

# Edvertisements: Adding Microlearning to Social News Feeds and Websites

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Figure 1. Our extension can show interactive microlearning tasks (Edvertisements) in users' Facebook news feeds.

## ABSTRACT

Many long-term goals, such as learning a language, require people to spend a small amount of time each day to achieve them. At the same time, people regularly surf the web and read social news feeds in their spare time. We have built a browser extension that teaches vocabulary in the context of Facebook feeds and arbitrary websites, by showing users interactive quizzes they can answer without leaving the website. On Facebook, the quizzes are shown as part of the news feed, while on other sites, the quizzes are shown where advertisements would normally appear. In our preliminary user study, we looked at the effectiveness of inserting microlearning tasks into social news feeds. We compared Japanese vocabulary learning rates when interactive quizzes were inserted directly into feeds, versus inserting links that lead them to quizzes. Our results suggest that users learn more and engage more with microlearning tasks when they can be done directly inside their feeds.

## Author Keywords

microlearning; social feeds; facebook; language learning

## ACM Classification Keywords

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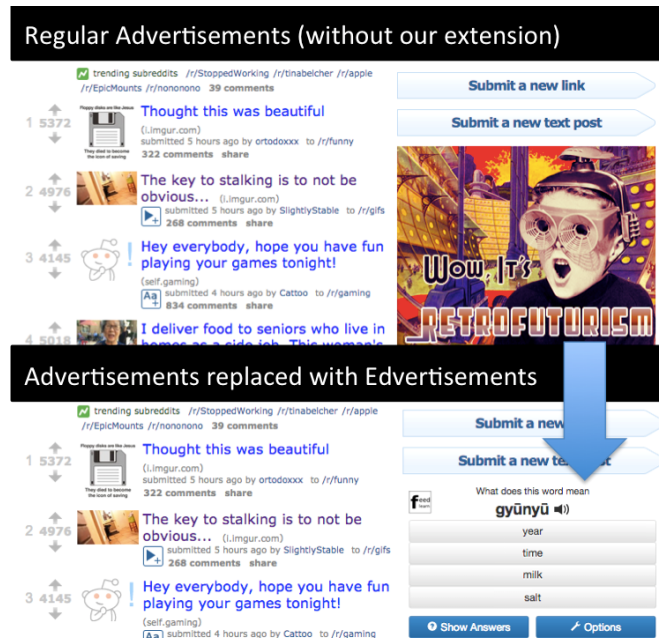


Figure 2. Our extension can replace advertisements with interactive microlearning tasks (Edvertisements) on arbitrary websites.

## INTRODUCTION

People spend large amounts of time surfing the web and reading social news feeds on sites like Facebook. American adults spend an average of 27 hours per month browsing the web [14]. 71% of American adults with an internet connection use Facebook. Of these, 63% visit Facebook at least once a day, and 40% visit it multiple times per day [4]. Among American college students, 90% use Facebook [7], spending an average of 30 minutes per day on it [17]. Social news feeds are widely used - over half of college students who use Facebook report reading their Facebook news feeds 5-7 days per week [17].

In this paper, we present Edvertisements, a technique for showing users interactive microlearning tasks, such as vocabulary flashcards, as they browse the web and read their Facebook feeds. We implemented a Chrome extension which shows microlearning tasks in two ways:

- On Facebook, microlearning tasks are inserted into the feed, alongside regular feed items.
- On other sites, microlearning tasks are shown in locations where advertisements would normally appear.

Our research questions are:

- Do users engage with microlearning tasks that we insert into their Facebook feeds?
- Are users more likely to engage with microlearning tasks if they can do so without leaving their Facebook feeds?
- Do in-feed questions result in higher learning outcomes than the links to external sites used by current Facebook applications?

Our preliminary user study compared Japanese vocabulary acquisition rates through FeedLearn's in-feed interactive quizzes, versus inserting links to an external website where they can do quizzes, as is currently done by Facebook applications. We found that users answered more quizzes when they could do so without leaving the feed, and they learned more new words on average over a week.

## RELATED WORK

### Microlearning

Microlearning is a strategy of using short periods of time throughout the day to study. It has been used for applications such foreign vocabulary learning via mobile apps [1] [6]. A potential drawback of needing a separate app for microlearning is that it requires the user to develop a habit of interrupting their routine to open an app to study.

Some systems have attempted to solve this problem by embedding microlearning into other contexts. There are games where users complete learning tasks while playing [2], video players which teach vocabulary while watching foreign-language videos [12], screensavers that show facts while the screen is idle [9], and chat clients that show vocabulary while the user is chatting [3].

Compared to the learning contexts used by existing work, we believe that recreational web surfing and Facebook feeds are especially good opportunities for microlearning, because:

- Unlike playing educational games or watching foreign-language videos, visiting Facebook is part of the daily routine of nearly half of American adults with an internet connection [4]
- Web surfing and reading Facebook news feeds are recreational activities, so the inserted microlearning tasks will not interrupt users' work.
- Users are already used to a variety of rich content appearing in their Facebook feeds, such as videos, games, recommendations, and advertisements.

### Spaced Repetition

Spaced repetition is a technique designed to help learners retain information by having them review items at regular intervals [10]. A class of applications that exploit this are flashcards, which split information into independent chunks that are scheduled for review based on factors such as mastery and recency of review. There have been a number of algorithms and models designed for optimizing learners' retention of the material via spaced repetition [16] [5].

### News Feeds as a Persuasive Technology

Many apps attempt to use Facebook feeds as a persuasive technology. For example, apps like Duolingo can broadcast users' study progress on the platform, inviting the user's friends to participate in the activity. However, there are many caveats with such applications auto-posting messages on users' feeds. Messages auto-posted by applications receive less attention from the user's friends, compared to messages posted by actual users. Viewers may perceive these posts negatively, ignoring them [8].

### Web Advertising and Ad-Blocking

Although advertisements are an important revenue source for websites, in consumer surveys 77% report that they hardly ever click on ads, and 69% express interest in skipping or blocking ads [18]. Ad blockers, which are browser extensions that prevent web ads from being displayed, are used by 5% of all internet users [15]. Ad-blocking is especially common among Chrome and Firefox users – 30% of Chrome users, and 35% of Firefox users, have installed an ad-blocker [15].

In surveys, users of ad-blockers cite “distracting animations and sounds”, and “offensive/inappropriate ad content” as their top reasons for blocking ads [18]. Although ad-blocking software can be configured to selectively whitelist/blacklist ads for certain websites, most ad-blocker users just retain the default behavior of blocking ads on all websites [18], which may perhaps be due to usability issues in configuring ad-blockers [13]. By preventing ads from being shown, ad-blockers pose a threat to the advertising industry, as well as websites which rely on advertising revenue [18].

## EDVERTISEMENTS SYSTEM

Our system is a Chrome extension that inserts microlearning tasks – in our case, vocabulary quizzes – into users' Facebook feeds, and as they are browsing the web. Although we originally implemented the browser extension for Chrome, we have also ported it to Firefox, and our technique can be implemented on any browser that supports extensions (Chrome, Firefox, Edge, Safari, etc). FeedLearn has a variety of microlearning tasks for learning vocabulary in multiple languages, but in this paper we will focus on learning Japanese vocabulary.

### INSERTING EDVERTISEMENTS INTO FACEBOOK FEEDS

Our extension can insert edVERTISEMENTS into users' Facebook feeds, as rectangular interactive quizzes mimicking the look of a regular feed item, as shown in Figure 1. We chose to insert 1 microlearning task for every 10 normal feed items, to mimic the approximate frequency we observed sponsored content appearing in the feed.

### REPLACING WEB ADVERTISEMENTS WITH EDVERTISEMENTS

People spend considerable time on sites other than Facebook, so we also wished to have a general mechanism for presenting microlearning tasks as users browse the web. We do so by detecting web advertisements on pages, and replacing them with microlearning tasks.

We detect the presence of web advertisements the same way ad blockers do – by checking the URL the element is loaded



Figure 3. One type of quiz presents a noun in Japanese (*jikan*), and asks the user to select its meaning (time).

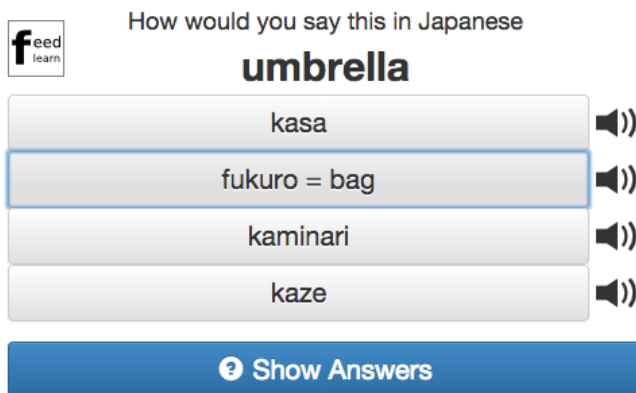


Figure 4. Another type of quiz presents a noun in English (*umbrella*), and asks the user to select the correct translation into Japanese (*kasa*). The user has incorrectly selected *fukuro*, so the user is shown its meaning (bag), and tries again.

from, and comparing it against EasyList, which is a public list of known URL patterns for advertisements maintained by Adblock Plus. If the element is detected as an advertisement, we then replace it with a quiz of the same size. There are standardized sizes for web advertisements, defined by

## FEEDLEARN INTERFACE

FeedLearn inserts interactive vocabulary quizzes into users' Facebook feeds, as shown in Figure 1. It is implemented as a Chrome extension, as Facebook's API does not currently allow developers to insert interactive content into feeds. FeedLearn supports multiple languages, but this paper will focus on learning basic Japanese nouns.

### Quiz Types

One type of quiz presents a noun in English, and asks the user to select the corresponding Japanese word, as shown in Figure 3. To ensure that users learn word associations in both ways, we also have a second type of quiz, where the user is shown a word in Japanese and selects the corresponding word in English, as shown in Figure 4.

We opted to use this multiple-choice quiz format, because it tests the user's knowledge with a minimal amount of interaction – the user simply clicks on a word to answer. Once the



Figure 5. The control condition in our user study inserted a link into users' Facebook feeds that led them to a site where they could do vocabulary quizzes

user answers a quiz correctly, a new quiz testing a different word is shown. Thus, users can continue to study vocabulary in their feed for as long as they wish to.

### Quiz Generation

Our words and definitions were taken from the Nouns section of Wiktionary's 1000 Basic Japanese Words list. We excluded loanwords that users would easily recognize (*pinku*=pink), and words that are homographs when romanized (*hana*=flower or nose). We focus on nouns, because they are the most common type of word [1].

### Spaced Repetition

Spaced repetition algorithms schedule items for review to ensure long-term retention [11]. We modified the Memreflex algorithm [5] to show the word due for review that has been seen least recently in the feed, as opposed to always showing the most overdue word as Memreflex does. This ensures that users will continue to see different words as they are scrolling through their feeds, even if they are not always answering the in-feed questions.

## PRELIMINARY USER STUDY

We conducted a preliminary user study to compare the effectiveness of inserting interactive quizzes directly into users' Facebook feeds, versus inserting links to the quizzes as is commonly done on Facebook today.

In study, we only inserted microlearning tasks into Facebook feeds and did not replace ads with quizzes, as Facebook feeds were an environment we could better control the frequency and appearance of quizzes, and many interested users were already using ad-blockers, which would have conflicted with the ad-replacement functionality.

### Participants

We recruited 12 users who had not previously studied Japanese but were interested in learning some basic vocabulary. 5 were female, 7 male. They were voluntary participants recruited from online forums and Facebook groups related to Japanese culture. All of our participants self-reported that they were regular users of Facebook.

### Materials



**Figure 6. Vocabulary test scores for the in-feed quiz and link conditions, with standard error bars**

We used 50 basic Japanese words from Wiktionary’s Basic Japanese Words list as the study material. We presented vocabulary words in romanized form instead of Japanese scripts, as our users could not read Japanese scripts.

### Conditions

Users were assigned to one of two conditions:

- Users in the *in-feed quiz* condition had quizzes inserted directly in their feeds, as shown in Figure 1.
- Users in the *link* condition had links inserted into their feed which led them to a site where they could do the quizzes, as shown in Figure 5.

Apart from the different items (quizzes/links) inserted into the feed, the questions and quiz interfaces were identical in the two conditions. In both conditions, the items were inserted at a rate of 1 quiz/link per 10 feed items. We chose this rate because it was approximately the rate at which we observed sponsored content and advertisements to appear in our feeds.

### Procedure

The study was conducted entirely online. First, users took a pre-test on the words we were intending to teach them, where they tried matching the 50 Japanese words to their 50 English definitions. Then they installed our Chrome extension and used it to study the 50 words for a week. After a week, we asked them users to do the post-test, which had the same format as the pre-test.

## RESULTS

### Vocab Quiz Results

Average vocabulary pre-test and post-test scores are shown in Figure 6. On average, users in the in-feed condition learned 13.2 new words, compared to 2.5 new words learned in the link condition. However, this was not statistically significant ( $t=1.51$ ,  $p=0.16$ ).

### Logged Interactions

The number of times users practiced answering quizzes is shown in Figure 7. We also kept track of “study sessions”, which we defined as the number of times the user clicked on the link to visit the external website (in the link condition), or first answered a quiz that was inserted into their feed (in the in-quiz condition).

On average, we found that users in the in-feed quiz condition answered significantly more quizzes than the link condition,

Logged event type	in-feed quiz	link	Significant difference?
Number of answers	116.3	17.4	Yes ( $t=2.42$ , $p=0.032$ )
Number of study sessions	21.29	1.57	Yes ( $t=2.68$ , $p=0.020$ )
Number of days on which at least one quiz was answered	4.43	0.86	Yes ( $t=4.33$ , $p=0.001$ )
Fraction of days Facebook was visited on which at least one quiz was answered	0.81	0.18	Yes ( $t=4.87$ , $p=0.0004$ )
Number of days Facebook was visited	5.71	6.14	No ( $t=-0.43$ , $p=0.677$ )
Number of feed insertions	132.1	89.6	No ( $t=0.80$ , $p=0.442$ )
Ratio of answers to insertions	2.32	1.03	No ( $t=0.82$ , $p=0.428$ )
Ratio of study sessions to insertions	0.25	0.098	No ( $t=1.27$ , $p=0.227$ )

**Figure 7. Average number of events logged per user for the in-feed quiz and link conditions.**

did more study sessions, and studied on more days across the week. We believe this difference is due to the decreased barrier to starting a study session in the in-feed condition, as they do not need to leave the feed.

Some users mentioned that they would prefer words to be explicitly introduced first before they start appearing in quizzes. In addition, as shown by our “ratio of study sessions to insertions”, even in the in-feed condition, users only interact with 1/4 of quizzes that they see. Hence, we need to ensure that seeing items reinforces memory, even if users do not interact with them. Later versions of FeedLearn address this issue with a new type of item that introduces new words and reinforces memory for old ones.

## CONCLUSION

FeedLearn uses Facebook feeds for vocabulary microlearning. By eliminating the need to leave the Facebook feed to do quizzes, FeedLearn reduces the barrier required to start microlearning tasks. Our user study found that eliminating the need to click a link to start studying vocabulary results in increased engagement.

Although we have focused on vocabulary, other content could also be microlearned in the context of social feeds. In-feed messages encouraging small, actionable tasks could also be used to promote habits such as microexercise.

Future work includes using a model to determine the optimal times to insert microlearning tasks into feeds. Another potential extension is making the microlearning tasks more integrated with the Facebook environment to create a more social in-feed learning experience.

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