Communication and Gamification in the Web-Based Foreign Language Educational System:
Web-Based Foreign Language Educational System

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ABSTRACT

The paper describes development of the educational online web communication platform for teaching and learning foreign languages. The main objective was to develop a web application for teaching foreigners to understand casual fluent speech. The system is based on the time bank principle, allowing users to teach others their native language along with taking foreign language lessons. The system is based on the WebRTC technology, allowing users to access synchronized teaching materials along with seeing and hearing each other. The paper describes studies associated with user involvement in the learning/teaching process. The hypothesis whether two previously unfamiliar individuals could communicate with each other using a foreign language, based on the developed system algorithms, was tested. System virality, where new users are attracted by the existing users was also studied, along with user motivation for viral behavior. Relationships between monetization, virality and user involvement were also considered.

KEYWORDS

Distance Learning, Gamification, K-Factor, Retention, Social Network, Virality

INTRODUCTION

Studying conversational speech is very important for practical purposes, since language training based only on written language and books is not sufficient. A person who speaks like s/he writes leaves an artificial or abnormal impression. Foreign language education in the former Soviet Union was based on reading and text translation, and not on speech. Thus, the students were able to read, understand and translate the text, but not communicate with live foreigners. There are multiple textbooks focused on the speech aspects of a foreign language (Kohonen et al., 2001; Munro et al., 1995; 1999).

The research objective of this study was to create a web-application to teach foreigners to understand fluent speech. Each language consists of the two essential parts. One is the written language, and the other is the spoken language. These two types are significantly different from the linguistics perspective.

Spoken language skills can be acquired by watching foreign movies or reading novels. Book writers, cultural, political, education and religious leaders provide spoken speech standards. The

rest of the society considers their language as a standard. However, casual conversation is the main spoken language characteristic. Casual conversation or speech cannot be prepared in advance, since it is used in the informal settings. There are certain attributes of the spoken language:

1. **The number of participants:** One, two, more than three, which is correspondingly called monologue, dialogue and polylogue. Dialogue is the main type of the spoken language conversation. It is characterized by changing the roles of the speaker and the listener, when both participants switch their roles periodically. Polylogue involves more than two participants. Polylogue, opposite to a dialogue, is characterized by the theme polyphony, since each of the participants talks about their business, leading the conversation, so to speak. It should be noted that polyphony can be present in a dialogue as well, as two people engaged in a conversation can jump from one subject to another;
2. **Conditions of the conversation:** Contact (private conversation), distant (phone conversation, speaking from one room to another, etc.). During direct conversation participants can also use gestures and facial expressions as additional means of communication;
3. **The main conversation theme:** The basis of spoken communication, which is also called constitution. Wherein the spoken language is the participants' reaction to non-verbal situation components, or is targeted towards available objects, enhancing the speech ellipticity and the role of pronouns;
4. **Common non-perceptional base:** Essential for conversational speech construction. Preliminary information, based on the previous everyday experience, is the common non-perceptional base. For example, in the Lev Tolstoy's novel "Anna Karenina", Kitty and Levin, who are in love, perfectly understand each other and only use the first letters of the words in written correspondence.

The main form of conversational speech is oral; however, not every type of speech is conversational. For example, lectures, public performances, scientific talks, TV interviews and reports are not conversational speech. In general, mass media and public oratory use codified language, while conversational speech belongs to the private sphere of communications. This is personal communication mainly with friends and family. One type of situation-determined conversational speech is of particular interest: stereotypical and high-frequency repetitive idioms. Learning these question-response cues, or speech patterns, associated with everyday life, it is one of the important tasks of studying conversational speech. There are two types of high-frequency repetitive idioms: etiquette stereotypes and urban stereotypes. "At the store", "On the bus", "In the theater", "At the movies", etc. are examples of the urban stereotypes. The importance of distinguishing stereotypical and non-stereotypical situations is signified by highlighting them in textbooks intended for people studying a second language.

Elemental conversation is even more extensive and interesting area of the spoken language, not related to typical situations. This live speech, which is all around us, can be called free conversational speech, to distinguish it from the urban stereotypes. Its study has increased significantly in recent years.

Conversational speech standards have more variability than the codified language norms in words formation, nominative means, phonetics, etc. Language is regulated by several standards. One is the nationwide standard, which is used by the whole population.

Additionally, there are more particular forms. Thus, unwritten, but multiple mandatory standards play a special role in conversational speech. However, conversational speech is regulated not only by the standards adopted in a particular language community, but also by the etiquette conventions. Certain expressions cannot be used, as they can be perceived as impolite and violating linguistic

etiquette. Thus, spoken language skills can be most effectively learned from live verbal interactions with native speakers. This is accompanied by acquiring skills that reflect conversational partner experience, including lexical and cultural verbal communication traditions in stereotypical and non-stereotypical situations.

An online application was developed for practicing spoken language skills with native speakers, which implements described provisions. It is based on the live video and audio connection between real people, where native speaker acts as a teacher. The system contains all the teaching materials in the form of the theme lessons for developing conversational foreign language skills (Benson, 2011). The main requirement for the native speakers is their ability to read, along with education and cultural competence. The system needs a large number of users for a potential "teacher" (native speaker) to meet a student online. Thus, attracting more users was a part of this research. The paper also describes studying user motivation in the online system for practicing spoken language skills.

SYSTEM DESCRIPTION AND USER BEHAVIOR STUDIES

Experiments were conducted using the users of the i2istudy system that utilized the service at their own will (Osipov et al., 2015a; 2015b; 2015c). To conduct the experiment, the following advertising was displayed in Facebook social network: "Want to learn foreign languages for free, or teach your native language? Click here." Over 40,000 users registered in the system from May through August 2014 as a result of the advertising. Most of the users (28,180) wanted to learn English, another 8,711 users wanted to learn Spanish, 1,028 Russian and 1,791 German. 14,943 users said that their native language is English, 20,673 Russian, 204 German, and 3,843 Spanish.

All registered users could find other users in the system present online, identified as students or teachers by pressing the corresponding "Learn X language" or "Teach Y language" buttons. This action sent requests to other selected users. Here, the words teacher and student refer to the user roles in the system. Each user can assume both roles as a teacher of the native language and as a student learning a foreign language. The users select the corresponding languages during the registration process, which can be changed later.

The recipient of the teaching or learning request sees the user sending this request, along with the language and selected lesson level. The recipient can either accept or reject the request. If the request is accepted, the interface window opens, where the teacher and the student see and hear each other, and use synchronized teaching materials (Osipov et al., 2015c). During the lesson the users not only see and hear each other, but jointly work with teaching materials divided into small portions (cards). Besides, the student can see prompts and translation in their understandable language. The teacher sees additional instructions, for example to ask the student to repeat words, etc. The system tracks the time spent learning and teaching. At the end of the lesson each participant rates the other party's corresponding quality of teaching or learning.

Subtle factors, such as language heterogeneity within the national boundaries, have not been taken into account. Perhaps it is worth considering in the future, knowing that Spanish in Argentina is not the same as Spanish in Spain. Language types can be codified in the system, so that native speakers could clarify which version of the language is native for them, also visible to a potential student. At present, no studies or measurements on this subject have been conducted.

Before the system creation the authors assumed that the majority of people want to learn a foreign language (be a student), and very few people want to be a teacher and teaching their native language. The authors implemented one of the gamification techniques - the virtual currency. Gamification is utilizing approaches specific to games in non-gaming processes to attract users and consumers by increasing their involvement in solving applied problems and using products and services. (Huotari et al., 2011; Deterding et al., 2012).

Virtual currency is in the form of minutes, which are spent during learning as a student and earned when teaching native language as a teacher. The number of minutes clearly indicates the current

balance, motivating the user to earn minutes in addition to spending them. If the minute balance falls below zero, the user can no longer learn and must earn minutes somehow. Thus, a time balance in human hours is maintained between the students and teachers.

Besides, there are other elements of gamification mechanics, such as user levels, titles and stars, implemented in the system. Users earn new titles by using the system more. i.e. teaching or taking more lessons. Each user is also rated with the number of stars at the end of the lesson by another user. Student is rating the teacher and the teacher is rating the student. Quiz results taken at the end of each lesson are clearly displayed next to the lesson icon, encouraging the student to improve their score by repeating the lesson. Taken lessons are clearly marked with the quiz results, while new lessons are visible, but not available until previous lessons have been taken by the student.

The main objective of gamification mechanics is to motivate users' positive behavior by taking more lessons, teaching, inviting friends and spending more time in the system.

Experiments were conducted using an online educational system with 40,000 registered users and 1,000-1,500 daily active users. The research objective was to test the assumption that two unfamiliar people could communicate and learn a foreign language together within the system framework. To test whether this hypothesis is even feasible, when specifically unmotivated people, without prior training could assume the appropriate role of a "student" or a "teacher", find and invite another user online to teach or to learn a foreign language. The system interface contains the tools for finding other users currently available online (Figure 1). Detailed screenshots of the interface and the developed online system principles are described in the previous publication (Osipov, et al., 2015a). The lessons are following pre-defined scenarios using face-to-face communication, realized using the web real-time communication (WebRTC) technology (Osipov et al., 2015b; 2015c).

NEW USER ATTRACTION METHODS

Initial users interested in practicing foreign languages registered as a result of an advertising placed in the Facebook social network. The advertising suggested registering in the system to learn foreign languages for free in exchange for teaching native language. The ads were displayed in English and

Figure 1. The system interface with the tools to find other users currently available online
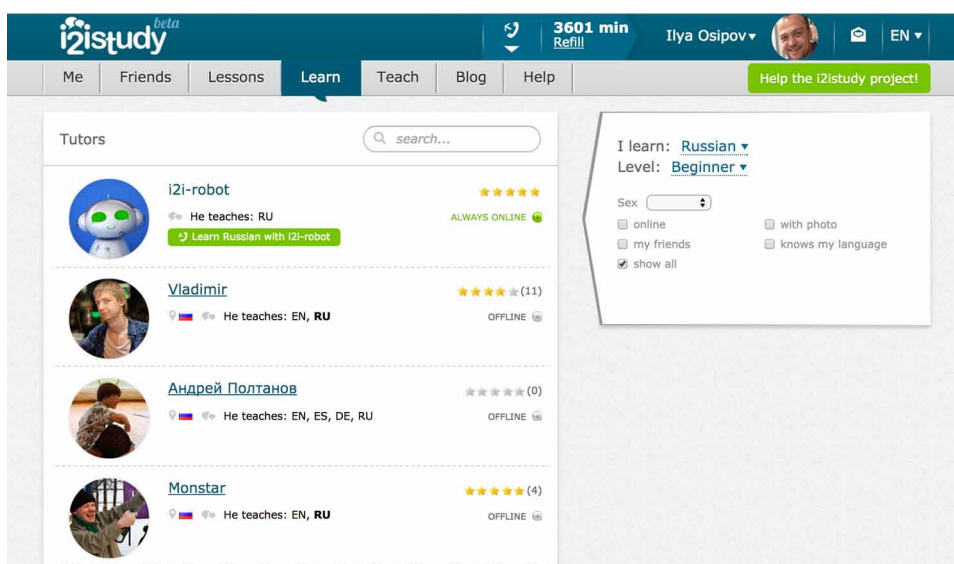
Spanish-speaking countries, Germany and Russia. Besides, some of the users were invited by their friends (new users invited by the existing users).

If the "teacher" accepts the "student" invitation and visa versa, a live audio-video session is established. Both users can hear and see each other, along with the synchronized lesson materials. These materials include corresponding individual prompts for the participants in their chosen language. The system also tracks the lesson time for the billing purposes in terms of the game currency or real money (Marks, 2012; Válek & Jašíková, 2013).

About 20% of the registered users participated in the experiments. The rest were either intimidated to talk with strangers online, or did not understand how the system works and decided not to spend their time. Some users could not configure their hardware (microphone and web camera) needed for the online communication session, or their browser did not support the WebRTC protocol used by the system. Table 1 shows the absolute number and percentage of the newly registered users for each month that made a call.

RESULTS

As a result of the test, it was established that two unknown people, who met in the developed online interactive system for the first time, could carry on a conversation in a foreign language and effectively help each other. Moreover, part of the users did not speak a common language, and communicated by using system prompts displayed in their respective native language. The average successful connection time was about 12 minutes (189,207 minutes or 3153 man-hours) divided by the 15,842 total successful connections. Any type of connection termination was accounted for, including finishing the lesson, participants terminating the connection within the system, or by simply closing the browser. Table 2 shows the number of successful connections for every month and the total connection time in minutes.

Table 1. The number and percentage of the newly registered users for each month that made a call

Involvement									
Month	01.12 - 31.12	01.01 - 31.01	01.02 - 28.02	01.03 - 31.03	01.04 - 30.04	01.05 - 31.05	01.06 - 30.06	01.07 - 31.07	01.08 - 31.08
Number of just registered users who made a call in period	93	734	61	15	251	1026	2037	2072	722
Percent of just reg. users who made a call in period	7	16	22	12	22	26	25	18	15

Table 2. The number of successful connections every month and the total connection time in minutes

Real Connects									
Month	01.12 - 31.12	01.01 - 31.01	01.02 - 28.02	01.03 - 31.03	01.04 - 30.04	01.05 - 31.05	01.06 - 30.06	01.07 - 31.07	01.08 - 31.08
Successful connects duration, min	151	10835	5021	3645	6202	37037	47140	54974	38202
Number of successful connects	19	1228	492	131	587	3093	3868	3763	2661

Regardless of the fact that the average connection time was not very long, this experiment shows that two unprepared participants, previously unknown to each other, can carry on a conversation for an extended period of time using the developed system. If the lessons duration was not too long, the users could finish them. Moreover, the average connection time continued to increase with the number of active users, reaching over 14 minutes by the end of the experiment in August 2014.

RETENTION AND VIRAL USER ATTRACTION. THE K-FACTOR

To practically track the system dynamics, the author calculated the local K-factor for a given period of time, one week in this case. It's important to emphasize that the local K-factor reflects the percentage of the newly attracted users in relation to all existing users. The local K-factor value can be much different from the global K-factor, which reflects the average number of new users attracted by the existing users over the lifetime of the project. Moreover, for the purity of the experiment, only active users were considered. Using the local weekly K-factor allows tracing the system dynamics affected by certain changes and innovations. Additionally, the K-retention parameter tracks how the audience is retained by the project. The ideal K-retention is 1. In this case, the project ideally retains the audience without losing a single user (Seufert, 2014):

$$K_{retention} = \frac{dU - dNU}{dU_{-1}}$$

Here, dU is the daily audience for a given day, dU_{-1} is the audience in the previous day, and dNU are the newly registered users in this timeframe. For example, if K-factor is 20%, and the K-retention is 90% (meaning that 9 out of 10 users visit the service next day), then the growth K-factor is 0.2+0.9=1.1. This system will continue to grow by 10% of its daily audience day by day (Fong, 2014).

For example, Figure 2 shows the user growth with 1 month increments, assuming 1,000 starting users, 20% monthly K-factor, 85% K-retention factor, extrapolated over 36 months. The sum of the

Figure 2. Hypothetical user growth with 1 month increments, assuming 1,000 starting users, 20% monthly K-factor, 85% K-retention factor, extrapolated over 36 months
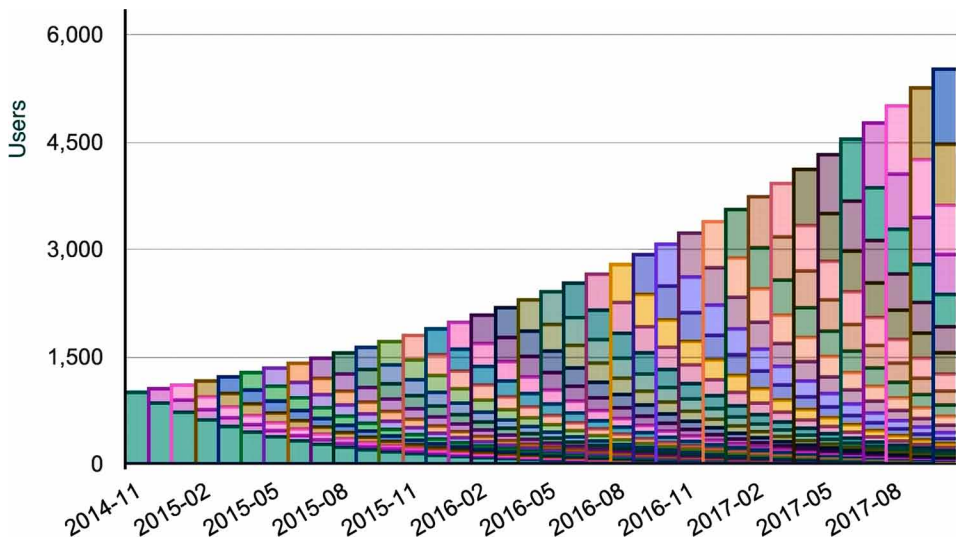
K-factor and the K-retention factor is called the K-growth. If K-growth is larger than 1, geometric growth progression would result. Alternatively, if K-growth is less than 1, the system loses users (Cohen, 2014; Skok, 2009; Rigatuso, 2014).

MONETIZATION AS SYSTEM CONTROL

Regardless of the fact that the system was initially designed as predominantly free, at a certain point users were given an option to purchase certain features. Internal system currency is time in minutes gained by teaching and spent by learning. Users were given an option to purchase minutes in the system using real money (Figure 3). This feature to purchase minutes was added to the user interface as a control action (Mäntymäki & Salo, 2011; Gains, 2014).

Let's see how the users reacted to the made change. The authors expected that 1-2% of the users would utilize the new option to purchase minutes. This seems to be realistic, as typical freemium products have 2-10% paying premium customers (Seufert, 2014; Eyal, 2014).

MONETIZATION AND VIRALITY RELATIONSHIP

Schematics in Figure 4 shows how users could earn or spend minutes in the system by A-inviting friends, B-spending minutes as a student, C-by teaching other users and D by purchasing minutes, which was the newly added feature. The actual user interface implementation to purchase minutes is shown in Figure 3. As mentioned earlier, the user had the free will to either use this feature or not. However, the developer's expectations have not been met, since only two users purchased system minutes since July 28th, 2014. Thus, only 0.0083% of the users got involved in the offered monetization, which is unacceptable (Yee, 2008).

However, this new feature has demonstrated the value of the minutes in the system to the rest of the users, which caused an unexpected growth of user involvement and virality. As a result, the number of users teaching their native language increased. Prior to this monetization feature implementation, 47% of the active users taught in the system, while 55% of the users taught after they were exposed to the value of the system minutes. The K-factor growth dynamics was even more interesting. Figure 5 shows the weekly K-factor before and after the implemented monetization feature. As seen in Figure 5, the weekly K-factor increased when the new function was added, and continued to grow until September 1st 2014, when the system was closed for renovation. Before July 28th, the average weekly K-factor was 2.01±0.84%, and increased to 3.89 ± 0.73% after monetization.

To test the hypothesis of the monetization effect on the K-factor, the p-value was calculated. The null hypothesis assumed that the K-factor did not change as a result of the monetization. The K-factor data before monetization was used for the expected value. The actual K-factor data was taken after

Figure 3. System interface with the new option to purchase minutes
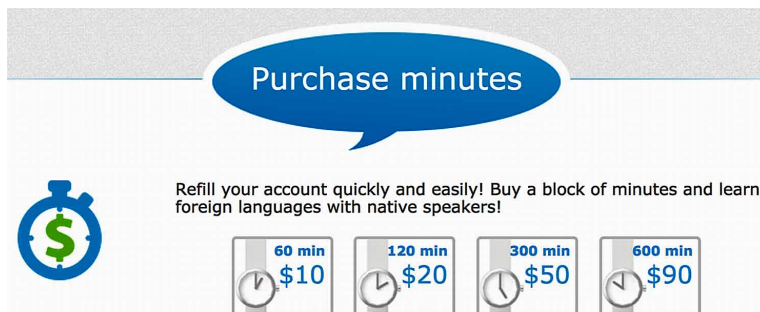
Figure 4. Schematics showing how users can earn or spend minutes in the system
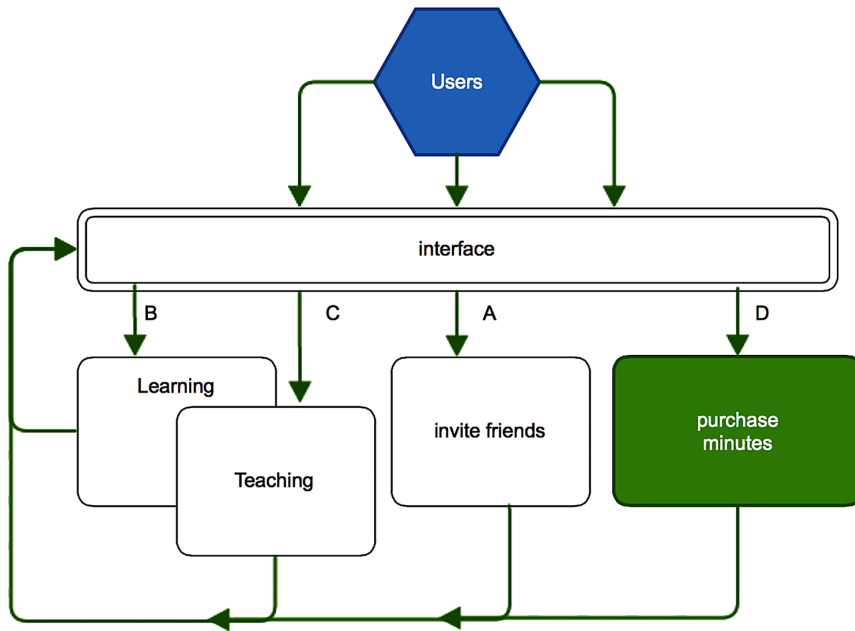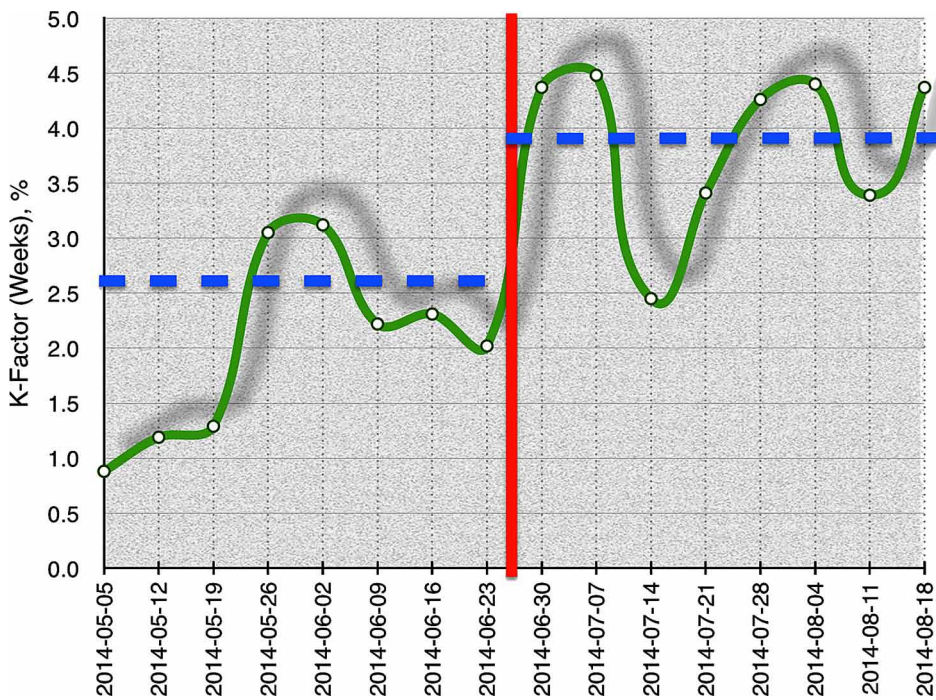

Figure 5. The weekly K-factor showing that it doubled after added monetization

monetization. The calculated p-value was 0.01%, thus the authors have rejected the hypothesis that the K-factor did not change as a result of monetization (Yee, 2008; Fields & Cotton, 2012).

Thus, it is clear that trying to affect the user behavior to motivate them by the paid functions resulted in an unexpected opposite effect. The users started to use alternative ways to earn minutes in the system, but not real money.

## SYSTEM INTERFACE TO MOTIVATE USER BEHAVIOR

In order to increase the virality and attracting new users, the existing users were asked to invite their friends. This is how the corresponding system interface looked like (Figure 6). This simply did not work, as the number of newly attracted users was minimal, corresponding with the K-factor of 1-1.15% in May 2014. Thus, the message was changed to ask users for their help to grow the project (Figure 7a).

The loyal system users were addressed with the message displayed in the internal system interface after they logged into the system. This message had a much stronger effect, as 26% of the users clicked the "Help the project" button in Figure 7a. As a result, the K-factor grew by 1%. The authors decided to strengthen the effect by removing the closing window cross in the upper-right corner of the window (Figure 7b). Thus, the user could only reject help consciously. It was impossible to close
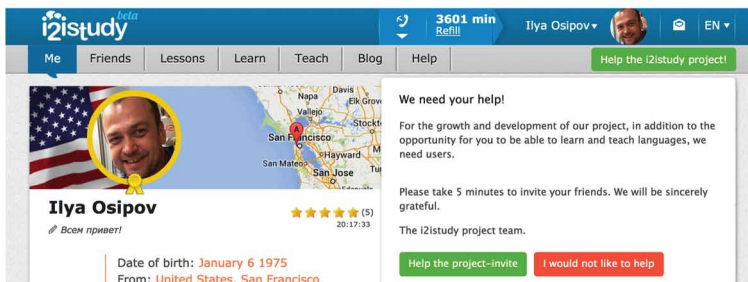
Figure 6. System interface offering 30 minutes for each invited friend

Figure 7. (a) Message asking users for their help to grow the project with the red window-closing cross in the right-upper corner; (b) Similar interface with the window-closing cross removed and the added "I would not like to help" button
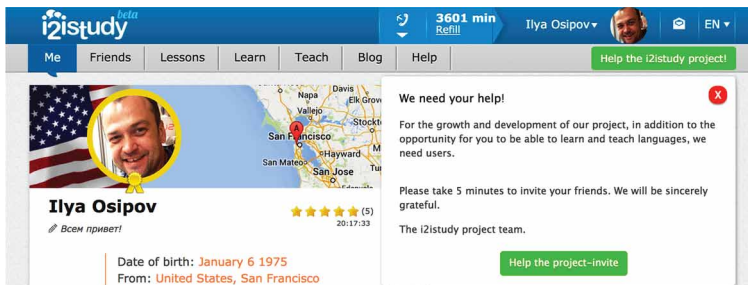
(a)

(b)

the window. As a result, 73% of the users invited their friends, and the K-factor grew to 4%. These very simple motivating aids increased the key parameters of the project in terms of its growth (Skok, 2009; Ellis & Brown, 2014).

DISCUSSION

The i2istudy platform helps users better understand spoken foreign language, while training them to more clearly express their thoughts in a foreign language. Other systems, aimed towards accent reduction, use paid professional teachers, which are expensive, or rely on impersonal demonstration of audio-visual materials. Our product allows live interaction between the users by providing lesson materials, prompts and translations, which achieves the immersion effect, similar to a foreigner communicating with native speakers when traveling in a foreign country. This method of improving spoken foreign language is the most economical of those we know.

For example, there were 26.7 million foreign-born immigrant workers in the US in 2014 (Migration Policy Institute, 2016), which represents more than 16% of the total population. From the 26.7 million workers of foreign origin aged over 16, 71.9% worked in occupations that require communication skills, including management (30.3%), service (24.6%) and sales (17%). However, among the 42.4 million US immigrants, 50% have limited English language proficiency. Spanish speakers make up 64% (16.4 million people), Chinese (all dialects) – 7% and Vietnamese – 3%.

People with poor spoken communication skills face many problems that prevent them from achieving their full potential, also creating many barriers (Hosoda et al., 2010; Purkiss et al., 2006). Foreigners with poor English communication skills, especially those with heavy accents, receive lower employment ratings, compared with their colleagues with standard American accent (Purkiss et al., 2006). Individuals with poor spoken language and accent can be perceived as less competent or even less intelligent (Edwards et al., 1982).

According to the recent market assessment, an average 12 week online course with ten 30 minutes tutoring sessions using Skype costs $695 (Johnson, 2016). High language education cost and lower chances of getting a job put foreign workers into a disadvantaged position. To learn a language, you need to make good money, and to make good money it is necessary to know the language.

Developed application attracts non-professional native speakers as teachers, which significantly reduces the cost of foreign language education. Besides, many people are willing to teach their native language for free, just for the need to communicate with other people, or for learning a foreign language in exchange. For example, in the US, one of the most popular foreign languages is Spanish. Hispanic, on the contrary, are interested primarily in English, and are willing to spend their time teaching Spanish in exchange for English lessons, which significantly reduces the cost.

VISION

The authors think that peer to peer learning systems, like i2istudy, can democratize online education market, or at least some of its niches, such as spoken language training in our case. This is similar to ebay democratizing buying and selling goods online, AirBnB democratizing renting rooms and Uber democratizing taxi services.

CONCLUSION

Online systems allow effective spoken language skills exchange, given there are many users available in the system and willing to participate in the process as both teachers and students. The paper describes experiments with user attraction mechanics. The effectiveness of certain mechanisms, including

monetization and gamification was demonstrated to stimulate users' participation in the spoken language and cultural exchange. Based on the conducted experiment, the average connection time increased to almost 15 min with many users involved in system integration. Some of them became daily active users. Users were motivated to invite their friends using simple methods described in the paper.

ACKNOWLEDGMENT

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