the interval during which a user is waiting in anticipation of a response from the other conversant.

## Interface Features

We built the WaitChatter prototype as a web-based chatbox[1], augmented with several key features to enable presentation of educational content.

*Learning Panel*

To encourage learning to occur within the natural flow of a user's normal conversations, the learning panel is embedded as a component of the chat interface rather than as a separate entity. The learning panel is positioned directly below the chat input box to minimize the visual and motor effort required to switch between chatting and learning activities.

To minimize potential confusion over whether the other conversant can view educational content, we keep educational content within the learning panel rather than embedding it within the chat history panel. We also do not embed learning-related text inside the chat input box so as to prevent user error while typing.

*Learning Modes*

In this initial prototype, the learning panel displays content in either study mode or quiz mode. In study mode (Figure 2a), the vocabulary word and its L1 translation are displayed, along with a phonetic representation if appropriate for the language. In quiz mode (Figure 2b), the learner is prompted to retrieve either the L1 or L2 translation from memory, given a prompt in the other language.

## Preliminary User Study

We conducted a preliminary Wizard of Oz study to understand the following issues:

1) Timing: Because users are likely to be engaged in multiple tasks simultaneously, we seek to identify moments when they are most likely to be receptive to learning opportunities. We are interested in times at which an injection of vocabulary prompts would be least disruptive to an existing conversation.

2) Relevance: The potential learning benefit of presenting context-relevant words is challenged by the necessity of providing repeated practice with old words that the learner has seen before but not yet mastered. It is thus important to understand how users respond to relevant and irrelevant words, and to identify times at which irrelevant vocabulary can be presented.

*Participants*

Five users between the ages of 21 and 26 (mean=23.8) took part in our preliminary study. The participants (2M, 3F) were graduate and undergraduate students in a university computer science department. All users reported that they desired to learn a second language, but none were taking a course in that language at the time of the study. Four of the five users regularly use instant messaging to chat with friends on an informal basis. The fifth user occasionally used IM in the past, but has not done so in the past few years.

[1] http://reason.cs.illinois.edu/wenpu1/chatbox.html

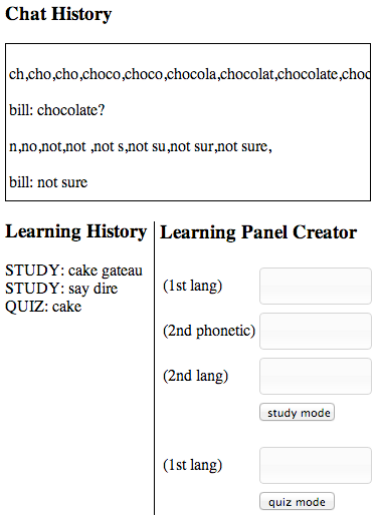


**Figure 3a**: Left side of wizard interface.

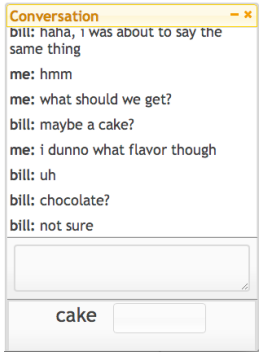


**Figure 3b**: Right side of wizard interface.

*Procedure*

Each participant was asked to chat with a conversant using WaitChatter for 20-30 minutes. To simulate a typical instant message experience, we selected participants who were already acquainted with the conversant, and they were asked to discuss what to get a real mutual friend for his or her birthday. Moreover, participants were asked to engage in any regular task they would normally do while instant messaging, and to expect the same from the conversant. Some chose to check email and social sites while others watched streaming sports videos online. Similar to typical IM situations, the participant and conversant were seated in different rooms and thus could not see each other during the conversation.

For the purpose of varying the timing between the delivery of messages and the presentation of learning content, the conversant was also the wizard. To aid the wizard in triggering context-relevant vocabulary exercises in a timely fashion, the wizard's interface (Figure 3a) displayed what the participant was typing in real-time even before a message is sent, and a running list of vocabulary exercises that have been presented. Participants were not told whether these displays were triggered by a wizard until after the study.

During the conversation, the wizard triggered learning exercises either in study mode or quiz mode. Quiz mode for a particular vocabulary word was only presented if the word had already been introduced in study mode. The wizard delivered this content in the language the participant desired to learn, including French (2 participants), Chinese (1), Spanish (1), and Hebrew (1). For languages the wizard did not already know (Spanish and Hebrew), the wizard used Google Translate to fetch translations.

As much as possible, the wizard varied the nature of displays in the following four ways. The first three points below are related to timing, and the fourth addresses relevance.

1) Presentation of learning content during rapid IM activity vs. during a break in the conversation, defined as more than 10 seconds since the last turn.

2) Presentation of learning content while the learner is typing vs. while the conversant is typing.

3) Delivery of a chat message while the learner is answering a translation quiz (quiz mode) vs. after a learner has completed a translation quiz.

4) Presentation of in-context vocabulary vs. presentation of irrelevant vocabulary. We define in-context vocabulary to be words used by either conversant during the IM conversation.

After the study, participants were debriefed and their feedback was captured in a semi-structured interview.

## Results

Our preliminary results suggest that the most opportune time to present learning content may be **immediately after the learner sends a chat message**. Within the first few seconds after sending a chat message, the user is likely to still be focused on the chat window, but open to completing other tasks while awaiting a response. As one participant put it, "The best time is when I'm waiting for a response, right

after I've finished making a statement. Then I look down and there's something interesting to do."

Consistent with user feedback, logs from the user study also revealed that users unanimously responded immediately to quizzes that were displayed right after the user sent a message. If a quiz was presented while the user was typing, the user almost always finished typing before attending to the quiz, and some even entered additional lines of IM to complete their thought before switching to the learning panel.

Similarly, users tended to engage with language learning activities if they were presented at a time when it was clear that their conversant was still typing, such as immediately after a conversant sent an incomplete sentence. However, a necessary prerequisite is that the chat window must already be visible during this time. Users attending to tasks on another browser tab were more likely to miss these prompts, whereas those who positioned their windows side-by-side tended to complete the quiz immediately.

When learning content was presented during a lull in the conversation, user reactions varied, likely due to differences in their setup. Because users tend to switch to other tasks after several seconds of IM inactivity, those who had both the chat window and other activity visible side-by-side either felt that the prompt distracted them from their other task, or "felt a little guilty" if they didn't noticed the flashcard when it first appeared. Because the display of learning content did not trigger the blinking of the chat window, those who alternated between browser tabs only saw this content when they actively decided to return to the chat tab. As such, they were not bothered by the timing of these displays: "I only look at my chat window when I'm open to receiving something chat related…so because I was looking for [new content], it was ok that new changes had been made." However, a user with this setup indicated that if the window were to blink upon delivery of new learning content with no new IM content, he would likely feel interrupted.

Interestingly, in other situations with some likelihood of interruption – such as when a quiz was displayed while the user was typing or when the conversant sent a response while the user was still completing the quiz – participants appeared adept at prioritizing tasks, and indicated that context-switching felt natural. One user said that "if I were typing mid-thought, I wouldn't let [the learning display] below distract me from the thing I'm trying to finish," and another explained that she continued typing despite the vocabulary word appearing "because I was in the zone." Another attributed his behavior to his level of engagement with the conversation: "If I were to stop mid-chat to answer a quiz question, it would be because I'm not that engaged in the chat to begin with, or don't know what to say." Surprisingly, most participants did not recall whether or not they received chat responses while filling out a vocabulary quiz. These results suggest that, so long as user focus is currently on the chat window, users are relatively adept at attending to one task at a time despite being presented with multiple activities.

The ease with which users interleaved learning and instant messaging may reflect their existing tendencies to context-switch during periods of waiting. As one participant put it, the language learning activity was "similar to having another chat window open" because he often switched to other IM conversations while

waiting for the original conversant to respond. Others attributed the ease of context-switching to the bite-sized nature of the quizzes: "I was only filling out one word, so it wasn't that hard. If it was a longer word I may have needed to spend more effort thinking."

Lastly, participants indicated that they were excited to see context-relevant vocabulary words, particularly when the word was displayed immediately after having appeared in the conversation. If the word was displayed several turns later, users tried to remember when the word had earlier appeared. One user desired trigger words to be highlighted in the chat history so that she could see where they had been used.

Despite reporting greater excitement in seeing relevant words, users maintained that irrelevant words were welcome, so long as those words hadn't already been mastered. One person added that irrelevant words were acceptable if there were no other obvious candidates.

## Conclusion

Results from our preliminary study suggest several design techniques to enable wait-learning, such as timing learning exercises to appear immediately after the learner sends a message, keeping learning exercises brief and bite-sized, and avoiding cues that may be distracting during a break in the conversation.

Future work includes evaluating vocabulary retention using WaitChatter, understanding how conversational relevance may impact learning, and examining usage patterns in real-world settings. Finally, wait-learning has the potential to be applied to many other domains, such as while a learner is waiting for the bus or on hold with customer service. Understanding where and when to leverage these brief moments for learning remains to be investigated.


## Acknowledgements

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## References


[1] Bahrick, H. P., et al. (1993). Maintenance of foreign language vocabulary and the spacing effect. Psychological Science, 4(5), 316-321

[2] Berleant, D., Lovelady, S., Viswanathan, K. (2004). A foreign vocabulary learning aid for the networked world of tomorrow. ACM SIGICE Bulleton, 19(3), 22-29.

[3] Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42

[4] Dearman, D. & Truong, K. (2012). Evaluating the implicit acquisition of second language vocabulary using a live wallpaper. CHI 2012.

[5] Dornyei, Z. & Otto, I. (1998). Motivation in Action: a process model of L2 motivation. Working Papers in Applied Linguistics 4, 43-69

[6] Edge, D., et al. (2011). MicroMandarin: mobile language learning in context. CHI 2011.

[7] Gassler, G., Hug, T. & Glahn, C. (2004). Integrated Micro Learning – an outline of the basic method and first results. Interactive Computer Aided Learning 4

[8] Tree, J. E. F., Mayer, S. A., & Betts, T.E. (2011). Grounding in instant messaging. Journal of Educational Computing Research, 45(4), 455-475.

[9] Trusty, A. & Truong, K. (2011). Augmenting the web for second language vocabulary learning. CHI 2011.

[10] Tulving, E. & Thomson, D. (1973). Encoding specificity and retrieval processes in episodic memory. Psychological Review, 80(5), 352-373