Edvertisements: Adding Microlearning to Social News Feeds and Websites

1st Author Name
Affiliation
City, Country
e-mail address

2nd Author Name
Affiliation
City, Country
e-mail address

3rd Author Name
Affiliation
City, Country
e-mail address

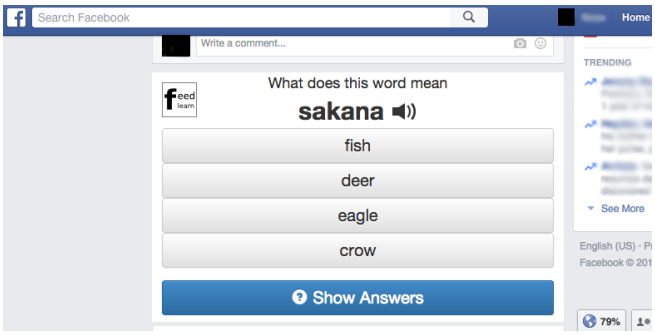

Figure 1. Our extension can show interactive microlearning tasks (Edvertisements) in users' Facebook news feeds.

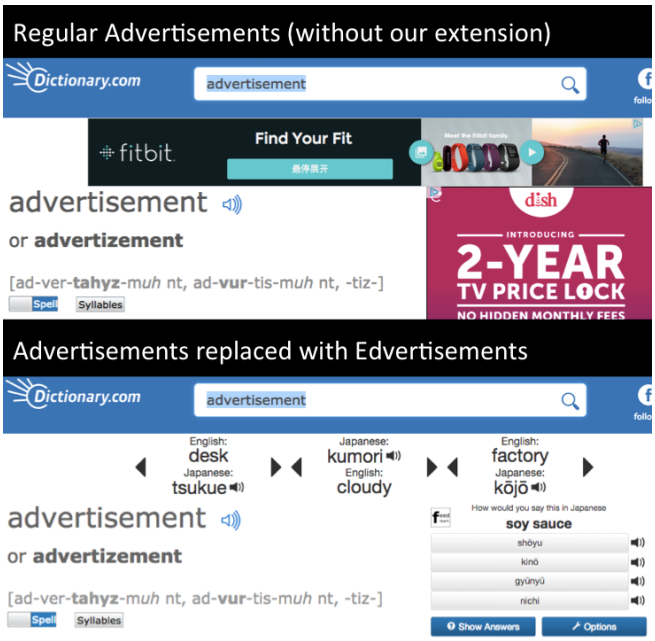

Figure 2. Our extension can replace advertisements with interactive microlearning tasks (Edvertisements) on arbitrary websites.

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 user study, we looked at the effectiveness of inserting microlearning tasks into social news feeds. We compared vocabulary learning rates when interactive quizzes were inserted directly into feeds, versus inserting links that lead them to quizzes. Our results suggest that users engage with and learn from our inserted quizzes, and engagement is higher when they can be done directly inside their feeds.

Author Keywords

microlearning; social feeds; facebook; language learning

ACM Classification Keywords

H.5.2. User Interfaces: Graphical user interfaces (GUI)

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 [13]. 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 [5]. Among American college students, 90% use Facebook [8], spending an average of 30 minutes per day on it [15]. 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 [15].

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

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

Our research questions are:

- Do users engage and learn from Edvertisements that we insert into their Facebook feeds?
- Do users engage and learn more with Edvertisements if they can do the microlearning tasks without leaving their Facebook feeds (compared to external links)?

In our user study, we looked at engagement and vocabulary acquisition when Edvertisments were inserted into users' Facebook feeds. We also compared the effects of being able to do the microlearning tasks in place, as opposed to having to click a link to go to an external website. We found that there was high engagement with Edvertisements, users had improved post-test results after a week, and that engagement was higher when the Edvertisements could be done without leaving the feed.

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 as foreign vocabulary learning via mobile apps [1] [7]. 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 [10], 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 [5]
- 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.

Using Social News Feeds as a Persuasive Technology

Many apps attempt to use Facebook feeds as a persuasive technology, to help users form study habits. 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 [9].

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 [16]. Ad blockers, which are browser extensions that prevent web ads from being displayed, are used by 5% of all internet users [14]. Ad-blocking is especially common among Chrome and Firefox users – 30% of Chrome users, and 35% of Firefox users, have installed an ad-blocker [14].

In surveys, users of ad-blockers cite "distracting animations and sounds", and "offensive/inappropriate ad content" as their top reasons for blocking ads [16]. Even users who do not have an ad blocker installed tend to avoid looking at ads, a phenomenon known as "banner blindness", with less than 0.5% of advertisements being clicked on – a number which has been in constant decline ever since the banner ad was introduced in 1994 [4].

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). Our system 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 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.

Web advertisements follow standardized sizes, called the IAB (Interactive Advertising Bureau) Standard Ad Units. We have implemented microlearning tasks to fit 2 of the common sizes – 300x250 and 200x90 – which correspond to regular-sized and small ads. If a microlearning task in the appropriate size is not available, we pick a smaller one and scale and stack it to fit the available space. For example we can fill a banner ad (728x90) with 3 small Edvertisements, as shown in Figure 2.

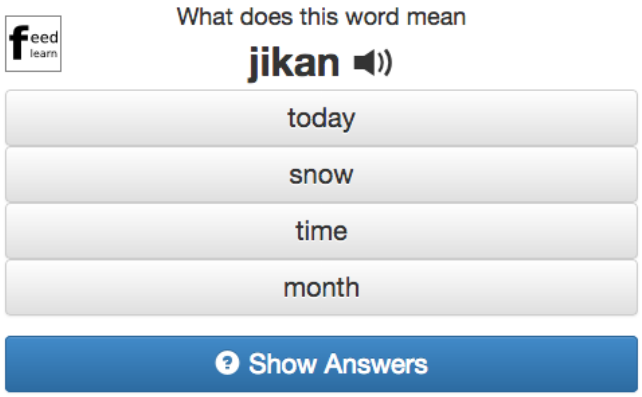

Figure 3. One type of quiz presents a noun in Japanese (*jikan*), and asks the user to select its meaning (time).

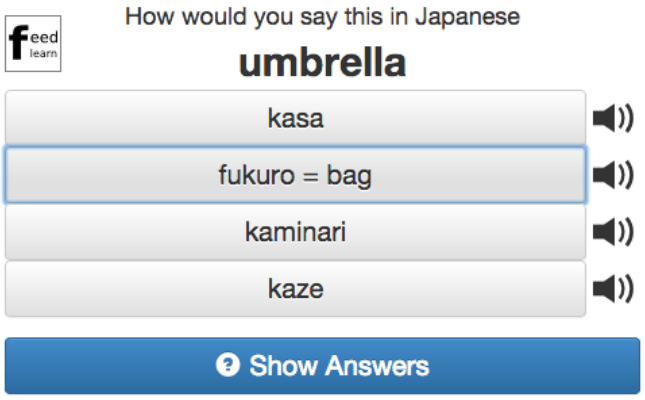

Figure 4. Another type of quiz presents a noun in English (umbrella), and asks the user to select the correct translation into Japanese (*kasa*). The user has incorrectly selected *fukuro*, so the user is shown its meaning (bag), and tries again.

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 4. 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 3.

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 user answers a quiz correctly, a new quiz testing a different word is shown. Thus, users can use an Edvertisement to continue study vocabulary 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].

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 quizzes.

Spaced Repetition

Spaced repetition algorithms schedule items for review to ensure long-term retention [11]. We modified the Memreflex algorithm [6] 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.

USER STUDY

We conducted a preliminary user study to see how much users would engage with Edvertisements, and compare the effectiveness of inserting interactive quizzes that can be done without leaving the page, versus inserting static links as is done by today's web advertisements and sponsored Facebook posts.

In our 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 with which quizzes appeared, their size and appearance, 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

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 script, as our users could not read Japanese script.

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 were shown links to a site where they could do the quizzes, as shown in Figure 5.

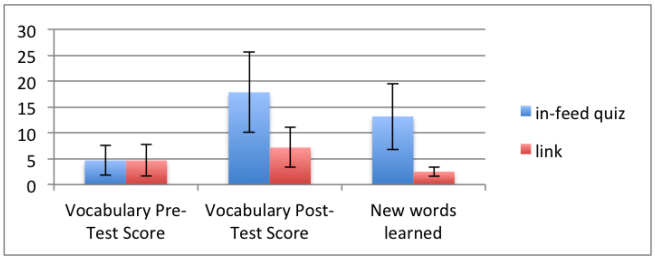

Figure 6. Vocabulary test scores for the in-feed quiz and link conditions, with standard error bars

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.

Apart form 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.

Procedure

The study was conducted entirely online. First, users took a pre-test 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 users to do the post-test, which had the same format as the pre-test.

RESULTS

Vocabulary 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 difference was not statistically significant (t=1.51, p=0.16).

Engagement With Edvertisements

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 website (in the link condition), or first engaged with an Edvertisement (in the in-quiz condition).

We found that there was high engagement with in-feed Edvertisements – on average, users answered 116 quizzes across 21 study sessions and answered a question 4.4 days of the 5.7 days they visited Facebook. Users in the in-feed quiz condition answered significantly more quizzes than the link condition, did more study sessions, and studied on more days across the week.

Qualitative Feedback

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. To address this issue, we later added new types of items to introduce new words and review old ones.

CONCLUSION AND FUTURE WORK

Edvertisements are interactive microlearning tasks that we can show to users as they are surfing the web. We have built a browser extension that shows Edvertisements by inserting them into Facebook feeds, and by replacing web advertisements with them.

In our user study, we inserted Edvertisements teaching vocabulary into users' Facebook feeds. We found that users engaged with and learned from Edvertisements, and that engagement rates were higher when the quizzes could be done without leaving their feeds.

Our current implementation inserts Edvertisements into Facebook feeds, and replaces web advertisements with them. There are other online contexts where we might show users Edvertisements – for example, between Youtube videos, chapters of a e-book, or in their email. Although we have focused on microlearning, Edvertisements could also be used to remind people to do other small, beneficial tasks as they are idly surfing the web – for example, encouraging people to do a small exercise, or complete an item on their to-do list.

Other directions for future work include making Edvertisements more personalized and contextually relevant, based on the user's browsing history and their social network. For example, if it is your Chinese friend's birthday and your browsing habits indicate that you are learning Chinese, we might show an Edvertisement in your Facebook feed teaching you how to wish him happy birthday in Chinese. Or if you are reading an anti-vaccination webpage, an Edvertisement might teach you scientific facts about vaccines, showing the names of your friends who have also completed that Edvertisement. Or if many of your friends run, we might show you an Edvertisement about the health benefits of running, showing your friends' recent runs as part of the Edvertisement.

Production of Edvertisements and monetization is another area of future work. One potential approach would be sponsored Edvertisements – for example, a local gym might sponsor an Edvertisement which teaches you a workout routine, hoping it'll encourage you to visit their gym.

As evidenced by the rise in ad-blocking, users are growing frustrated at distracting, irrelevant advertisements on webpages and in their social feeds. Edvertisements aims to help address this issue, by re-claiming the spaces for purposes like microlearning that will benefit the end user.

EDVERTISEMENTS DEMO AND SOURCE CODE

Researchers interested in using or building on Edvertisements can visit `https://edvertisements.github.io/`

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