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Implementing Game Mechanics for Crowdsourced Language Learning

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Submission date: May 2014
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Abstract

English
Mobile phones and other digital devices has become a big part of our everyday lives. We have stepped into a digital age where the amount of information contributed by us to the Internet has exploded. We are using applications and online services for purposes such as personal entertainment and personal education. More and more services and sites bases itself on the contributions of its users, and without these contributions, the system will stagnate and falter. We share and learn from each other in the form of text and media.

This thesis takes a closer look on how the use of game attributes can be used to make contributions to the crowdsourced language learning application Lingobee self-driven and more fun. These attributes are introduced in an attempt to harness some of their motivational properties to further engage the users.

The technological delivery presented with this thesis is a prototype with implemented game mechanics and connection to Lingobees repository. The game mechanics that are implemented focuses on creating an implicit competition amongst the users of Lingobee. The application was tested and evaluated by eight testers with different backgrounds and knowledge about gamification during a period of three weeks.

The research achievement was evaluating the results from the user evaluation, and the testers perception of the applications usefulness and usability. It was discovered that the chosen game mechanics implemented was considered to promote both motivation and engagement amongst testers, and the results can be used in the further development of the application Lingobee.

Keywords: gamification, game mechanics, collaborative learning, crowd sourcing.

Trondheim 2014-01-06

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Sammendrag

Norwegian
Mobiltelefoner og andre digitale enheter har blitt en stor del av vår hverdag. Vi har tatt steget inn i en digital tidsalder der mengden av informasjon som blir delt av oss på nettet har eksplodert. Vi bruker applikasjoner og tjenester til blant annet personlig underholdning og personlig utdanning. Flere og flere tjenester og nettsteder baserer seg på bidrag fra sine brukere, og uten disse bidragene vil systemet miste sin mening og dø ut. Vi deler i form av tekst og media, og lærer av hverandres bidrag.

Denne avhandlingen tar en nærmere titt på hvordan bruken av spill egenskaper kan bidra til at bidrag til språklærings applikasjonen Lingobee som baserer seg på crowdsourcing(brukernes bidrag) blir mer selvdrevet og moro. Disse egenskapene ble innført i et forsøk på å utnytte de motiverende egenskapene spillmekanikker har for å ytterligere engasjere brukerne.

Den teknologiske presentert med denne avhandlingen er en prototype med implementert spillmekanikk og kobling mot Lingobee sine servere. Spillmekanikkene som er implementert har fokus på å fremme implisitt konkurranse blant brukerne av Lingobee. Applikasjonen ble testet og evaluert av åtte testere med ulik bakgrunn og kunnskap om spillifisering gjennom en periode på tre uker.

Resultatet av avhandlingen blir presentert ved å evaluere resultatene fra brukerevalueringen, og brukertesternes oppfatning av applikasjonens nytteverdi med tanke på fremmet motivasjon, og applikasjonens brukervennlighet. Det ble oppdaget at de valgte spillmekanikkene som ble implementert ble ansett å fremme både motivasjon og engasjement blant testerne, og resultatene kan brukes i en evt videre utvikling av programmet Lingobee.

Nøkkelord: spillifisering, spillmekanikk, samarbeidslæring.

Trondheim 2014-01-06

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Preface

This project was carried out as a part of my masters degree in Computer Science at the Norwegian University of Science and Technology(NTNU). This project is 50% of the masters degree, and was started in the fall 2013.

During the project I have received great help from several people. I would like to thank my supervisor, Adjunct Associate Professor Sobah Abbas Petersen, who have guided me in the right direction throughout the project and provided me with the resources needed to carry it out. I would also like to thank everyone who participated in the user evaluation and interviews.

Thanks to friends and family for the continued support, feedback and general input, and for making my time as a student memorable.

Finally I would like to thank my girlfriend Karina S. Wangen, who supported me, helped me keep my mind of things when thoughts were piling up, and generally motivated me throughout the year. Thanks for everything!

Abbreviations

API	-	Application Programming Interface
MMORPG	-	Massive(ly) Multiplayer Online Role-Playing Game
Q&A	-	Questions and Answers
IDE	-	Integrated Development Environment
SDK	-	Software Development Kit
UML	-	Unified Modeling Language
XML	-	Extensible Markup Language
SUS	-	System Usability Scale
SQL	-	Structured Query Language
RQ	-	Research Question
NTNU	-	Norwegian University of Science and Technology
PHP	-	PHP: Hypertext Preprocessor
CSS	-	Cascading Style Sheets
XP	-	Extreme programming

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Chapter 1

Introduction

Mobile phones and other digital devices has become a big part of our everyday lives. Smart phones have become as small as a credit card, and as powerful as expensive computers were just a few years ago. We are walking around with a tiny powerful computer in our pockets every day, using applications for ordering bus tickets, entertainment, listening to music, educational purposes being either in form of a game or a learning application, and much more. People generally spend a lot of their spare time online. They are chatting with others through different social media, contributing with elements of their choice or just simply interacting with others through online communities. Many of these communities are based on peoples contributions, and without these contributions, the system will stagnate and falter.

There exists web sites and applications for learning purposes which are based on the ideas of *collaborative learning*, where you as the user provide your knowledge for other people to learn from you, and by that can under the right circumstances have a positive effect on learning [1]. These web sites and applications have much potential, but many of them die out due to *under-contribution*, or the complete lack of contributions [2]. As a rule of thumb, it is said that if you gather a group of 100 people online, only 1 of them will contribute with something, 10 will interact with that contribution with comments or suggested improvements, and the other 89 will just view or completely ignore it [2]. So these types of sites and communities can be further developed to actually make it fun to contribute or make use of, and at the same time steer the users in the direction of wanting more. This is

where the concept of *gamification* can make its entrance.

Gamification can be defined as using game mechanics and dynamics to present a game like environment to a non-game context [3]. This means using attributes from games that provides the user with the motivation and engagement needed to continue their usage. Gamification has been used by humans since the development of games, but the word gamification hasn't been used widely until a few years back [4]. Gamification can be as simple as counting red or blue cars with your family on long road trips to forget that time is passing, or pretending the spoon is a train going in to a tunnel when feeding a child. But even in these simple forms, it can be broken down into elements with roots in human psychology and motivational theory.

In this project, gamification attributes, or game mechanics such as points, badges, rewards and leaderboards can all be implemented with the collaborative language learning application *Lingobee* in order to increase the motivation and engagement of the users.

1.1 Goal

The goal of this project is to develop a prototype for the android platform that works as a side module for Lingobee. The prototype will incorporate mechanics and dynamics from games in order to create an implicit competition amongst the users. There is no open source code for Lingobee, so the prototype will be constructed from scratch as a native application. An API with a developers key is provided by the creators of Lingobee, and therefore access to Lingobees repository is available for use. The technological work will also entail the learning of programming for the android platform.

After the development of the application, it will be evaluated in an user experiment, where participants get the opportunity to use the application with the new features. The users will first use Lingobee for a period of *one* week, then they will use the application with gamification features together with Lingobee for *two* weeks. During and after the evaluation period the users will be asked to answer a survey regarding the perceived enjoyment, usability and the applications usefulness. The two users with the *fewest* contributions during this evaluation period will be further interviewed about the motivational

factor of the application, its usability and usefulness. The contributions made by the testers during this evaluation period will be mapped, and their usage will be observed through Google Analytics[1] which will be implemented in the application. The results of this experiment can be used to see if implementing gamification features in a collaborative language learning application like Lingobee is relevant on a motivational level, and provides the users with the motivation and engagement needed to spend more time contributing to the application and further use.

1.2 Research Questions

The main idea is to explore the possibilities of using gamification as an element in Lingobee to improve the users motivation to continue contributing. This has lead to the following research questions:

RQ1: How can the theory of gamification be used in a collaborative learning application like Lingobee to make it more engaging and motivating?

Gamification is a word that has been tossed around in different kind of scenarios the last few years. But what does it mean to *gamify* something? I will do a review on what gamification is, and how it can be used as an element in collaborative language learning applications like Lingobee to engage and motivate people to continue to contribute to it.

RQ2: How motivating towards further contributions can a gamification feature be when used in a collaborative learning application?

There exist several types of gamification features, and most of them serve the purpose of being a motivational factor to further engage the user. But Lingobee being an application based on the ideas situated learning and social networking, there are some gamification features that can not be implemented successfully. I will conduct a review of the most popular gamification features, and choose the ones that can be implemented with Lingobees repository successfully. These features will be implemented in a prototype and I

[1] A service offered by Google to generate detailed statistics about the usage of websites and applications

will do an user evaluation where I have the opportunity to evaluate the impact on the motivation the different gamification features have towards the desire to continue to contribute and use Lingobee.

RQ3: Did the test persons of the application with gamification features find it usable and useful?

A high priority criteria of any systems and applications is that users find it both useful and usable. Regarding finding it useful, users must understand how to use it properly, or the system will experience loss of interest. Regarding usability, it is critical that the users are not presented with a system that is flawed and contains bugs. They should be presented with a system were the right design choices are made. By following guidelines on how to create a system with good usability, I will create the prototype as simple and intuitive as possible to get proper and reliable feedback from the user evaluation. By doing this I will be able to evaluate if those factors were of any influence on the user experience, being both usable and useful.

1.2.1 Results

The results of this project will be a set of conclusions and hypotheses gathered from the user evaluation and the interviews, and insight on gamification features that are relevant when gamifying a collaborative learning application to motivate and engage the users. These results will answer the above mentioned research questions. Part of the project is also creating a functional prototype with gamification features that works as a side module to Lingobee, and the design and implementation of this will also be presented in a functional manner.

1.3 Report structure

This report starts with the detailing the research method used to carry out this project, which is presented in chapter 2. Relevant literature is reviewed in chapter 3 to clarify the the information needed for better understanding of this project. In chapter 4 the design choices for the application is explained, and follow by the implementation presented in a functional matter in chapter 5. The user evaluations of the application is presented in chapter 6 and the

results are presented in chapter 7. These results and the conclusion derived from this project are discussed, together with suggested implementation of the gamification attributes in Lingobee, limitations and implications with the project, and future research are presented in chapter 8.

Chapter 2

Research method

The research method is largely based on the *Design and Creation* strategy [5]. A process often used during development of an IT artefact, as in this case, a native android application. In this type of project it is important not only to show technical skills, but also the academic value which is reflected through analyzing the evaluation period, the artefacts usefulness and usability, and discussions of the findings. This strategy is described by Oates [5] as being an iterative process which involves problem solving. This process is:

- *Awareness* - The recognition and articulation of a problem.
- *Suggestion* - Involves a creative leap from curiosity about the suggested problem to suggesting a tentative idea of how the problem might be addressed.
- *Development* - Implementation of the tentative design idea.
- *Evaluation* - Examine and evaluate the developed artefact.
- *Conclusion* - Results from the process are consolidated and written up. Any loose ends or anomalous results can be the subject of further research.

Even though this process represents an iterative process, one is not obligated to follow this with exactness. If during the suggestion process you find a tentative idea that contributes with better understanding of the problem, you can jump back one step, and better refine your problem.

2.1 Literature review

Review of relevant literature is important for the first steps of the project, the awareness and suggestion. The problem need to be defined as thoroughly as possible to be able to come up with suggestions for ideas to try solving the said problem. This literature will be gathered and / or located primarily from:

- ACM Digital Library[1].
- IEEE Xplore[2]
- BIBSYS Ask[3]
- Google Scholar[4]
- Google Books[5]

Other than these digital libraries, relevant sites found using search engines with relevant keywords will be used to support theories found from above mentioned sites.

2.2 Generation of data

Many researcher who choose to develop an IT artefact and use the design and creation strategy pay little attention to the data generation methods, and by that the data is inadequately documented and analysed. Some say that this is easily overlooked because of the thrill of developing an artefact [5]. Therefore different types of data generation will be used to back up the findings of this research, and by that get as reliable data as possible to evaluate and discuss.

The data will primarily be gathered from:

[1] http://dl.acm.org/
[2] http://ieeexplore.ieee.org/
[3] http://ask.bibsys.no/
[4] http://scholar.google.no/
[5] http://books.google.no/

- Interviews with two of the testers from the user evaluation of the application that will be created.
- Questions directed to testers that stand out from the others when it comes to contributions amounts and types.
- Mapping og evaluation of the contributions made during the user evaluation period.
- Questionnaires that assesses the impact the gamification application has on the users on a motivational level.

Observation of the early tests during the design period will be conducted to see how the users respond to the design and general usability, and for direct feedback and discussion.

2.2.1 User testing

The user testing will be executed in two rounds; *early testing* and the *user evaluation* (see figure 2.1).

The early testing will be executed by persons with knowledge of both programming for the android platform and general usability design, and is executed primarily to get feedback on the design and to discover serious bugs that needs to be eliminated before the user evaluation. It will be performed under observation by me to be able to discuss potential changes and choices needed to be made afterwards, and to view how the testers react to the system and its layout. The Systems Usability Scale(SUS) tool is utilized here to assess the early prototype's usability in a quantifiable manner.

The user evaluation will be executed by eight persons, divided into two rounds. First round they will only use Lingobee for one week and in the second round they will use both Lingobee and the gamified application for two weeks[6]. The contributions added both before and after using the gamified application will be mapped and studied.

[6]The evaluation periods are not equal in time due to experienced down periods on the Lingobee server.

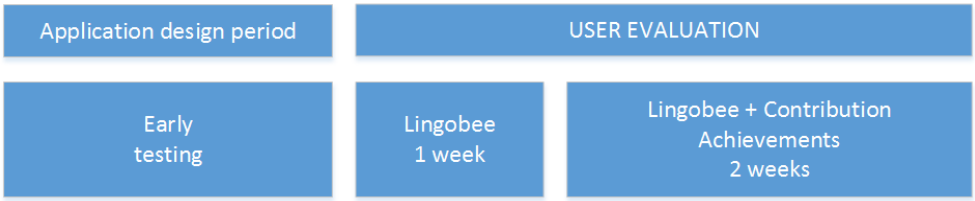


Figure 2.1: Overview of the user evaluation period

2.2.2 Survey and questionnaires

The users are to answer a survey about Lingobee and its functionality after the first round of testing(pre-gamification), and after the second round(post-gamification) the same survey will be given together with a questionnaire that also assesses the perceived enjoyment, usability and the applications usefulness. This is done to compare the users view on Lingobee both before and after introducing gamification, and to see if there are any changes in their motivation and view towards collaborative language learning. The first survey also assesses the functionalities that Lingobee has to offer, and will be backed up by the mapping of the contributions to obtain as correct results as possible. The format of the questions are to be answered on the *Likert scale*, where the users has to tick the box that matches their feeling towards the question on a scale from *1 - Strongly disagree*, to *5 - Strongly agree*.

2.2.3 Interviews and discussions

The two users with the fewest contributions after the evaluation will be chosen to answer questions about why they decided on their actions during the test period. These questions will focus on the motivational factor behind the different game mechanics implemented in the application, perceived usefulness, elements that they felt was missing and / or elements that could have been removed, and what could have been done different with the application to further engage them and motivate them. This is done to evaluate the IT artefact developed [5] from a users point of view.

Chapter 3

Literature review

To initiate this study, literature about how gamification works and can be utilized needed to be reviewed. This entails also how motivation and the urge to compete manifests in us humans, together with how all this can be combined to be used in the collaborative language learning application Lingobee. This chapter clarifies this relevant literature and information needed for a better understanding of the content and choices made in this thesis.

3.1 What is Lingobee?

Lingobee is a collaborative language learning application where users can add and collect words or phrases they've come upon in their everyday lives, and share them with the other users of the application to support language learning. Lingobee is based on the ideas of situated learning [6] and is designed to support social networking by giving the users the option to define their profiles such as the user name and contact details. Users can then click on other users who contributes with a post and view their information. Other ideas from social networking such as peer rating and flagging of contributions is also implemented.

In figure 3.1 an overview of the functionalities of Lingobee is presented. Being an application based on the ideas and principles of crowd sourcing, it is important that people continue to contribute to the application for it to maintain its usefulness. Below there is a detailed explanation of the func-

tionalities that Lingobee has to offer.

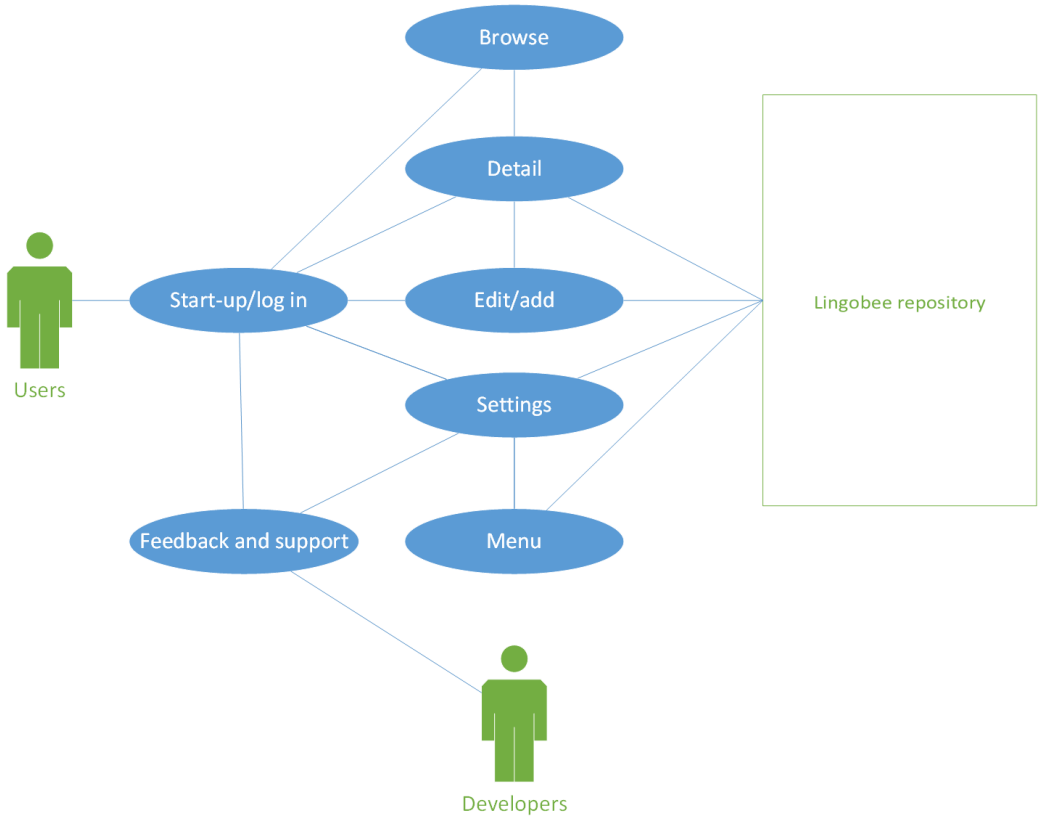


Figure 3.1: Overview of Lingobees functionalities

3.1.1 Browse

After Lingobee starts, you can browse for definitions in your personal list of added favorites(figure 3.3a), or from your *user group*(figure 3.3b). The user group is chosen upon installment of the application, and consists of users looking to learn new phrases and words in the same language. Your favorites are stored on your device, and are therefore available offline. Words in the user group are stored online and an Internet connection is needed for viewing. You can search by full-text search in your favorites or in the user group, filter by categories, and sort list by date or alphabetically. New words added by you are automatically shared with your user group, and also added to your personal list of favorites.

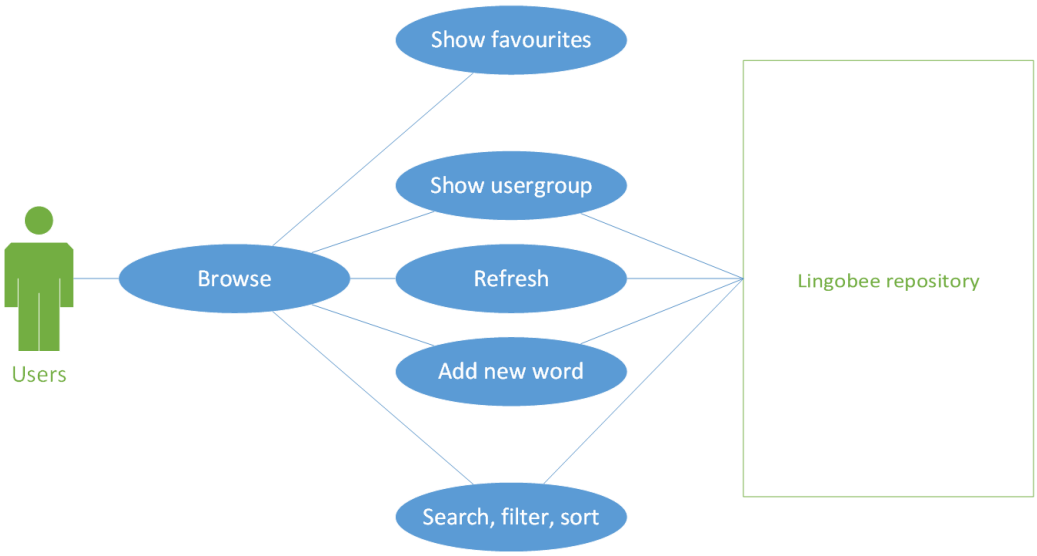
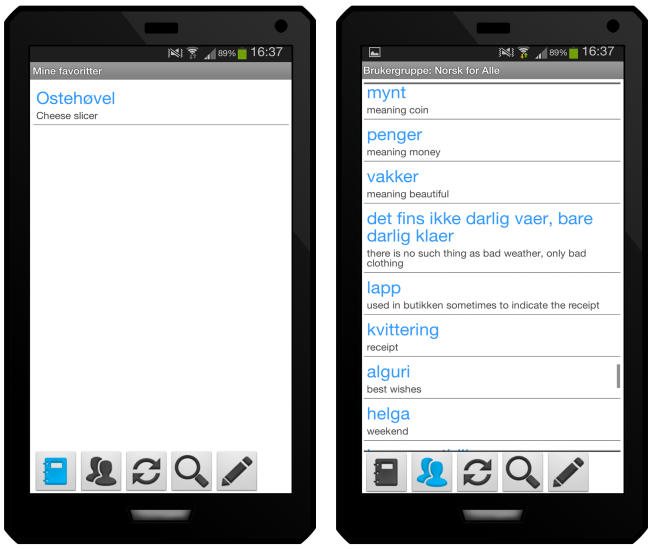


Figure 3.2: Overview Lingobees of browsing functionality



(a) (b)

Figure 3.3: Lingobees browsing functionality

3.1.2 Detail

When clicking a word in your list of favorites or clicking a word in your user group, a new screen with the overview of details will show with pronunciation support, definitions, and tools to rate, flag or add them to your list of favorites (figure 3.5). Other available options are text-to-speech, audio comment and web link. Your device can speak out the word to give an idea how it is pronounced, play an audio comment added by this user or browse a web link added by this user. You can also view the profile of the user who added the definition.

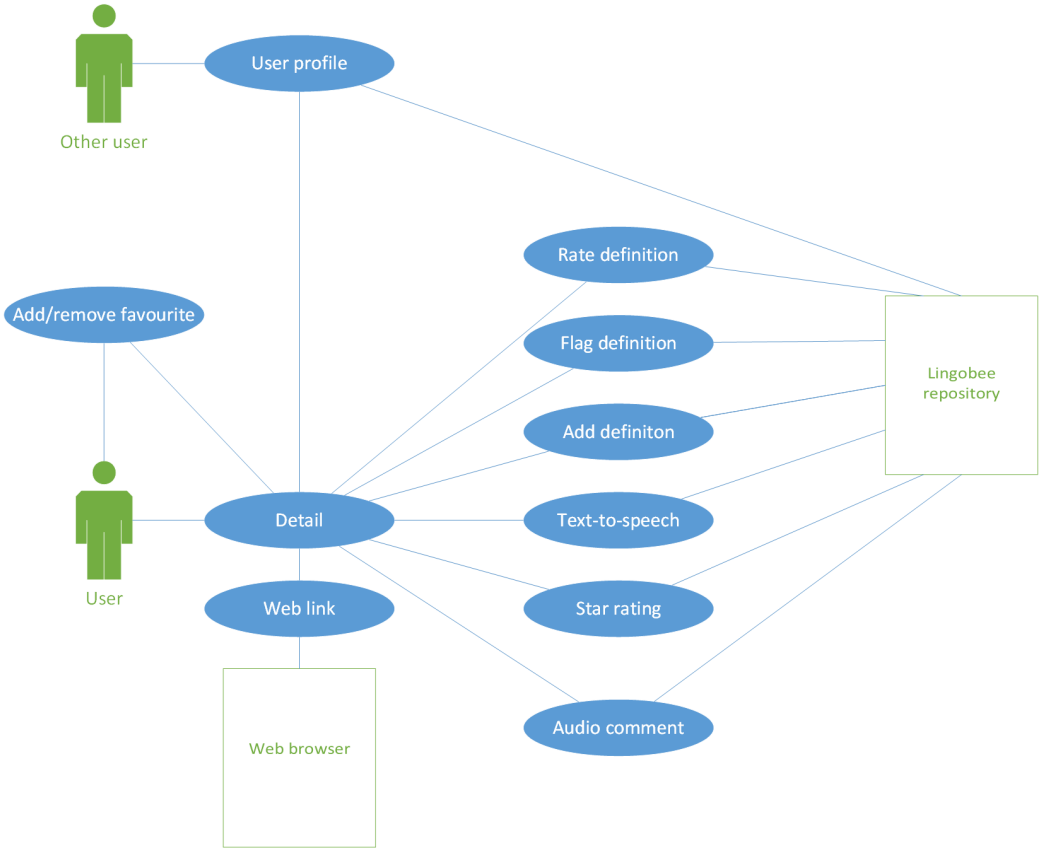


Figure 3.4: Overview of detail functionality

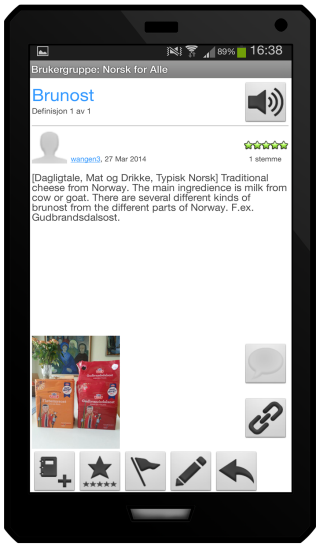


Figure 3.5: Lingobees detail functionality

3.1.3 Edit

When clicking the *pen icon* in the browse or edit screens, a screen with tools to add a new word or definition will show(figure 3.7). You can select category, add an image, audio comment, web link and save your new word or definition. This is the core of the application. The backbone. By contributing in the form of editing existing definitions or adding new ones, you are supporting the collaborative learning community that Lingobee is.

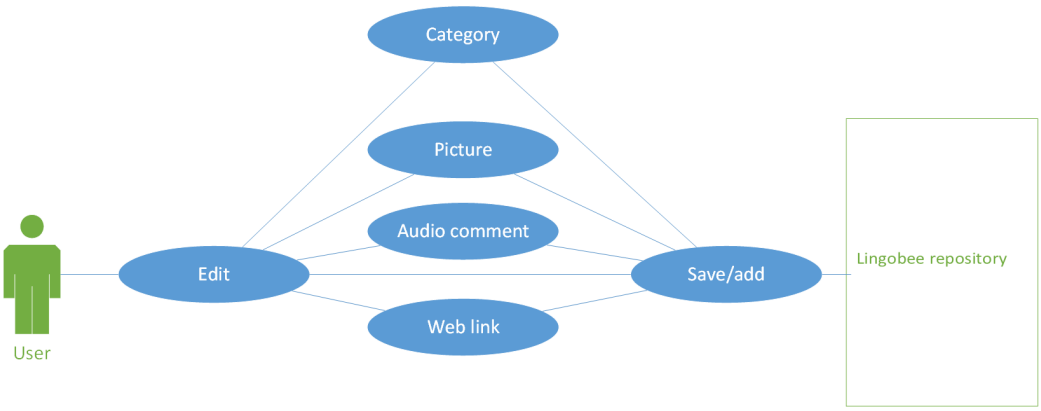


Figure 3.6: Overview of Lingobees edit functionality

Figure 3.7: Lingobees edit and add functionality

3.2 Collaborative learning and contributions

Virtual communities have evolved at the same pace as the growth in computer networking since the first Usenet news sharing programs saw the light of day in 1979, and people choose to share news, information, media, social support and more with each other through these online channels [7]. We benefit from the presence and activity of other people in online communities when we contribute with information and other resources to the conversations we participate in [8]. But despite the increased use of this type of communication, many of these communities tend to fail. There may be many people participating, but only a few contribute to it [9]. Under-contribution is a problem even for the communities that have regular traffic and activity, and much of the contributions is created by only a few percent of the users [10].

But how do we overcome the problem of under contributions?

Participation inequality is a problem you can't overcome completely. There will always exist *lurkers*[1] in online communities. But there are ways to try to equalize the participation curve. Several other services and companies have

[1] A member of an online community who observes, but does not actively participate.

tried different tactics. Some of them are:

- Making it easier to contribute. Netflix[2] and many other online streaming sites lets users rate movies with a star instead of writing a natural language review.
- Let the users edit and not necessarily create from scratch. Let them build their contributions upon others by modifying existing entries, or as simple as modifying templates. This is for many users much more enticing than presenting them with a blank page and making them contribute.
- Rewarding the users for their contributions. The reward does not have to be a physical object, but can be something digital. Reward them with something that encourages them to keep up what they are doing, and ignites the spark thats needed for others to follow in their foot steps and start contributing also.
- Promote them who contributes regularly. This can be done with reputation ranking, leaderboard and user statuses. Give those who create good contributions something back for their time, and show them that what they do is beneficial for others.

Lingobee is an application based on the idea of crowdsourcing. This means the system, or community that Lingobee is, depends on the contributions coming from the users. Lingobee also bases itself on the concept of collaborative learning which is a situation were two or more people learn, or try to learn something together. This is a very broad definition and can be interpreted in different ways [11].

- By "two or more", it can be interpreted as a pair, a small group, a class, a community, a society, and all intermediate levels.
- "Learn something" can be as simple as follow a course, study course material, perform learning activities such as problem solving, or maybe learn from lifelong practice.
- "Together" can be interpreted as face-to-face or computer mediated, synchronous or not, frequent in time or not, whether it is a truly joint effort or whether the labor is divided in a systematic way.

[2]Http://www.netflix.com, American provider of on-demand Internet streaming media.

So if we say that Lingobee is a collaborative learning application, this can be defined as an application where a community perform learning activities such as sharing knowledge through a computer system. The users of the application learn from the contributions, being either your own or other users entries. This means that if you as an user contributes with a post, other users have the possibility to explore this post, rate it, flag it, favor it or add a new definition of the post. The users act as a community and learn something together and the community must therefore contribute for it to have any use.

3.3 Games and gamification

Gamification can be described as using game-based *mechanics* and *dynamics* in a non-game environment to give it a game-like context [12]. Gamification has become more and more popular in use amongst consumer-oriented applications and services online. The primary purpose behind implementation of gamification attributes in any type of service or scenario is to increase the audience engagement, loyalty and perceived enjoyment. It engages the user, encourages desired user behavior and gives them the greater sense of reward for using that particular service. But to understand what gamification really is, we first have to understand where the concept as it is used today came from. What is a game?

Katie Salen and Eric Zimmerman has an interesting description of a game;

> "A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" [13].

But what does this mean? What is a system, and who are the players? The answers will be different from what game you are playing, this can either be a digital games, or a game in real life. But the basics is still there, that you are playing within a system where you as the user are the player, and you follow defined rules trying to solve the given conflict which can be finding all of your friends in a game of hide-and-seek, and if you find everyone it results in the opportunity to be the one to hide the next round. But this description also won't fit in certain games. There exists adventure game, simulation games, and several more genre where there are no conflict and no quantifiable outcome. Taking The Sims as example, which is a casual life simulation

game, winning or losing is not an option. A more suited definition may be that a game is a form of play with goals and structure [14]. This leaves room for the user/player to make choices between various options throughout the game, and each choice will bring the user closer to the set goals. The goals may be uncertain, but will work as a motivational factor [15]. Having a well structured game will make you feel in control, but you are in fact choosing the path that goes in the right direction as well. But why look toward games?

A simple answer can be; Games are designed to motivate! They can be entertaining, educational, joyful and an experience in itself. But not everyone is looking to be entertained when playing certain games. What some experience as a fun simulation may be a deadly serious lesson for others. For example doctors and army officers use certain games to learn the best way to approach an upcoming surgery or practice the best strategy choice during simulated battle situations [3]. These types of games is called serious games [16].They can be described as an experience, designed using game mechanics and game thinking to educate individuals in a specific content domain. Or breaking it down to the simplest you can say that serious games are games that do not have entertainment, enjoyment or fun as their *primary* purpose. But that doesn't mean that games under the genre serious games are not entertaining, enjoyable or fun [13]. The concept of serious games is often used to promote leadership, sale techniques and other business topics, but it is also used in the issue of utilizing the beneficial properties of games for educational purposes, and is done by mimicking normal games and replacing the game content with something educational.

But the games that are fun for the users are certainly a tremendous motivational factor. And that is why it has long been sought out by man to use games as inspiration during certain scenarios. How many of us haven't done chores for our parents while they time us, or cleaned our rooms to get permission to go outside or receive some other *reward*. These are examples of how game elements can, and for most of us have been used in some part of our lives. So by breaking down activities and processes, then creating systems, rules, artificial conflicts and quantifiable outcomes, you can experience the concept of gamification. Many of us remember the gold stars from early elementary school, given to us if we did our homework on time, and the person with the most stars at the end of the week or month, won a simple price. This is called *fixed action rewards*, which is often used as a gamifica-

tion attribute and engages the students into studying, doing their homework and motivates them to continue reaching for other goals.

So why try to gamify a system that works? Will it have a negative or positive impact on the system? Video games have had a big increase in popularity the last few decades, and has become ubiquitous. The demographics of gamers is spread across all ages and sex, and there is a growing appreciation that games demonstrably motivate users to engage with them using unparalleled intensity and duration, and by that you can draw the conclusion that game elements should be able to make other, non-game products and contexts more enjoyable and engaging [17]. Systems can always be improved in some way.

Gamification is a rather new concept, but have already received very warm welcome by many giants in the computer industries such as Google, Groupon, Adobe, FourSquare, etc. They have used it within their sites to better engage their loyal customers, and to try to attract new ones [18].

3.3.1 Gamification design

Games are designed for success otherwise they wouldn't be played. They activate *intrinsic motivation* by offering the user clear goals combined with a varied feedback system. Challenges need uncertain, but not unreachable goals [19]. There exists several frameworks [20] for the use of gamification in computer systems, and they all have different areas of effect. Social medias like we know it today, can be set under the framework for *social pressure*, where the typical mechanics used is friend invites, bragging, touting, group quests and many more. For gamifying a collaborative learning application, the more fitting framework would be *accomplishments*, which typical contains mechanics like [20]:

- Points - A running numerical value given for an action or combination of actions.
- Badges - Often called achievements, are a virtual or physical representation of having accomplished something.
- Fixed Action Rewards - Users complete a certain task, and get the exact reward that they want or expect when they complete it.

- Leaderboard - Overview of the top users within a system.
- Progress Bar - A dynamic in which success is granularly displayed and measured through the process of completing itemized tasks.
- LevelUp symphony - A symphony which focuses on the user reaching a milestone/leveling up.

But if we take a game as an example, for it to be effective it must be motivating, addictive and provide encouragement through very short-term goals. If these terms are met, the player can fail and try again until they succeed without getting the discouraging feeling of failing. In the design of creating an application with gamification attributes to support language learning, there are three things one should try to achieve [4]:

1. Increase the users engagement and motivation.
2. Enhance content understanding and learning.
3. Increase the contribution to the application and the use of it.

When creating a gamification design one should also take three basic properties in consideration. The design should have a meaning for the user, it should have the ability to inspire him/her to master the topic and it should be autonomous [21]. By doing this you are providing the user with a free choice and guide the focus towards accomplishments and not the feeling of forcing it upon them [3].

3.4 Game mechanics

Game mechanics are the elements of games which is used to improve the experience of playing. They are the attributes that provides motivation and engagement within that given game. A game may consist of several game mechanics, and a game mechanic may be a part of many games. In MMORPG, a type of game which allows people to play the game's evolving virtual world at the same time via the Internet, the game mechanic of trading is widely used, were during the game the players have the possibility to trade game items with each others. This is only one of many game mechanics, and Gamification.org [3] lists as many as 24 different game mechanics used during the

[3] http://gamification.org/

design of games. But game mechanics such as reward schedules and reduced reward attributes are in itself just forms of operant conditioning. The individual, namely the user, modifies its own active behavior due to the association of the behavior with a consequence or stimulus [22]. This might be one of the explanation why some games or systems that uses game mechanics based on reward systems are really addictive. Even though people don't get an electric shock if they don't do a specific task in a certain amount of time, like rats during a behavioral experiment, something virtual can be taken from you. If this is an important piece of a game, like crops in Farmville[4], you as the player will be kept engaged in the game or system. Game mechanics can through the view of behavioral psychology be viewed as the different systems used to reinforce user behavior. They help the users work towards a goal, or completing challenges. And by this seeing the progress and feeling the accomplishment of reaching it [23].

So, by establishing that game mechanics are elements that makes games fun and enables them to motivate users over time, how can it be adapted to be used in a collaborative language learning application? The same behavioral concept as games applies to these communities. They need users to keep contributing or the system will falter and eventually die out [24]. As stated above there exists many game mechanics, but some are not meant to function in this type of system [25]. To give a better understanding of different game mechanics, we can describe the most widely used ones, which can also be used as gamification attributes in the development of the prototype.

3.4.1 Points

Points is the most important attribute in gamifying a non-game context [12]. Users are rewarded with points after performing the different actions that the application or context offers, or performing a combination of actions. This attribute has taken its step out from games and are being used in social networks, forums, and many other environments now a day. Using the social news and entertainment website Reddit [5] which bases itself on the users contributions as an example, users contribute with content in form of links or text posts. The content score starts at zero points, and the other

[4]FarmVille is a farming simulation social network game developed by Zynga in 2009
[5]http://www.reddit.com

users may then vote the content either *up* or *down* to rank the post and determine its position on the site. This engages people to contribute with content that may be of interest for the other users, and they strive to keep their link and comment *karma*[6] at a positive side. While the users striving for perfected posts, the other ones sit at home and act like judges by voting on the contributed posts. This engages them by being the element that keeps the site updated with posts that the majority of users wants to see.

Leaderboard

When introducing points to an application or a site, one also has the option to implement a leaderboard. This is an attribute that can have both a positive and negative impact when used as a motivational factor. Taken a community with ten thousand users as an example, where you are ranked as second to last since your contributions always gets voted down, you will find further contributions discouraging. But by introducing only the top list of users with points, the motivation towards further contributions may increase. So this is a game attribute that may easily be misused, but when used right, it can transform a boring experience into a tense competition. This attribute does not have to focus on showing the top contributors or users, but can e.g show the best rated post by the users.

3.4.2 Achievements / Badges

Achievements, or in some environments also called badges, emblems or ribbons, are virtual or physical representation of having accomplished something [26]. In the context of online social media, badges can be seen as *virtual goods*. They are provided to the users after having performed a particular set of actions, and does not have to be serious or individual. Getting achievements can be easy, difficult, surprising and funny. In most environments they are used to give the users an opportunity to *brag* of what they have accomplished so far, and add challenge to the environment as well as character. These achievements are mostly locked until a series of tasks has been performed, and when they are unlocked, many sites or games gives you the opportunity to share the achievement or tell people about what you have accomplished via your social network of choice.

[6]Points which reflects how much the user has done contributed to the community that the users perceived as useful.

3.4.3 Levels / User status

Levels can be seen upon as a system by which players are rewarded an increasing value for a cumulation of points. In many games, different attributes and/or abilities are unlocked as players continue to level up, and therefore become more powerful. Levels are also used to divide games into smaller stages, and can by that increase the difficulty slowly. By doing this, it will keep the user engaged and motivated by making the progression natural and provides the user with milestones to reach for. The thought of getting to the next level is often a strong motivator.

3.5 Motivation

Motivation can be described as the processes that can arouse and instigate behavior, give direction and purpose to behavior, continue to allow behavior to persist, and lead to choosing or preferring a particular behavior. So by asking a question; How do we get Lingobee users to contribute with new posts, or comment on existing ones?, we address the issues of motivation [27].

The typical starting point for motivation theory, are the *physiological* needs. These needs can be divided into two groups; the development of the concept of homeostasis, which refers to the body's automatic efforts to maintain a constant normal state of the blood stream, and the finding that appetites, which refers to giving our body what the body needs. So if we lack some sort of chemical, we will develop a specific appetite or partial hunger for a food element that contains this chemical. The key word to this will therefore be, dopamine [28].

Dopamine is the chemical signal that gets passed from one neuron to the next. It is these cells that light up in your brain when something nice in your life happens, or something that you have linked with a nice experience throughout your life. For example the microwave timer beep to tell you your popcorn for the movie is finished on a Friday afternoon. So in short, dopamine clues you in ahead of time that something good is in the vicinity. But the real key is that while dopamine neurons fire when the microwave beeper goes off, or in computer games where you finish a boss and pick up the weapons or items he dropped so you can either use or trade them, these

cells really react when an unexpected, unpredicted rush of dopamine shows up. They will then provide you with an even bigger rush. So in video games it will be like finding these sword or items out in the middle of nowhere, or getting unexpected popcorn when coming home from work. So dopamine can be seen as the brains version of a carrot. The more you achieve, the more dopamine gets released, and you stay motivated [29]. Gamifying Lingobee will therefore also be an attempt to tap into this by introducing game mechanics and linking the act of contributions with something nice and intriguing.

So using Lingobee as an example the pattern of motivation when contributing can be broken down to five different stages:

- The user needs the capacity to act (energy)
- Make a choice (volition)
- Going after a certain purpose (direction)
- Continuing with this purpose(involvement)
- Finishing the contribution (completion).

So in this manner, an user has to start the application, decide on a word or phrase to add or edit, read or practice on already existing words or phrases, and complete the process which he started on. The problem here might be that the application are not giving the user the motivation to select a word to practice on, or maybe contribute with a word or phrase. There are no specified goals with the application other than learning new words or phrases, and therefore not enough factors that motivates the user for further contributions and use. So how can gamification motivate user of Lingobee to keep contributing?

Gamification only works when it motivates the user to do something or reach a set goal. There exists lots of theories from different scientists and psychologist about what motivates us, but it can be broken down into three basic elements [30].

- Autonomy - Motivation is gained when you feel like you are in charge, and therefore tend to stick to your set goals for a longer period of time.

- Value - When you value a certain subject, and you feel that a goal is important, you gain motivation.
- Competence - The better you are at something, the more likely it is you will continue doing it. The same goes for when hard work is the way to reach a goal instead of some innate talent.

These points helps to understand how gamification is the factor that helps to engage our innate motivations. The next thing we need to know is how motivation is triggered during any learning event. This can be summarized in three critical periods, which motivation strategies will have an impact on the users motivation [31]

1. Beginning - when the person enters and starts the learning process
2. During - when the person is involved in the body or main content of the learning process
3. Ending - when the person is finishing or completing the learning process.

So the key to gamifying Lingobee comes down to combining these elements of how motivation works, and how motivation is triggered through any learning process [32] [31].

During these periods, there are general motivational factors that needs to be addressed to motivate the person. At the beginning, the person often have an attitude toward the general learning environment, which includes the subject matter, and their basic needs within the time of learning. So when creating an application that will take these factors under consideration, it should focus on meaningful accomplishments, a sense of discovery and incorporate visually pleasing elements [33]. By doing this it will give the user a positive impression and engage him/her to use it again. But what is it that engages this person and makes him/her to come back for more? By providing them with a goal, and presents them with accomplished milestones along the way, you will show them that they are actually going forward with what they are doing. So by presenting them with e.g badges, it will inspire them to work towards goals. It will work as a self-affirmation symbol, as well as allow that person to identify themselves with other people that are working towards the same goal [34]. And in the end of the learning period, the competence value

for the person that is a result of the learning behavior, and the reinforcement value attached to the learning experience for the person.

Badges and leaderboards will allow users to view what they have accomplished compared to others in the same community, and motivate them by introducing *implicit competition* amongst them. This system must be carefully designed so there is no focus on the ones that have not achieved as much as some have, or maybe haven't achieved anything at all.

3.6 Introducing competition

Humans are naturally competitive. It is a basic instinct, deeply rooted in our evolutionary heritage. It is one of the most basic functions of nature, and occurs naturally between living organisms which co-exists in the same environment [35]. Hormonal changes happens in our body while competing, winning, or just psyching up before a competition [36]. We compete for resources in the forms of jobs, academical grades, and basically status in todays society. But not everything is made out to be a competition where the winner takes it all. Most of us meet competition in one form or another throughout our day. Maybe you hope you get more likes on your contributions to your social media of choice, or just try to keep up your reputation. You strive with an activity in order to attain a certain outcome. This activity does not need to be intrinsically motivated. This extrinsic motivation comes from outside of the individual. Common extrinsic motivations can be money or grades for showing a desired behavior. And that is what competition is to us humans, an extrinsic motivator. It encourages the performer to win and to strive to be better than others, and not just simply enjoy the intrinsic rewards from the activity. Standing on the podium after becoming world champion within a sport, and hearing the crowd cheering for you, that is an extrinsic incentive [37]. It engages you and motivates you. But how can we use this within the application without misusing it? Most of us don't like to be dead last in a competition, and have it broadcasted on leaderboards. This is the type of misuse, or demotivating factors that need to be avoided when introducing competition within the application. The key word is therefore to introduce implicit competition.

Implicit competition is something most of us meet daily. We don't have

to win something materialistic, other than the feeling of being better than someone else. We strive to get better grades than our classmates, more recognition from our bosses, bigger sales than our co-workers, and lately in the new technology era, some of us try to achieve more *up-vote* points than others on contributions made to social network sites. This is one of the factors which makes new things fun to learn and use [38]. So by taking a computer game as an example, it must provide a goal whose attainment is uncertain. These goals are one of the backbones of computer games, and without them, there will be no motivational factors to keep us moving forward. But the presented goals must neither be too easy or too hard to reach, so by that not reward the users to often.

So by introducing implicit competition to educational environments, peoples motivation will improve because they may want to be better than everyone else, or just improve their own skills of choice, thus introducing a purpose and goal. Competition is considered to be an effective way to motivate people to want to learn more [39], but there is a fine line between improving their motivation, and breaking it down by sharing their *losses*. Introducing leaderboard and user status in the application, and showing of the top users will keep those who are contributing motivated, but at the same time not removing the motivation from those who are at the bottom of the list. And by showing the users that their user status are changing after a certain amount of contributions will keep up the competition against yourself and therefore providing both intrinsic and extrinsic motivation with the application [40].

3.6.1 Colors that motivate?

Color is a fundamental aspect of human perception. It affects us on a deeper level than we know and is not something that we think about when encountering e.g facebooks[7] blue site and logo. A large amount of research has been done in this domain, but the psychological processes through which colors operates has not been explored fully. Most research examining this topic has focused on two of the the three primary colors, red versus blue (or green). Some reports have proposed that red enhances cognitive task performance as compared with blue or green, and some have shown the opposite [41] [42]. But that doesn't dismiss the fact that some colors are associated with cer-

[7] http://www.facebook.com

tain elements and situations. Many of us associate red with dangers and mistakes, and some claims have been made that the color red is also linked to the highest level av hazard [43]. The proposed is that these different associations related to red versus blue color can induce alternative motivations, e.g red because of its association with dangers and mistakes, should activate and avoidance motivation. Blue is usually associated with openness, peace and tranquility, and therefore it will likely activate and approach motivation. This is aspects that is carefully considered when creating websites, logos, and general services today. The colors of the office is painted with colors that motivate and therefore implicit engages us to do our best. These color schemes must be considered when creating the badges and the general design for the application.

3.7 State of the art

This section presents online services and applications that bases itself on the users contributions, online communities, or services which have implemented gamification attributes. In order to create a prototype with gamification attributes, existing solutions and similar systems have been checked into to see what attributes that are mostly used with success, and are most popular. Some had problems with under contributions and lurkers, but after gamifying their services they had an increase in engagement and motivation.

3.7.1 Duolingo

Duolingo is a free language-learning and crowd-sourced text translation platform. They have implemented game mechanics in such a way that users gain *skill* points as they learn a language, e.g when they complete a lesson. The users can gain up to a specified amount of points for each lesson, and must retry the lesson if they don't make it. Duolingo also incorporate game mechanics such as unlocking skills, achievements and leaderboards.

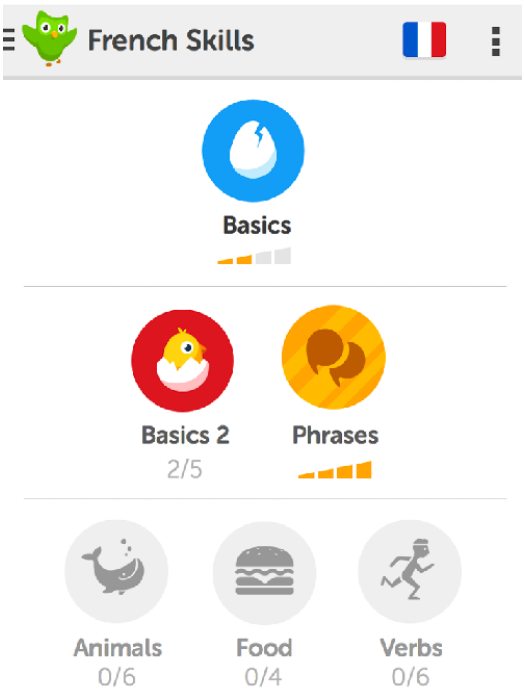


Figure 3.8: Overview of some badges in Duolingo

3.7.2 Codeacademy

Codeacademy[8] is an interactive platform that offers free classes in six different programming languages. The service was launched in 2011, and was originally bases on coding in JavaScript. It is designed to help users learn how to program via simple step by step exercises. These languages includes Python, PHP, jQuery, JavaScript and Ruby. The markup languages HTML and CSS can also be thought. You go through different types of exercises by reading a problem description, and answers with the selected language. Each user has their own profile, and to motivate users to continue to participate, the site has used the gamification attribute of offering badges for completing exercises(see figure 3.9). The user can also choose to share any achieved badge with friends via social media like twitter and facebook.

[8]http://http://www.codecademy.com/

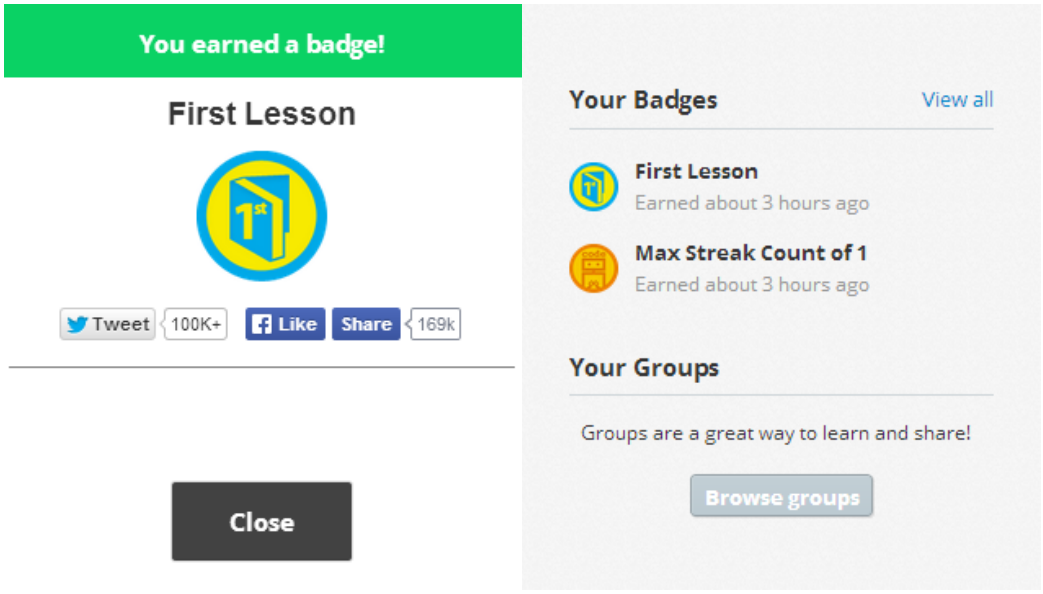


Figure 3.9: Badges in Codeacademy

3.7.3 DevHub

DevHub is a web portal that lets users create their own blogs and web sites in a very easy way. They originally did well when they launched in February 2009, but there was a lot of competition on the market then, and only about 10 percent of the users finished building their sites. After the chief executive was introduced to gamification, they used three months to revamp the site, figuring out ways to give users points, coins and badges. They re-launched in July with many new gamification attributes, e.g rewarding the users with badges and making them compete over prices. The amount of users finishing their sites was now stunning 90 percent [44].

3.7.4 Zondle

Zondle is a game based learning web platform. They focus on delivering a learning environment based on games for small kids. The content is delivered in the form of questions and quizzes so this also helps the teachers to track their students progress, see what their strength and weaknesses are, and can therefor make a more personalized learning environment for them. Playing Zondle games motivates students to practice, review, revise and memorise,

and therefor create a secure foundation which they can build their learning.

3.7.5 Stack Overflow

Stack Overflow[9] is a privately held website. It features questions and answers on a wide range of topics in computer programming. It was created in 2008 as a more open alternative to earlier Q&A sites about programming. The website serves as a platform for user to ask any questions the have about programming. Users then answer other users questions, and through membership these answers can be voted up or down depending on how good the answer is. The can earn reputation points and badges for their actions within the site and their contributions.

3.7.6 Wikipedia

Wikipedia is a wiki based encyclopedia which means it is a web application which allows people to add, modify or delete content in collaboration with others. It works as a type of content management system. Users can add information about what ever they want, and if it already exists, they can contribute with changes or new facts. Wikipeida uses Barnstars, which can be seen as a fixed action reward to the contributors, or for some, an achievement/badge.

3.7.7 Popular attributes

The common denominator of the reviewed services, are that their goals is to be educational, and / or the system is based on contributions by the users. They have all used some game mechanics in order to engage their users, and the most common one is the use of points. But some of the game mechanics are more popular than others, and in table 3.1 the above mentioned services and popular sites most of us have visited at least one time in our lives are listed together with some of the game mechanics they have implemented to increase their success, and to keep their users motivated and engaged in their services. This is done to show that gamification is not only used by educational services or systems that need a general make-over, but are actually more common than we think.

[9] http://stackoverflow.com/

Site/service	Points	Badges	Levels / Unlocking	User status	Leaderboards
Duolingo	X	X	X	X	
Codeacademy	X	X		X	
DevHub	X	X	X		
Zondle	X	X		X	X
Stack Overflow	X		X	X	X
Wikipedia		X		X	X
Imgur.com	X	X		X	X
Foursquare	X	X			X
Ebay.com	X		X	X	

Table 3.1: List of popular game mechanics used by popular sites and services

Chapter 4

Application design

Based on the literature review in the previous chapter, design choices made about the gamification application are explained in this chapter. These choices were decided to be the best ones suited to be able to achieve results from an user evaluation that could answer the research questions stated in chapter 1.

4.1 General description of the application

The design approach to this prototype is inspired by the basics of gamification and the game mechanics covered in chapter 3 section 3.4. The goal is to engage and motivate the users of Lingobee, and keep them motivated by introducing implicit competition and motivational factors through game mechanics.

Since Lingobee is a collaborative language learning application, contributions by users should be fun and self-driven, and are therefore in line with the philosophy of gamification. An API that specified how Lingobee interact with its server was provided by the creators of Lingobee, together with a private developers key, so everything in the repository was of free access for retrieving. By pulling the information needed for the application, and storing them in a local database on the users device, the functional requirements could be met for creating the prototype. Since the application works together with the existing repository of Lingobee, previous user are also able to use

the gamified application by entering their Lingobee user name and password. The chosen name for the application is *Contribution Achievements*.

4.2 Chosen game mechanics

The chosen game mechanics implemented for the application are the ones which successfully can be implemented with the provided API and Lingobees existing repository and architecture. These game mechanics are some of the more popular ones used in different sites and services today. One of the choices that has to be made when gamifying a system or service, is to choose a game type / game environment for the implementation. This is the factor that will drive the following elements forward. For this application, the choice fell on an implicit competition based environment. The main purpose is not to drive the users to directly compete with each other, but be introduced implicit to a competitive environment and therefore set personal goals that motivates and drives them for further use and contributions.

4.2.1 Points

As previously stated, points are one of the most important feature in gamifying a non-game context. In Lingobee, users has to provide content for the system not to stagnate and falter. This content can consist of different elements, but a minimum requirements is text and which category the post belongs in. Points for the different types of contributions and attachments are given, and summed up to a total score. This total score are used to implement a leaderboard, and user status / levels.

4.2.2 Leaderboard

By introducing a sorted list over the contributors in Lingobee and displaying your own ranking, the users are introduced to the competition factor of the application. The list only shows the top contributors, so if an user can't find his own name on that list, it is displayed in the screen with his own personal statistics. By designing the leaderboard like this, the users of the application does not feel exposed if they are lurkers, and by that don't get the feeling of discouragement towards trying or continuing contributing to Lingobee. The amount of users that are displayed on the list is set to ten.

Since this is a prototype, and the calculation of points is based on a fairly simple algorithm, small margins between the different users scores occurs, and therefore as much as ten people provides the users with some insight in how many points and how many users that are in front of them.

4.2.3 User status / Levels

The user status / levels (herein referred to as *user status*) works as a personal motivational factor, as it sets a personal goal to try to achieve the next status. It is implemented to show them that their contributions count for something, and that you are contributing not only for yourself, but for others also. It is the first game mechanic that is presented to the users, and to be able to view the leaderboard, the users must unlock the second user status by contributing with one post. This limit is fairly low, but done because of the time limit of the user evaluation period, and is easily changed. This works as an unlocking feature, which is widely used in computer games now a days. The user status is only available to the current user, and can not be viewed by others. The different statuses are portrayed by an image, which symbolizes your current status in a materialistic way.

4.2.4 Badges

Badges are given to the users to award them for using the different functionalities Lingobee has to offer. It is an important issue to understand the different roles played by intrinsic and extrinsic motivation, and the designing of a successfull reward system is complex. The completion achievements for performance or non-performance creates extrinsic motivation, and should therefore be used sparingly. If this system is overused, it can reduce the intrinsic motivation. This feature is also based on the points system. So when an user contributes with five posts and attach images to every post, he receives a badge for posting his fifth post and using the image attachment functionality five times. The amount of points for achieving the different badges are set lower than it should be. This is done to evaluate this feature, and therefore a necessity for the users to receive a badge as early as possible in the evaluation period.

4.3 Design guidelines

There are different design guidelines when creating an application that should be followed for the system to be as usable as possible.

4.3.1 What is a prototype

A prototype in the context of application development, is an initial version of a suggested software system. It is used to demonstrate concepts, try out design options, and find out more about the problem and its possible solutions [45]. You can divide prototypes into two different types [46].

1. A horizontal prototype gives us a broad overview of the system as a whole, or parts of a system, without focusing on any types of functionalities.

2. A vertical prototype is considered a more complete model of a specific function or a module, and therefore will contain the functionality that is intended with the system.

There are several different variants of prototyping in the context of application development, but these are in some way based on the two major types: Throwaway prototyping and evolutionary prototyping. The basics of throwaway prototyping is that for some projects it is important to develop prototypes to be able to explore different design ideas, and therefor this needs to be done fast. The prototypes are developed, often as paper sketches, explored, evaluated and then thrown away. Evolutionary prototypes is based on developing a robust prototype which can be further developed into a finished product. They are developed in an iterative process, and an initial version of the prototype will often contain the core functionality. This initial prototype is then tested by intended end-user to retrieve feedback for the evaluation. The prototype will then be redesigned if needed, and more functionality can be added. This process goes on and on until a finished and functional product is ready.

4.3.2 Usability

Usability is often described as the *ease-of-use* or *user-friendliness* of a system. These definitions can be of great help when designing and evaluate

new software where the users are in direct contact of many of the softwares functions. Nielsen [47] defines usability in terms of five quality attributes:

- Learnability - How fast an user can go from not knowing the system to perform some tasks.
- Efficiency - When the user is familiar with the system, he can attain a high level of productivity.
- Memorability - Infrequent users can return from a period of inactivity without having to learn how to use the system all over again.
- Errors - Prevent the user to make errors, and if an error occur, they are easily to recover from.
- Satisfaction - Satisfy the user subjectively, so he likes to use the system.

Usability design and the development process

Perfect user interfaces are not achieved in the first attempt. Perfection comes from design iterations, and developers should be using methods that support the concept of iteration.There are many different ways on how to organize and manage software development projects and their processes. Since there was no source code available for Lingobee, and the decision fell on making a side module, the choice for development methodology fell on Agile.

The term agile software development, or by some called agile programming, denotes a group of methodologies that approach iterative and incremental software development. This methodology was chosen mostly because it provides the chance to adapt to new requirements based on feedback from testing of the application. Retrieving information, storing them and doing the required calculation came out different than first expected and planned since doing the right API calls to get the correct information takes much more time than first planned. Therefore the information flow had to be rethought and redesigned. By choosing Agile development, this was possible without any great loss of time, and enabled me to make new decisions later in the project.

Early in the development process, the application was presented to two co-students for some early design feedback. Choosing Agile development gave me the chance to discard early design choices at no cost based upon this

feedback. Changes that had to be made was fed into a simple backlog(table 4.1) that was created to keep track over the functionality that needed to be implemented[1]. Being alone with this project made me have full control over everything that was going to be developed, so a more elaborate agile software development methodology e.g SCRUM would have been wasteful. Instead, the choice fell on Extreme Programming (XP) as development approach. It focuses frequent *releases* of the application in short development cycles to improve productivity. Other typical elements include avoiding programming of features until they are actually needed, flat management structure, simplicity, and clarity in code [48]. The application was then build up from the first screen which is presented to the user, and continued with expanding in screen amounts and the functionality needed. By doing it like this, the chances to discard functionality that would be to slow, or not work, was of no great loss, and the work could continue.

ID	**What**	**Category**	**Bug ID**	**Done**
1	GetWord functionality	Connection / query	-	X
2	Query functionality	Connection / query	-	X
3	Repository connection controller	Connection	-	X
4	GetWord functionality	Connection / query	-	X

Table 4.1: Backlog table example.

User Interface Design

Jakob Nielsen has developed ten heuristics for designing good user interface [49]. They are called *heuristics* because they are not strict rules, but can more be seen as general principles that can be used as a rule of thumb during development [49]. These heuristics are:

- Visibility of system status - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

[1]Backlog is attached as a PDF file.

- Match between system and the real world - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

- User control and freedom - Users often choose system functions by mistake and will need a clearly marked *emergency exit* to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

- Consistency and standards - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

- Error prevention - Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

- Recognition rather than recall - Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

- Flexibility and efficiency of use - Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

- Aesthetic and minimalist design - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

- Help users recognize, diagnose, and recover from errors - Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

- Help and documentation - Even though it is better if the system can be used without documentation, it may be necessary to provide help

and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

These heuristics have been used as guidelines during the development of the application and when updating the user interface after feedback from early testing.

4.4 Development tools

This section explains which technologies was used to implement the prototype. Since my solution is a side module for Lingobee, it was a natural choice to create a native application for the android platform since Lingobee is built on this. The application is mainly intended to be displayed on mobile phones, and therefore no focus on layout for tablet devices was given during the development. The use of layout types that will dynamically scale according to the devices screen size are applied for best user experience on mobile devices.

4.4.1 Eclipse and ADT plugin

Eclipse [50] is a free and open-source IDE. It is very flexible and Google has developed a plug-in for it called Android development tools. This plug-in makes the process of creating applications for the Android platform much easier by providing easy access to many of the Android SDK tools. For example easy access to using your mobile device as emulator when testing the application. By doing this you also get the possibility to view the log output from the device which makes the process of debugging the application much faster and easier.

4.4.2 Adobe Photoshop

Adobe Photoshop is an advanced graphic editing program. It was used to draw the different types of achievements/badges which can be achieved during continuous use and contribution to the application. It provides the tools to create high quality images, and the ability to scale them down or up to the desired size. Sketches are drawn with the digital drawing tool Wacom Graphire in Adobe Flash for smooth and rounded edges, imported to Adobe Photoshop and then edited and finished to achieve the desired look.

4.4.3 Visio 2013

Microsoft Visio is a diagramming and vector graphics application which makes the process of creating flowcharts and diagrams easier. The diagrams which outputs from this software are simple in design, follows standard UML notation and therefore easy to understand.

4.4.4 Google Analytics

Google analytics is a free service from Google used to generate detailed statistics about web sites, videos, applications and many more. It is mainly directed towards marked research, but is implemented in the application to observe which screens are used the most, and get statistics about how much the application is used during the user evaluation.

Chapter 5

Application implementation

This chapter describes how the prototype *Contribution Achievements* was implemented, its architecture and the final solution. Since the application is a side module for Lingobee, connection to its repository is necessary, and the information flow process between the repository and Contribution Achievements is also explained.

5.1 Functional requirements

Table 5.1 shows the functional requirements of the application. These requirements were decided based on an analysis of the chosen game mechanics that were to be implemented. This is why the importance of most of them is set to *high*.

ID	Priority	Use case	Description
FR1	High	4	Log in with account from Lingobee
FR2	High	1	View personal points/statistics
FR3	High	2	View top 10 users
FR4	High	3	View statistics about the top 10 users
FR5	High	1	View personal achievements for contributions
FR6	Medium	3	View top 10 users personal achievements for contributions
FR7	Medium	4	Remember password on login
FR8	Medium	None	Log out

Table 5.1: Functional requirements

5.1.1 Non-functional requirements

User friendliness

Contribution Achievements is mainly intended to be used by people with normal technical insight, hence it is important to make an application that is easy to use and self explainable. The interface should be as clean and minimalistic as possible, and the buttons should be as self-explanatory as possible.

Local storage or external storage

As Contribution Achievements is implemented as an android application, all of the data are stored on the mobile device. When the user logs in, the application checks for updates on Lingobees server. If there are any updates in the repository, it pulls these and stores them in a local database on the device. This is not the most optimal solution, but since the Lingobee API does not have the functionality needed to pull the correct information about every user from the repository, it is crucial that the information that is retrieved is done calculation upon as fast as possible, therefore local storage is chosen. This will also entail the security aspect of storing the password on the phone, since manipulating the database on the phone is simple and fast.

5.2 Architecture

The system is divided into two main components:

- Contribution Achievements with the gamification features
- The original Lingobee application with its repository

Contribution Achievements does not interact directly with the Lingobee application, but uses the methods provided by the API to retrieve the information needed from the Lingobee repository to function properly.

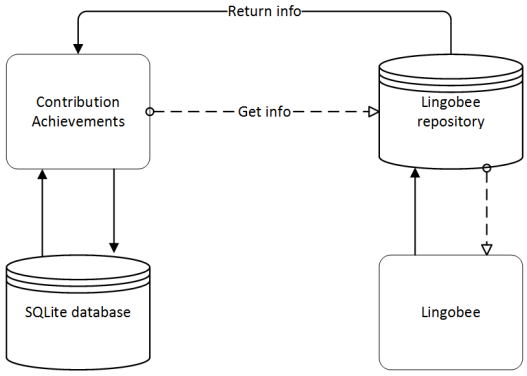


Figure 5.1: Architecture for the implemented solution

5.2.1 Information flow

The basic sequence for retrieving the necessary information needed to calculate the different points is simple, but not efficient. This is because the Lingobee API does not contain the most efficient methods for retrieving the information needed for every calculation.

Figure 5.2 shows that an user wants to view the statistics feature, this be either his/hers or maybe another users statistics. The application then gen-

erate a HTTP Post query[1] for the Lingobee repository with the method GetWordList. This method will then answer with every word associated with the users user group. The application then saves the wordlist for further use in the local database. Then it is necessary to loop through this list with words, using the now obtained wordID from every word in the list as a parameter on a new query against the repository. This provides the application with all the needed information about every word in the current users user group. This information needs to be stored in the local database, and done some calculation on before it is ready to be shown to the user. This process is done only one time when the user logs in to Contribution Achievements, and is the applications bottle neck when it comes to loading time.

[1]POST is the request method used by the Lingobee server, and is one of many request methods supported by the HTTP protocol used by the World Wide Web.

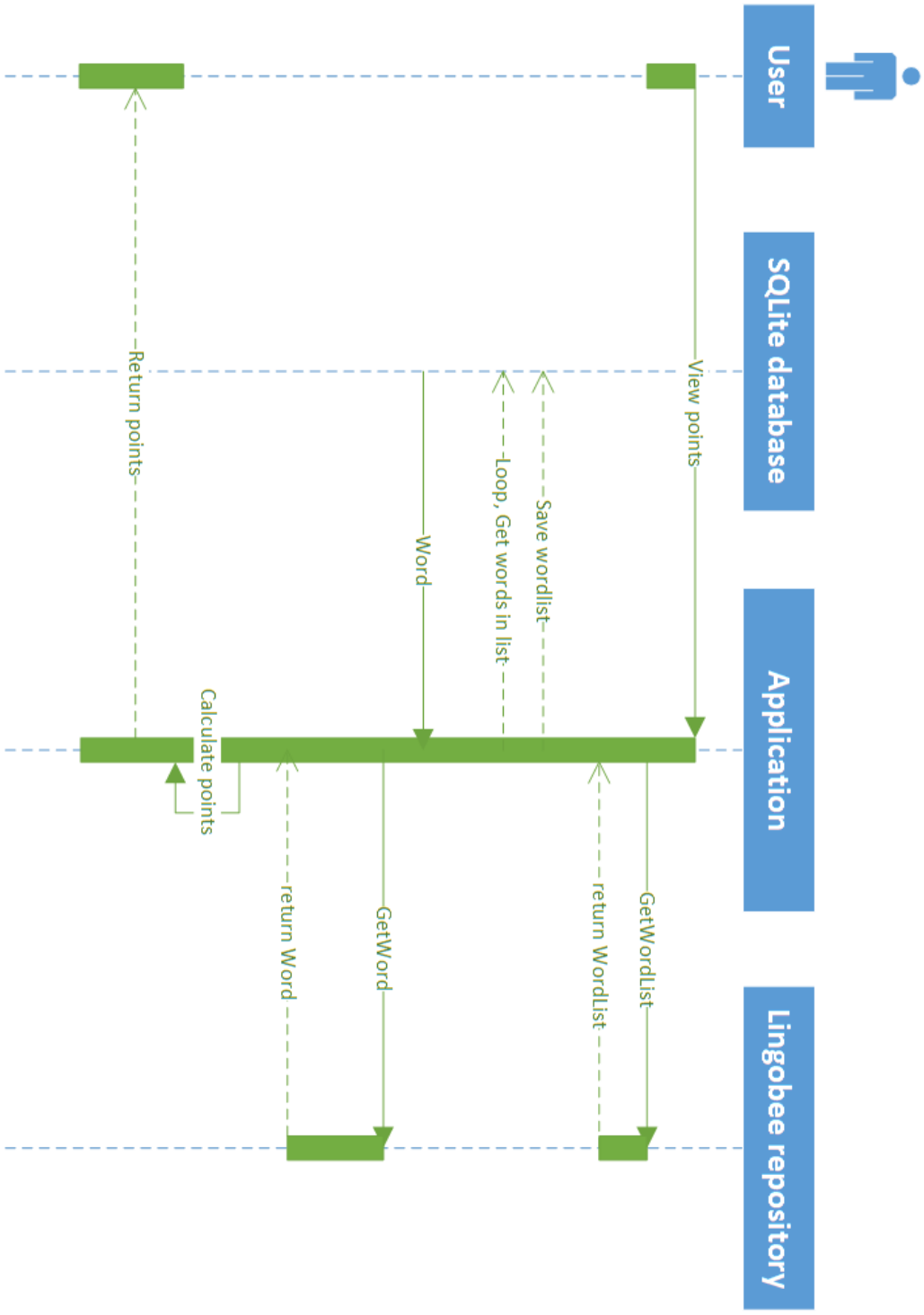


Figure 5.2: Information flow for the implemented solution

5.2.2 Class diagram

The application contains several classes of importance and are presented in figure 5.3. This excludes classes that handles the splash screen, loading screen and other typical cosmetic functions.

XMLParser, *XMLNodes*, *User* and *Word* are classes that handles the XML schema retrieved from the Lingobee repository. After speaking with the developer of Lingobee, the choice fell on Sax parser for the XML parsing. This because it is the same parser used in Lingobee and therefore a good choice.

LoginCredencials is the class that handles the *remember me* function of the application when logging in. It is connected to the *InternalDatabaseHandler*, and stores the user name and password if the user chooses to do this. Only one user and password is stored, and every time the box is unchecked, the information is deleted, or when a new user logs in via the same phone, the user name and password is replaced if the new user checks the box.

The *LingoServerQuery* class handles the query against the Lingobee server and its parameters. All Lingobee API calls require application-level authentication. To authenticate an API call, developers need a public API key, and a private API key[2]. These two keys are appended to every API call, together with these required parameters:

- api - API version
- cid - the call id for this request. Which is a random string to identify the call and is used as input for the signature
- sig - the signature for this request
- uid - User-ID which is assigned by the system on signup. When logging in and for special request this id is -1
- fmt - format
- q - the name of the requested method.

[2]This key is provided by the creators of Lingobee and is private.

The *ParseLoadActivity* handles the information retrieval sequence after login. It gathers the information needed for the user that has logged in, and handles the needed queries for the application to be up to date with the Lingobee repository.

All the information needed to view the statistics in *UserViewActivity*, or the top users displayed in *TopViewActivity* are retrieved one time, which happens in the *ParseLoadActivity*. This is explained in more details in section 5.2.1. After this is done, the needed information is stored on the phone, and all loading processes are removed for a better user experience and smooth transitions between the different screens.

Figure 5.3: Class diagram

5.2.3 Use case

This section contains use cases describing the actions performed by the user in order to perform certain tasks. These are the actions that the user can perform in the application, and the flow of them are explained in figure 5.4.

ID	1
Name	View personal statistics
Goal	View information about own contributions
Main Actor	User
Start requirements	The user is logged in to the application
End requirements	The user can view updated statistics about his / hers contributions
Main flow	1. Log in 2. Click on statistics
Alternative flow	1.2. Click on ”Remember me” to remember user name and password.

Table 5.2: Use case for viewing personal statistics

ID	2
Name	View top 10 users/contributors
Goal	View list about the top 10 users/contributors
Main Actor	User
Start requirements	The user is logged in to the application
End requirements	The user can view updated statistics about who the top 10 contributors in the logged in users user group.
Main flow	1. Log in 2. Click on statistics
Alternative flow	None

Table 5.3: Use case for viewing list of the top 10 contributors

ID	3
Name	View user statistics
Goal	View information about other users contributions
Main Actor	User
Start requirements	The user is logged in to the application
End requirements	The user can view updated statistics about other users contributions
Main flow	1. Log in 2. Click on top 10 users
Alternative flow	None

Table 5.4: Use case for viewing user

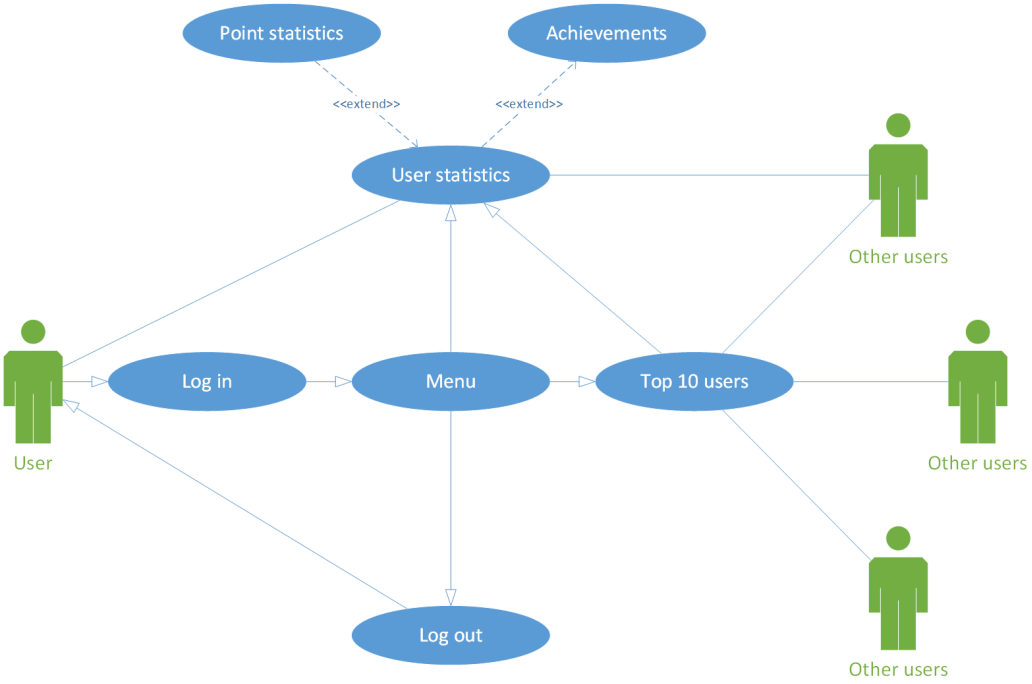


Figure 5.4: Use case diagram for the implemented solution

5.2.4 Flow

At figure 5.5 a basic flow chart of the screens and their interactions in the implemented solution is displayed.

The *splash screen* is the first screen that the user sees when starting the application. This screen does not have any function other than displaying the applications logo.

The *log in screen* is the first screen that presents itself for the user with any functionality upon application start. Here the user must type in his/hers user name and password from Lingobee. The user can also choose to let the application remember the user name and password for future use. When user name and password is entered and the user chooses to log in, a *loading screen* will be presented with a progress bar to show the progress of the ongoing login process.

The *menu screen* is the main central for the application, and consists of four buttons. One button will take you to the screen *top users*, one will take you to your own statistics within the *statistics* screen, one will show you the needed information about the application, and the last button will simply log you out of the application. In the middle of these buttons, there is a layout window which shows the user status of the logged in user based on contributions.

The *top users screen* shows the top contributors within the logged in users user group in the Lingobee community. It will show where each user is ranked, and show their user name and total points amount. Each user name is click-able, and will open up the *statistics* screen, where the user can view detailed statistics about the clicked user. In this screen there is a listview with badges reached by the selected user. These badges are obtained by contributing to Lingobee.

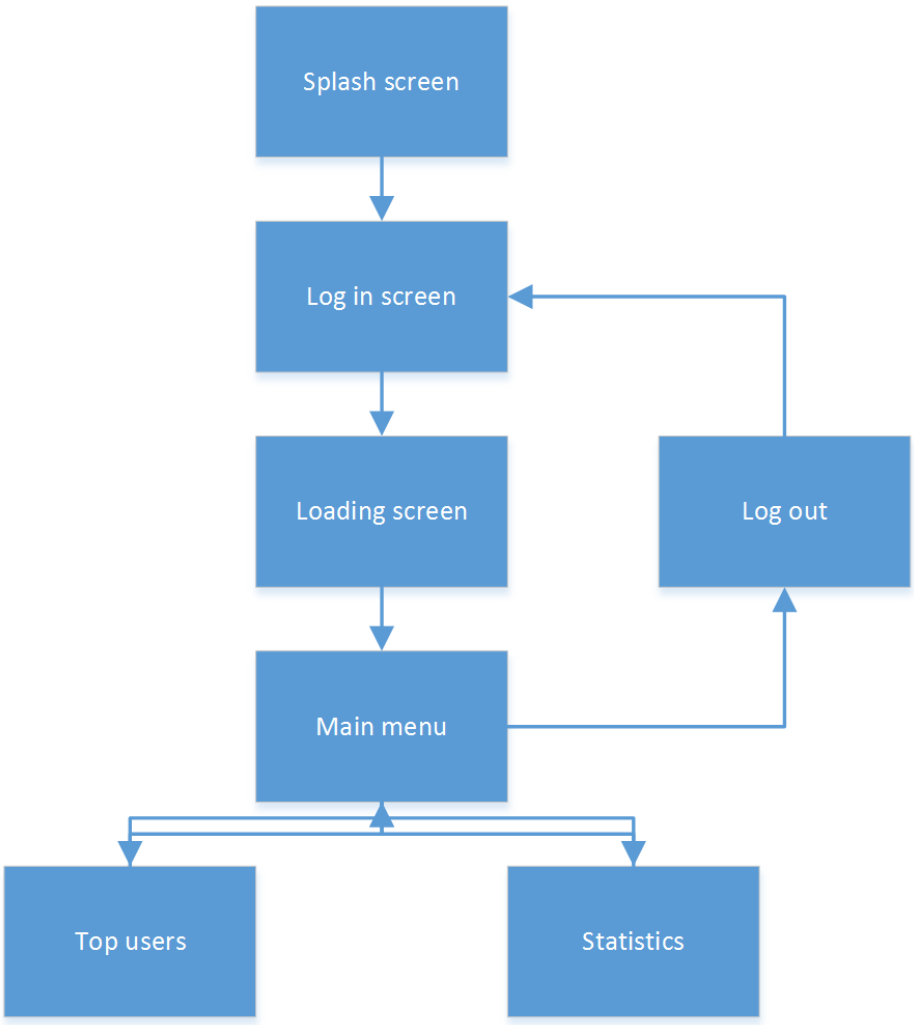


Figure 5.5: Flow chart for the implemented solution

5.3 Database design

The SQLite database contains three tables with their *primary key*:

1. User - *USERID*
2. Word - *IDWORD*
3. Password - *LOGINUSERNAME*

These tables are design accordingly to the information which is returned when executing a query against the Lingobee repository. The values returned from the Lingobee server that are of no importance for the calculation of points are filtered out and discarded during the parsing of the XML form which is returned. This is done to keep the size of the information that is stored in the database at a minimum.

5.3.1 User

When signing up for an account on Lingobee, a new user must type in a desired user name, password and a valid email. Lingobee will then assign an user id to that user, which will be used as a primary key for future parameters when doing API call. This same id is retrieved and stored as primary key in the SQLite database of my application when the users logs in with his/hers Lingobee account, along with the user name. By using this key when doing API calls, the words that are associated with that user can be retrieved, and calculations can be done to retrieve the correct amount of points the user have achieved.

5.3.2 Word

Each contributed post to the Lingobee repository has an id, called *id word*. This is the primary key of the table Word, and is a required parameter when querying the server to retrieve the needed information about each word. This is a necessity to be able to calculate the different points needed for the different game mechanics to function.

5.3.3 Password

This table is used for the remember me functionality on the front page of the application. The users types in their user name and password, checks the box, and the application will remember the password. This is stored in the SQLite database, and when the user choose to un-check the box, the table is cleared.

5.4 Prototype screens

The design for the different screens are chosen to be as simplistic and easy on the eye as possible. The colors are used after guidelines from Android[3], and chosen to provide good contrast between visual components. The blue color chosen is the standard accent color in androids color palette. This color is also chosen since the color blue is proposed to be associated with peaceful environments and triggers a positive motivational response [43].

[3] http://developer.android.com/design/style/color.html

5.4.1 Splash screen

The splash screen in figure 5.6 is the first screen presented to the user when starting the application. It shows the logo and the name of the application. This screen does not have any background functionality, and is used to show the user the name of the application which is starting.

Figure 5.6: Splash screen

5.4.2 Log in screen

The log in screen in figure 5.7 is the first screen with any functionality directed towards the users. Here the users must enter their login credentials from Lingobee to be able to view their achievements. The users also have the option to choose the application to remember the user name and password for future use.

Figure 5.7: Log in screen

5.4.3 Loading screen

The loading screen in figure 5.8 was not implemented until after the early testings. Feedback suggested that this was needed, as the information sequence that goes on between the log in screen and the user status and menu screen (Figure 5.9) takes time, and with no indication that the application is working in the background, people thought that it had stopped. This resulted in the early testers starting to press on the home button on the phone to force quit the application. The loading screen is implemented with a progress bar that is connected to the background queries, so it gives a correct feed on how far in the process it has lapsed.

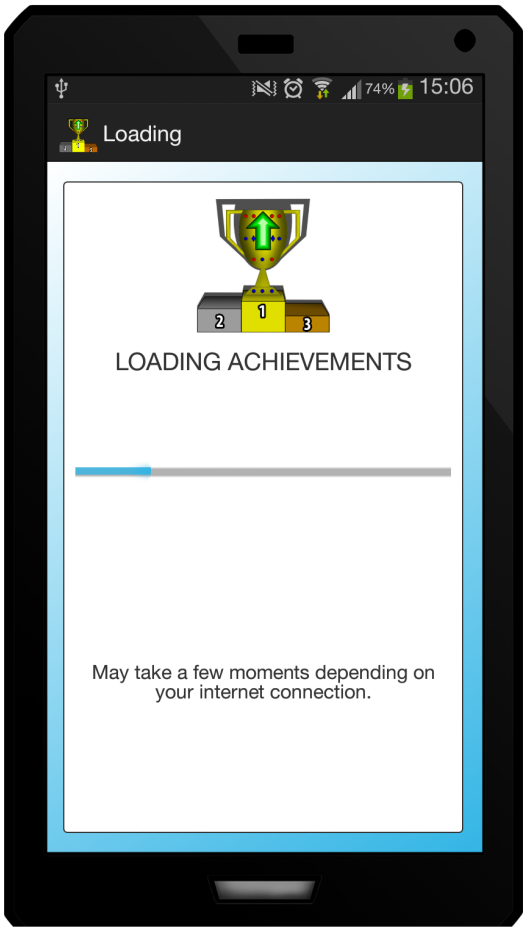
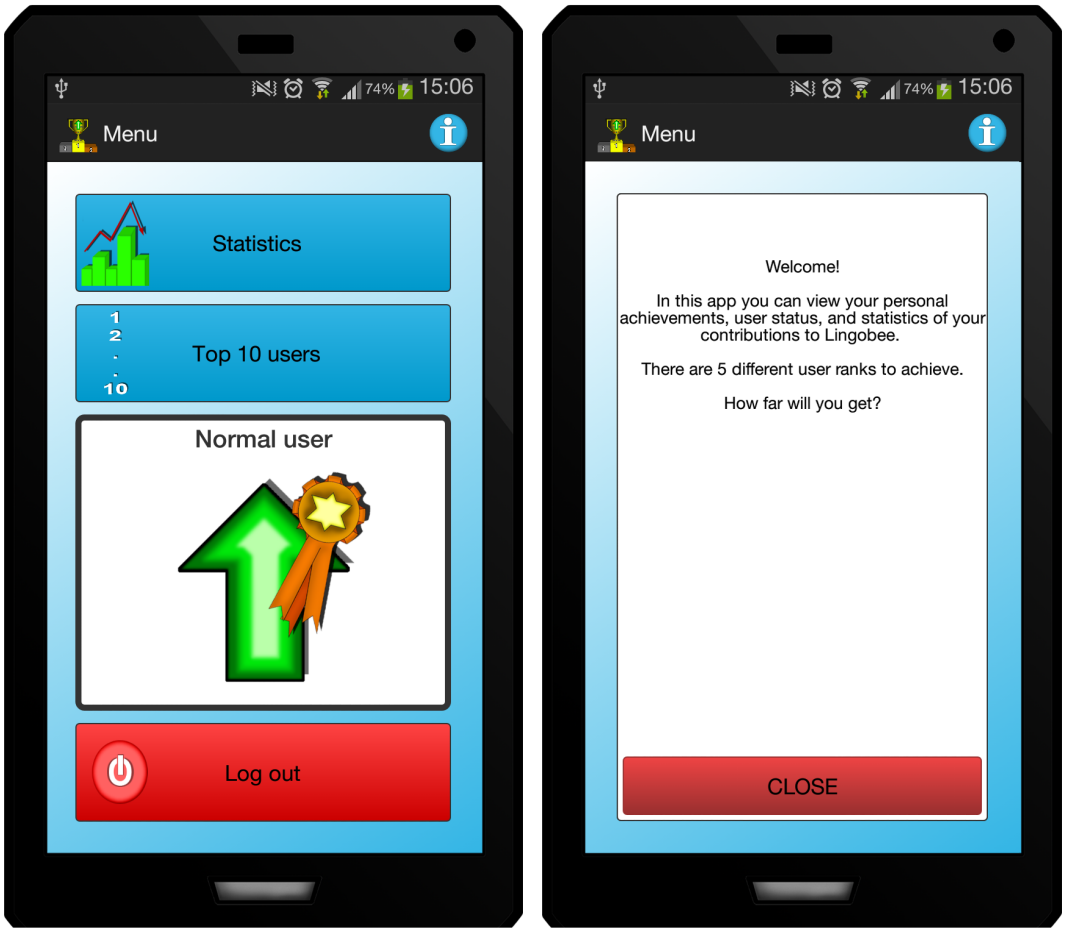


Figure 5.8: Loading screen

5.4.4 User status and menu screen

The user status in figure 5.9 shows the current status of the logged in user, the option to view his/hers own contributions statistics, and view the top users in that user group.

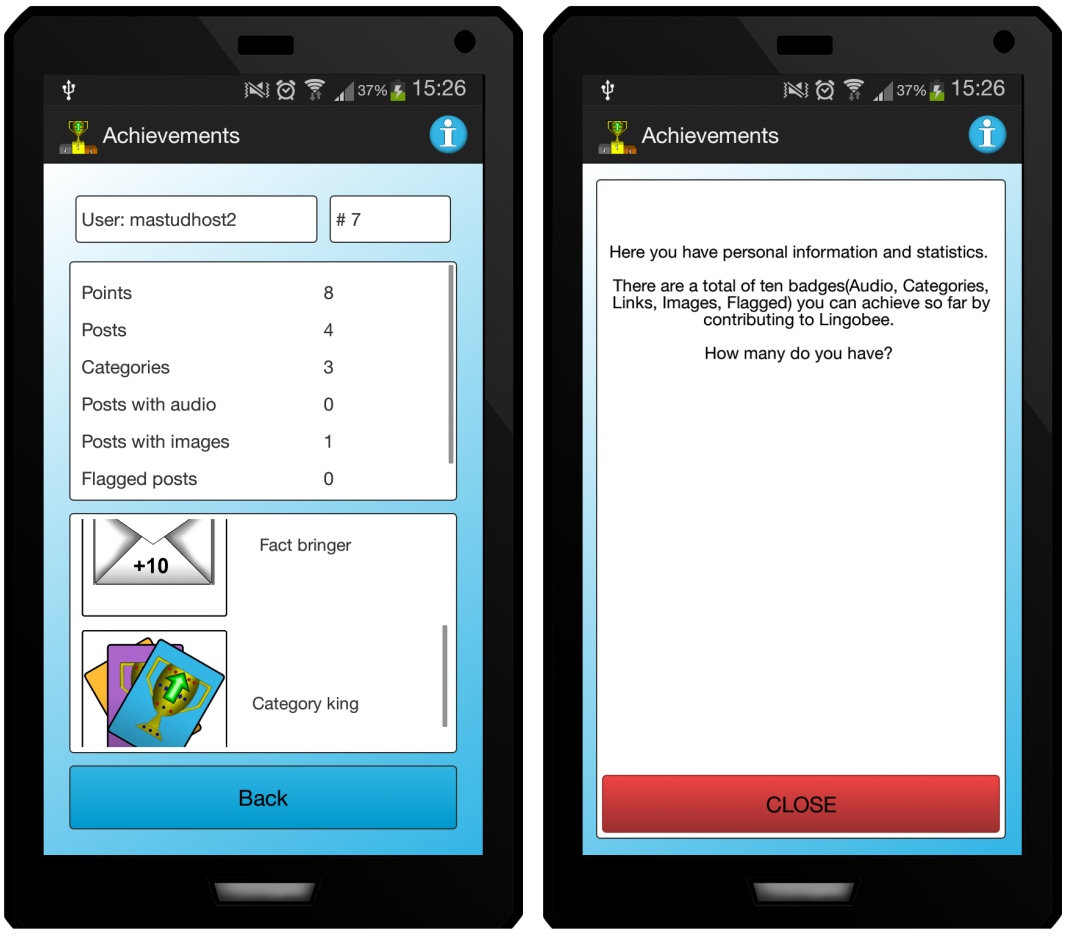


(a) (b)

Figure 5.9: Menu screens

5.4.5 Statistics

The statistics screen in figure 5.10 shows statistics about the current logged in user. When clicking an user in the leaderboard, you will see the same screen. It shows the users user name, ranking in the user group, detailed point statistics, and the users achieved badges. These different fields are a direct representation of what the different fields in the database has stored. So when it says *Posts 7*, it means that the user has contributed with 7 posts, and therefore have achieved 7 points for that.

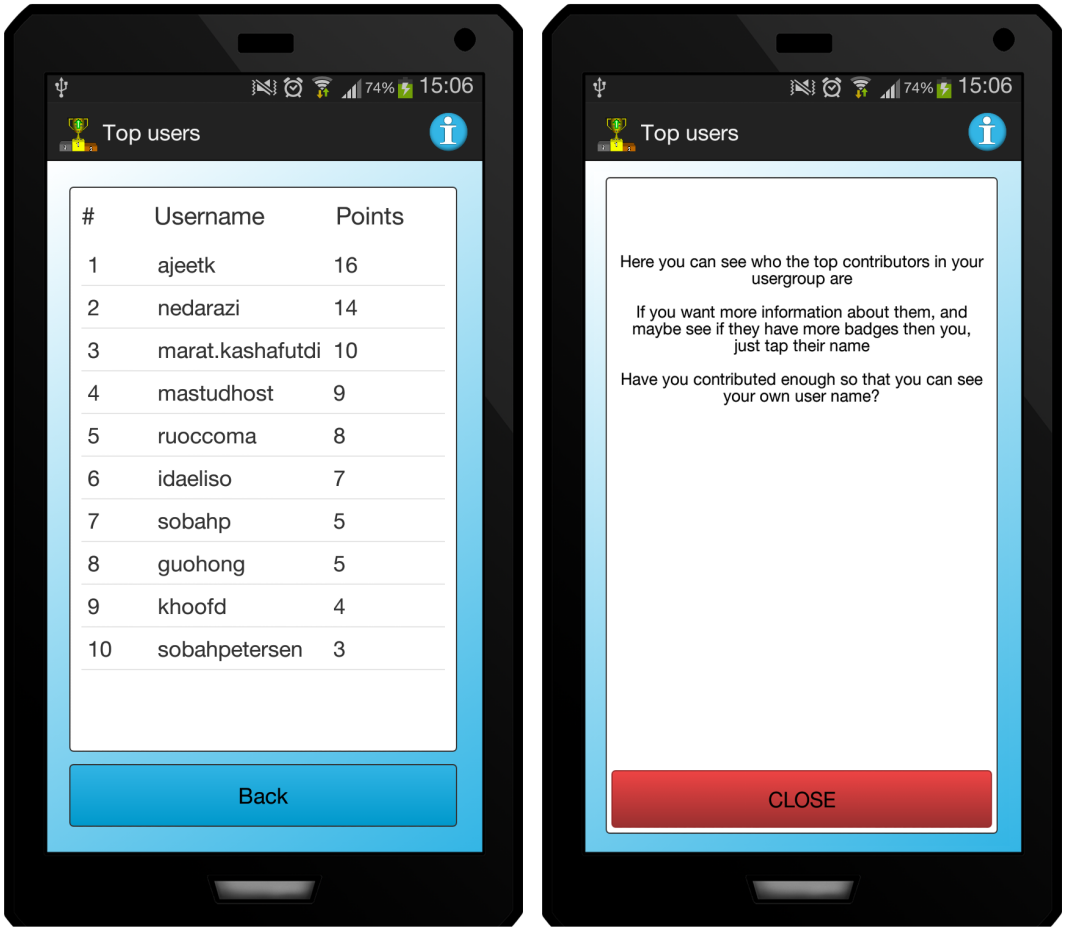


(a) (b)

Figure 5.10: Statistics screens

5.4.6 Top users

The top users screen in figure 5.11 shows the top users in the current logged in users user group. It displays the different users user name, their ranking and their total points amount. By clicking on one of the users, you will be taken to a new screen(figure 5.10), showing detailed statistics about that clicked user.

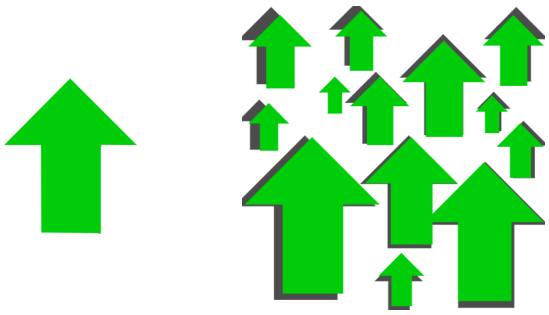


(a) (b)

Figure 5.11: Top users screens

5.5 Badges

What to use as images to represent the different badges for the different types of achievements were decided after some discussions with a few acquaintances that are familiar with gamification, and a simple questionnaire answered by a few people not familiar with gamification. They were given a short briefing in what this was supposed to be about, asked what they associated with the different achievements which was to be implement, and then had the chance to come with ideas for what sort of figures should be used. The ones that were chosen to represent the different badges is either a combination of several of the ideas for that given badge, or the figure that made most sense or had most recurrences. The badges then underwent several layers of sketching, first in Adobe Flash for clean and round edges, then shaded, colored and finished in Adobe Photoshop before they where ready to be used. Some of them went through another round of design after feedback from the early testers. Figure 5.12 are examples of how the user status badges looked like in the beginning, and after some feedback from the early testers, the badges had a graphical touch up in design, and multiplied in numbers.



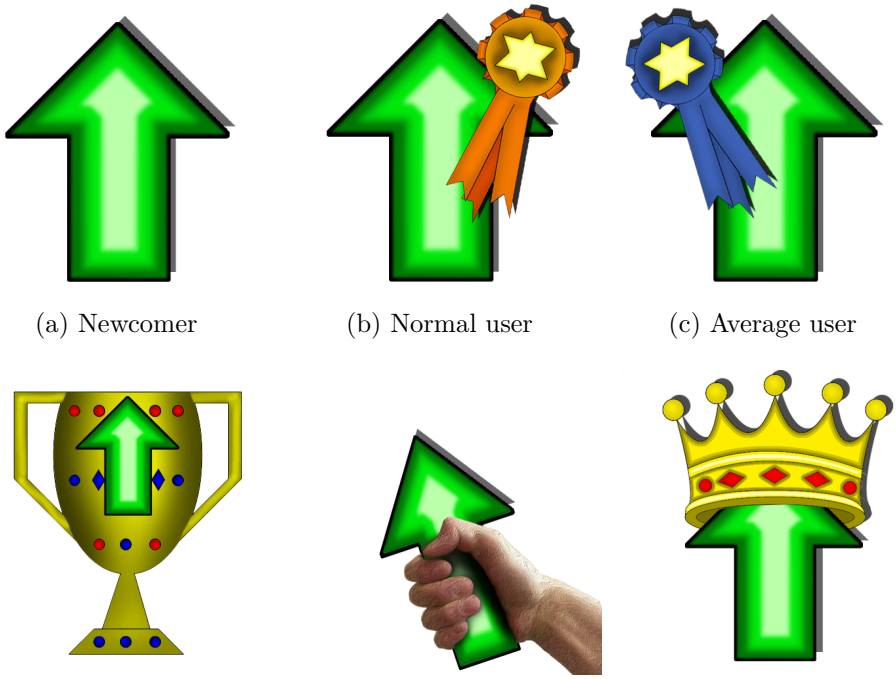
(a) First user status (b) Second user status

Figure 5.12: Early badges design

5.5.1 User status

The user status shows the current status of the logged in user. It is the first badge that will be presented to the user when logged in to the application.

This badge is based on the summed amount of points achieved in the application. When the decision landed on the up-arrow, famously known as *upvote* in different collaborative contribution communities like reddit[4], imgur[5], it went through some design iterations. The user status badges are presented in figure 5.13 with their name / description underneath.



(a) Newcomer (b) Normal user (c) Average user

(d) Power user (e) Fighting for the throne eyy? (f) !!! KING !!!

Figure 5.13: User status badges and their description

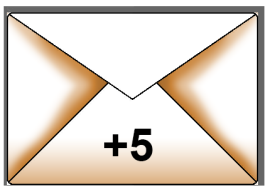
5.5.2 Achievement badges

Post amount badges

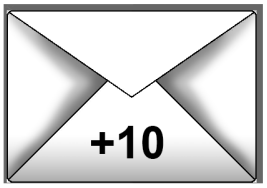
A post is specified as a new entry to the Lingobee application. There are five different badges to achieve by posting new entries. The design is an envelope

[4]http://www.reddit.com
[5]http://www.imgur.com

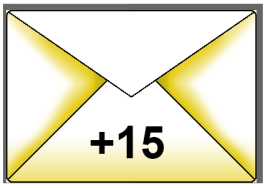
with a number on the bottom. The number gives an indication on how many posts the user have contributed with, and is not accurate for this prototype. Because of the length of the test period the requirements to achieve the different badges were severely lowered in the prototype. The color choices are bronze (Figure 5.14a), silver (Figure 5.14b) and gold (Figure 5.14c) for the three first badges, and the last two are colored gold (Figure 5.14d) and platinum (Figure 5.14e) with a cloudy colored background, a ribbon and a crown to stand out from the rest of the badges since they require a high post amount.



(a) Active contributor



(b) Fact bringer



(c) Spreading the knowledge

(d) Superior contributor

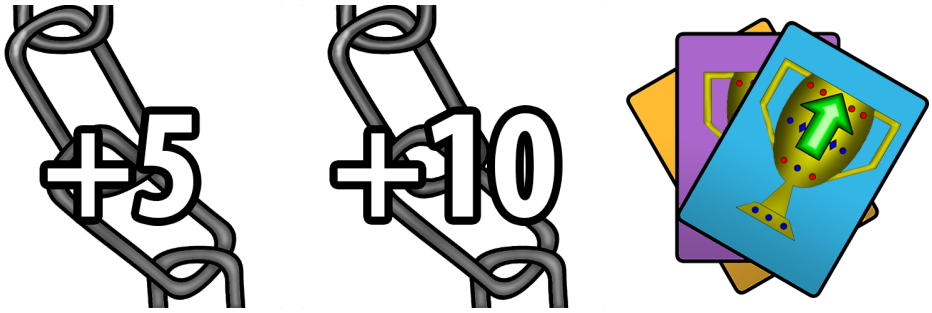
(e) Are all these posts real?

Figure 5.14: Post amount badges

Link, categories, image and audio badges

When contributing to Lingobee, you have the choice to attach a link with extra information about the content you are contributing about, attach audio and attach an image. These different types of attachments provides you with

one extra point each. It exists two badges for attached links(Figure 5.15a and 5.15b). Posting entries in different categories will also provide the user with points, and there is one badge to be achieved for this action(Figure 5.15c). and audio (Figure 5.17a and 5.17b), and three badges for attached image(Figure 5.16a, 5.16b and 5.16c).

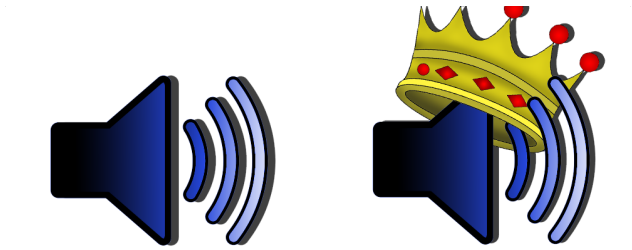


(a) Bringing forth the extra information (b) Trustable source (c) Category king

Figure 5.15: Link and categories badges

(a) More than a thousand words? (b) Photographer? (c) Professional tourist!!

Figure 5.16: Image badges



(a) Bringing the noise (b) Raising the roof

Figure 5.17: Audio badges

Flagged amount badges

Lingobee has the functionality to give the users the option to flag other users entries. When this is done, the user gets one negative point on their overall point score, and it is possible to get two different types of badges for flagged entries. These badges consist of a red arrow, with a big skull over it and are presented in figure 5.18. The color red is chosen to portray the arrow because this is the color most of us associates with negative elements or something bad [43]. This is done to associate bad or unpopular contributions with something negative.

There will be no information given to the users about what happens if you flag someones post, to try to avoid misuse of that given feature, but this feature is also a part of most gamified systems that bases itself on user contributions, and by that showing what type of contributor you are. Some systems give negative reputation/karma points, and some have achievements with a negative vibe which most of the users try to avoid at all cost.

(a) Not the most trustable person

(b) Me fail english? Unpossible!!

Figure 5.18: Flagged posts badges

Chapter 6

The user evaluation

The user evaluation was executed mainly in two rounds; *early testing* and the *user evaluation*. The early testing were done by classmates who have knowledge of programming for the android platform, and general knowledge of usability guidelines[1]. This chapter explains the two different evaluation periods that took place, and general information about the testers of the user evaluation.

6.1 Early testing

The early testing was executed to eliminate as many bugs as possible before the user evaluation test, and to observe how users interact with Contribution Achievements. With a stable version of the application ready and usable for the user evaluation, the chances are that the users will have a more realistic test period and therefore generate more reliable test results.

The testers were provided with a test account to Lingobee to be able to log in to Contribution Achievements, and a list with every achievement and their names available. They were asked to test the application to find bugs, and provide me with general feedback about any design and other changes needed to be made. While they were testing, they were asked to say out loud exactly what they were thinking about the design and other thoughts that came to mind about the application. Below are the comments about the application

[1]Previous participants in the subject TDT4180 Human Computer Interaction, NTNU.

that was given to me that needed to be fixed before the user evaluation.

- Buttons on front page need colors.
- Application needs loading screen.
- Takes to long to retrieve information when using Edge instead of WiFi or 3g. No indication on whats happening. Needs loading bar that shows progress.
- Implement information button on the different screens.
- Implement remember me button on the front page.
- More detailed effects on the badges.
- Bigger view of the badges.
- Cooler/funnier information/name about each badge.
- Be able to exit the application by double tapping the back button on the phone.

After receiving the feedback, the application went through some rounds of development, and each commented item was considered and discussed with the testers why they should be implemented or fixed. The ones with greatest impact on the usability and usefulness were implemented to heighten the experience and perceived enjoyment of the application.

Other than the above mentioned feedback, the observation of the early testing did not reveal any problems of significance with the design and architecture of the prototype. The amount of user input needed in the application is quite low, and there is not much room for error from that perspective. One element that revealed itself during the observation, was the tapping of names in the leaderboard did not present itself clearly enough. The solution to this was adding the instruction that this is possible to the *information button* connected to the leaderboard.

6.2 User evaluation

Information about the execution of the user evaluation test was given to the test subjects via a website presented in figure 6.1 that was created for this purpose. Here they could find general information about the project, the course, information about and how to use Lingobee, examples from Lingobee to provide a thought about what they could contribute with, general information about gamification, and how to install both applications since they are not approved for the Google Play market.

Figure 6.1: Website used for information regarding the user testing

The subjects were given Lingobee to use for one week, and after that week had passed they were given the gamification application. The length of the user evaluation was chosen to simulate real use of Lingobee and to be able to evaluate if gamification has any effect on motivation and further engagement. The users were then to use both Lingobee and the gamification application for one more week, but due to experienced down periods of the Lingobee server this period was extended to two weeks. They used the applications at their own pace within the time limit which was set and no demand on

how much time they needed to spend with them was given nor any demands on contributing with posts. This was done to try to simulate as real use of Lingobee as possible. During the evaluation period and after the subjects were asked to answer surveys regarding the perceived enjoyment, usability and the applications usefulness, together with a survey regarding their view on Lingobee and the usage of its functions during the evaluating period. The two users with the fewest contributions were selected for further interviews, with focus on why they did what they did during the user evaluation, the motivational aspect of Contribution Achievements through perceived enjoyment and its usability and usefulness.

6.2.1 The test subjects

The test subjects for the user evaluation of the application ranged from age 16 to 31. Both male and females were selected, and their knowledge about gamification and game attributes ranged from below, to above average. For the experiment to reflect a real life situation on the usage of the application, people with different types of background, age and occupation was selected.

In table 6.1 an informative overview of the testers is presented.

Subject	**Sex**	**Age**	**Occupation**
P1	Male	27	Traveling agent
P2	Female	24	Nurse
P3	Female	25	Sales
P4	Male	29	Student university
P5	Male	26	Student university
P6	Male	26	Truck driver
P7	Male	16	Student
P8	Male	31	Electrician

Table 6.1: Information about the testers

Chapter 7

Results from user evaluation

This chapter presents the results that were found from the conducted user evaluation. The results from surveys and contribution findings are divided into sections regarding their element of impact. Finally results from the conducted interviews with P5 and P6, and findings from Google analytics are presented.

7.1 Survey and contribution findings

After the first week of using Lingobee, the test subjects were given a questionnaire to answer about their general attitude towards both Lingobee and their functionality usage. They were asked to rank the different questions choosing a value on a scale from *1 - Strongly disagree*, to *5 - Strongly agree*. This same survey was given to the test subjects after using Contribution Achievements to measure up the results to see if their attitude towards Lingobee had changed. They were also asked to answer another questionnaire regarding direct feedback on the applications usability, perceived enjoyment and usefulness, and the two subjects with the fewest contributions were chosen for a post interview. These surveys was treated anonymously and answered via SurveyMonkey[1], and any quotes used in the evaluation and thesis was uttered by test subjects on their own free will to use as both negative and positive feedback about the application. The contributions made by the test subjects during the test period were mapped and used as statistical support.

[1]Free online survey tool - https://no.surveymonkey.com/

7.1.1 Impact on motivation

One of the main intention with the application is to motivate people to continue contributing, or else the whole point of collaborative learning is gone. For this to happen, people need the motivation to continue usage. The survey sought to uncover Contribution Achievements ability to motivate and engage the users of Lingobee. The question in figure 7.1 was asked both before(pre) and after (post) use of the application.

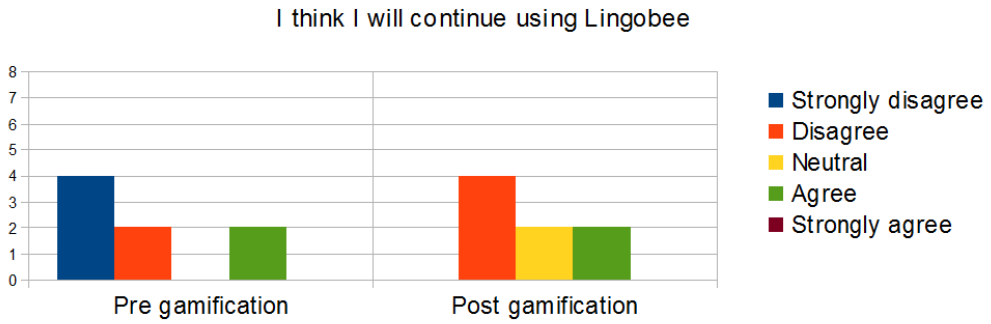


Figure 7.1: Impact on motivation

Before use of the application, half of the subjects was as sure as it gets that they would not continue using Lingobee, and only two of them was on the positive side of the statement. This means 75% of the test subjects lost interest in the application. But after the use of Contribution Achievement only 50% disagreed in the question. This means there was an increase in the amount of users that perceive the application to be a motivational factor in itself.

> ”Seeing the leaderboard and my user status helped”.
>
> ”I went all in to achieve as many badges as possible.”.
>
> ”You have made a nice application, but I don’t quite see the meaning in gamifying this type of systems/apps.”.

The quotes above are from three of the users after using Contribution Achievements. Two of them agreed that seeing both the user status and the leaderboard helped on the motivation for continued contribution to Lingobee. Two

of the eight test subjects felt that the application did not change their view on Lingobee(figure 7.2), and one felt that the application did not motivate for further use, which was expressed in the last quote above. The fact that the application is not a direct part of Lingobee and only a side module was also one of the factors that had a negative impact on the motivation. Had the applications been working as a whole, the load time would have been significantly lower, and the threshold for checking your own statistics would have been lowered.

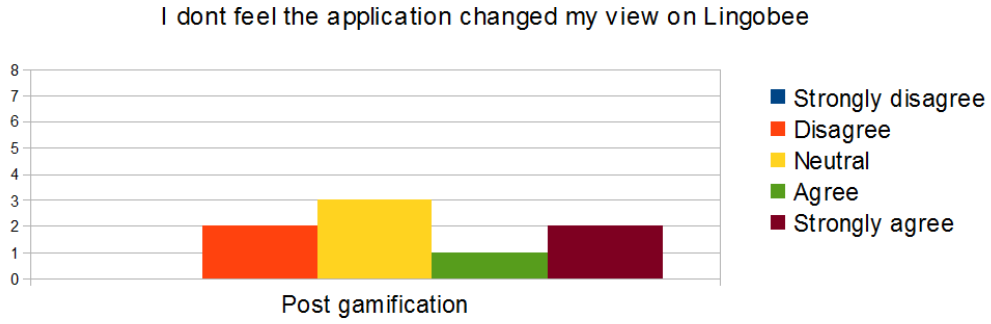


Figure 7.2: Contribution Achievements impact on motivation

7.1.2 Use of implicit competition

The use of game mechanics such as points, badges and leaderboards was predicted to affect the contribution amount after introducing it to promote implicit competition to Lingobee. Four of the test subjects agreed on the matter that they liked to compete(figure 7.4), but when asked what they felt when they saw the leaderboard(figure 7.3), only three of them agreed that they felt the need to improve their rank.

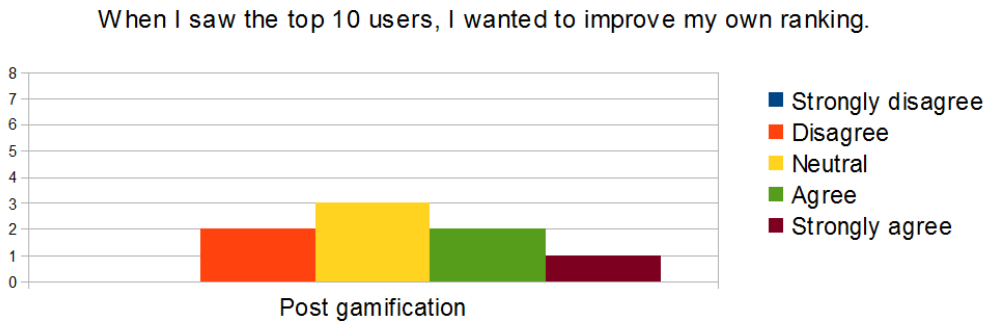


Figure 7.3: Use of leaderboard

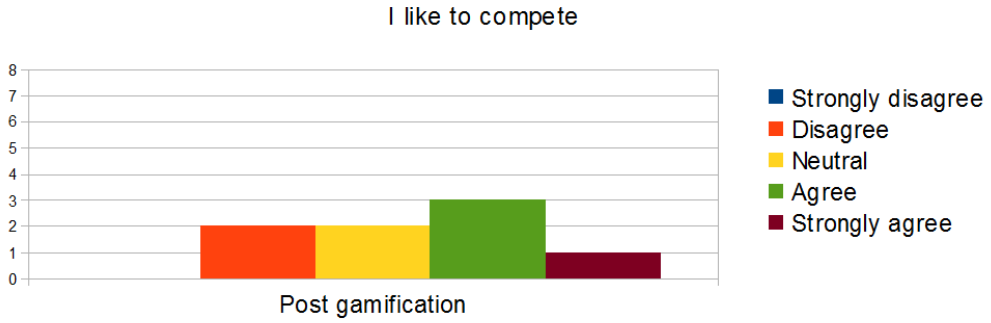


Figure 7.4: I like to compete

So the direct feedback on their rank was intriguing, but the user status showed to be more useful. Four of the test subjects agreed that they wanted to improve it(figure 7.6b).

> ”It should be a list over the different user statuses”.

> ”I’m King!! Needs more statuses, it is way to few”.

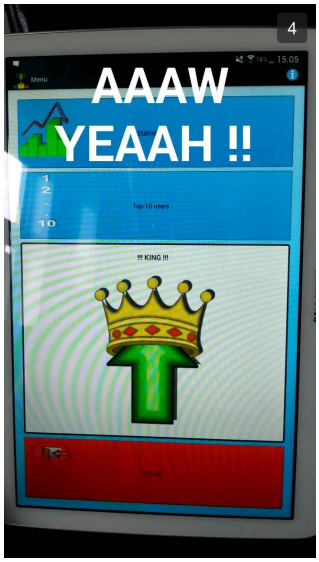
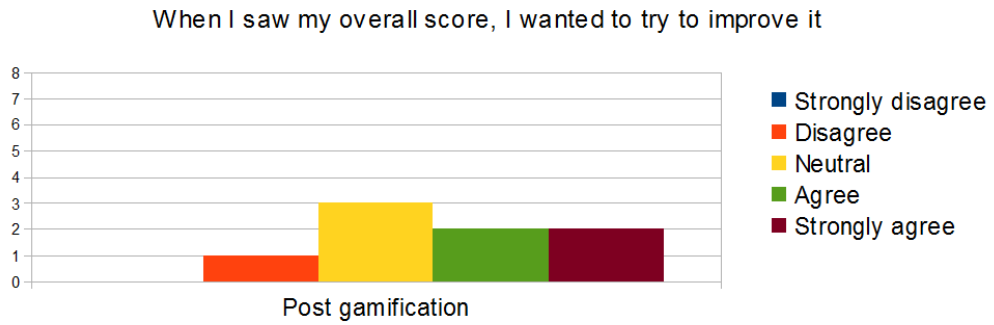


Figure 7.5: Snapchat image sent from one of the participants in the user evaluation

Figure 7.5 and the two quotes above come from the same person which shows a high engagement in the use of user status. The list over the different statuses was taken into consideration when planning the application, but implementing this functionality will reveal the badges and their names, and remove the goal that the users implicit strive to reach, and therefore the idea was discarded. But the overall impression on the game mechanics implemented, 37.5% to 50% of the test subjects either agreed or strongly agreed that they felt it gave them the motivation and a reason to continue to contribute. This is about the same amount of test subjects that answered that they liked to compete.



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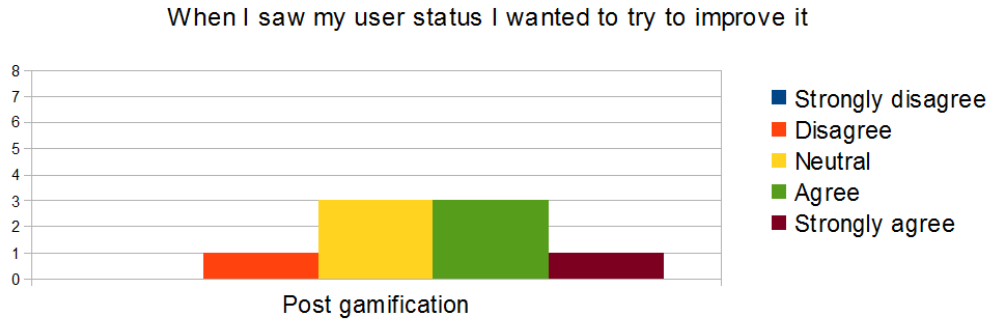


(b)

Figure 7.6: Personal achievements

The overall score and user status showed to be the most motivating gamification functionalities. These are also the functionalities that only bases on your own achievements. The users are not matched up against each other in any way when viewing these mechanics, but instead they are competing against themselves.

Badges are one of the more popular gamification mechanics used today, especially when looking upon games and social media. But when asked, half of the test users felt neutral about the whole feature being used in Contribution Achievements, which was the highest neutral vote amongst all the game mechanics that is implemented.

Figure 7.7: Impact on motivation using badges

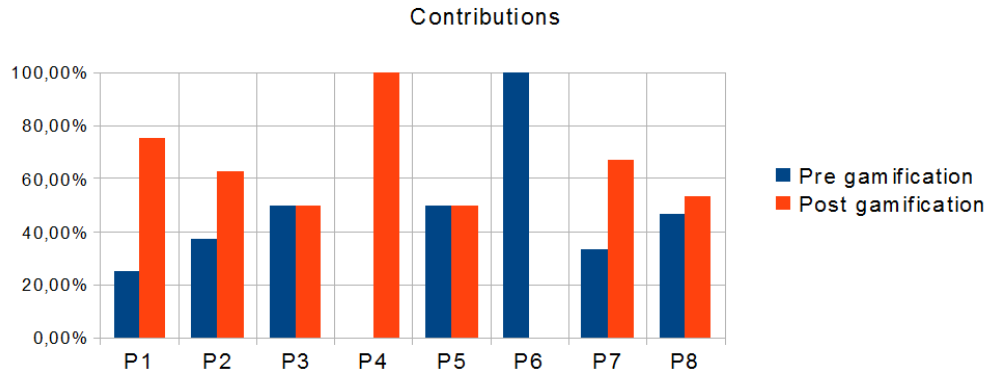
7.1.3 Impact on contributions

The impact Contribution Achievements had on contributions are evaluated by looking at the contributions made by the test subjects. These were mapped before the use of the application, and after. This was done to see if there were any increase in both contribution amounts, and types(media attachments). Looking at figure B.4 five of the eight test subjects had the majority of their contributions after trying out the application. On the left in figure B.5 one can see the total contribution amount both before and after trying out the application. Almost 80% of the contributions with different types of attachments, being primarily images, occurred after trying the application. Only two of the users attached something except an image.

> ”There should be a list of badges, or maybe a progress bar. I don’t know what badges I can achieve!”.

> ”Nicely drawn badges, but the ’image’ badges are to similar”.

The first quote may speak for the reason primarily image badges were achieved by 75% of the testers, being the simplest badge to achieve. The users were provided with only the total amount of badges that they could achieve, and their category type. This was done to try to build some suspense around what they need to do to achieve badges and is a strategy also used by the service *Codeacademy*. But cast aside the negative feedback some of the users uttered about the focus on contributions, Contribution Achievements had a positive impact on both contribution and attachment amount.



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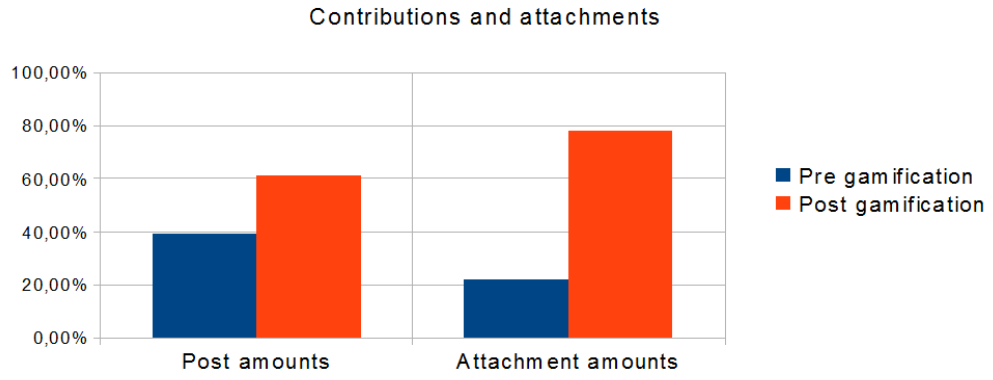

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Figure 7.8: Impact on contributions

7.1.4 General usefulness

The general usefulness of the application is influenced by the general view of Lingobee. If the users don't see any use in it, or don't understand the concept behind collaborative learning, the gamification application will be seen as useless. After the first test week with Lingobee, two persons felt that collaborative learning is not an effective way to learn new languages(figure 7.9). And after the last week of the testing, there was only one person that felt this way. Every other test subject was either neutral or agreed that it is an effective way, and four persons went from disagreeing that they

have learned something from the application, to none disagreeing and four at neutral(figure 7.10). So the application did not change the testers mind about collaborative learning being an effective way to learn, but half of the testers did not disagree that they did not learn anything new.

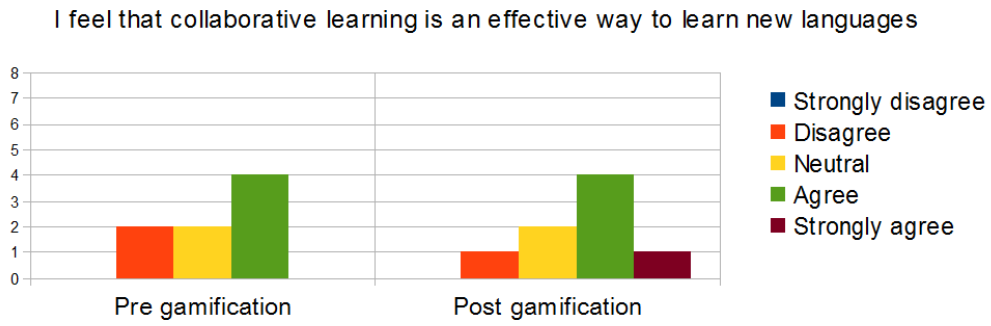


Figure 7.9: Impact on usefulness

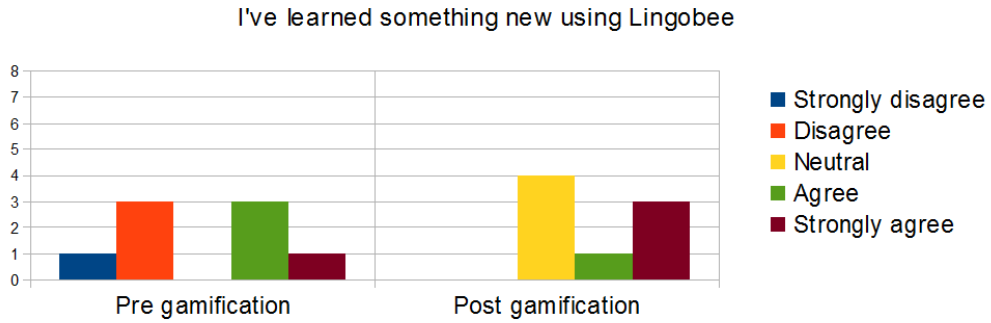
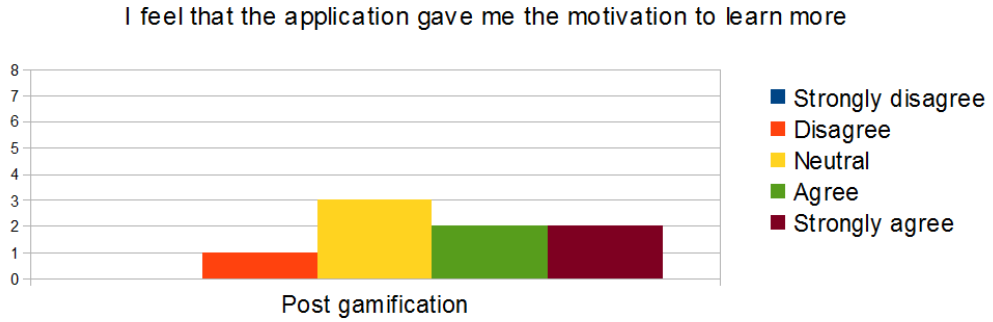


Figure 7.10: Impact on usefulness

An important factor of the usefulness of the application is tied to the fact that it has a motivational benefit towards continued use. The responses to the question in figure 7.11a were similar to the response in figure 7.11b. Even though the desired response is to get everyone to have some sort of benefit, either learning or motivational, it might not be realistic. There will always be lurkers in this type of systems, and people have different learning styles. But the fact that 50% of the testers either agreed or strongly agreed that the application had a positive effect on both the motivation for further

learning, contributing and therefore use is considered positive in terms of the usefulness of Contribution Achievements



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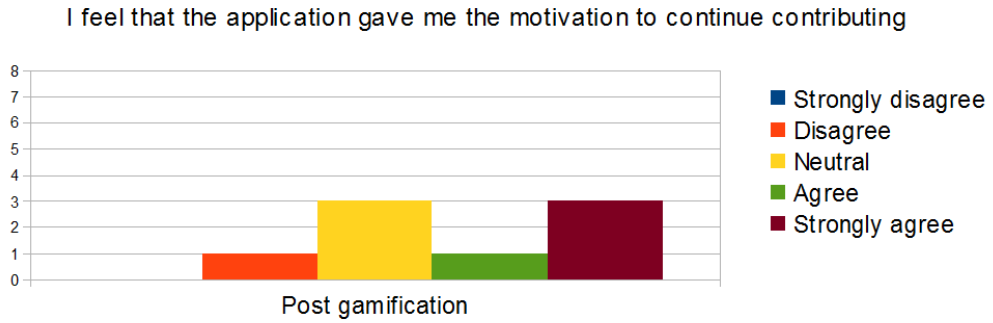


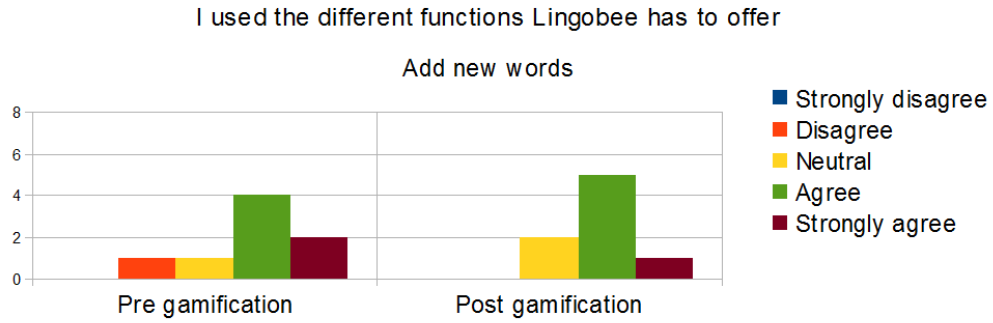
(b)

Figure 7.11: Impact on usefulness

7.1.5 Impact on functionality

The biggest impact on the functionality Contribution Achievements has on the usage of Lingobee, was not surprisingly the functionality that referred to basic contributions(figure 7.12a and 7.12b). The application has no focus on either rating of other persons contributions, the search function, the possibility to contact other users or changing user groups. There is a badge for flagged posts, but this was not mentioned to the testers. It was implemented to see if they would try out the different types of functionality Lingobee has to offer, and would not gain anything from that other than giving the other

person a negative impact on their points, and possibly that said badge. This is a functionality that can be abused by people flagging everyones post except for their own to try to rise to the top of the leaderboard, and therefore kept quiet about. This was an experiment in itself, and showed that there was no misuse of this function.



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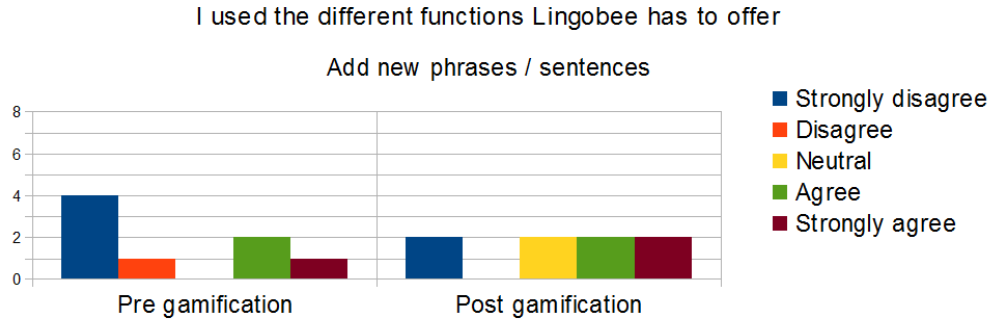

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Figure 7.12: Impact on functionality

7.1.6 General usability

The general usability of the gamification application was measured with the SUS tool. It was developed by John Brooke as a *quick and dirty* scale for administering after usability tests on systems [51]. It is generally used after the test subjects have had the opportunity to try out and get familiar with the system that is being evaluated, but before any debriefing or discussion

takes place. It is a 10 item questionnaire with 5 response options, 1 to 5, were 1 is Strongly Disagree, and 5 is Strongly Agree.

This tool was used two times. The first time the testers of the early testing phase were asked to answer this. This was the primary feedback mechanism together with direct feedback and observation of the early testing, used to guide the development of the application towards a more usable and stable system. Then the application was refined and given to the participants of the user evaluation, which answered it after the test period was over. The SUS score after the user evaluation was a total of 88(figure 7.13b). This score is not represented as percentage. The average SUS score has been found to be 68 after a studies of 500 evaluations. A score of 80,3 can be seen as an A (this is the top 10% of scores). This is also the point where users are more likely to be recommending the product to a friend.

#	Question	User's Scale Position	SUS Contribution
1	I think that I would like to use this application frequently:	3	2
2	I found the application unnecessarily complex:	2	3
3	I thought the application was easy to use:	5	4
4	I think that I would need the support of a technical person to be able to use this application:	1	4
5	I found the various functions in this application were well integrated:	3	2
6	I thought there was too much inconsistency in this application:	2	3
7	I would imagine that most people would learn to use this application very quickly:	4	3
8	I found the application very cumbersome to use:	2	3
9	I felt very confident using the application:	4	3
10	I needed to learn a lot of things before I could get going with this application:	1	4
	Individual SUS Score		77,5

(a) Early testing

#	Question	User's Scale Position	SUS Contribution
1	I think that I would like to use this application frequently:	3	2
2	I found the application unnecessarily complex:	1	4
3	I thought the application was easy to use:	5	4
4	I think that I would need the support of a technical person to be able to use this application:	1	4
5	I found the various functions in this application were well integrated:	4,6	3,6
6	I thought there was too much inconsistency in this application:	1,8	3,2
7	I would imagine that most people would learn to use this application very quickly:	3,8	2,8
8	I found the application very cumbersome to use:	1	4
9	I felt very confident using the application:	4,6	3,6
10	I needed to learn a lot of things before I could get going with this application:	1	4
	Individual SUS Score		88

(b) User evaluation

Figure 7.13: SUS tool

The good usability of the system was supported by questions from the questionnaire about the gamified application. The overall question about the application(figure 7.14) shows that all the test subjects either agree or strongly agree that the application was clear and easy to understand.

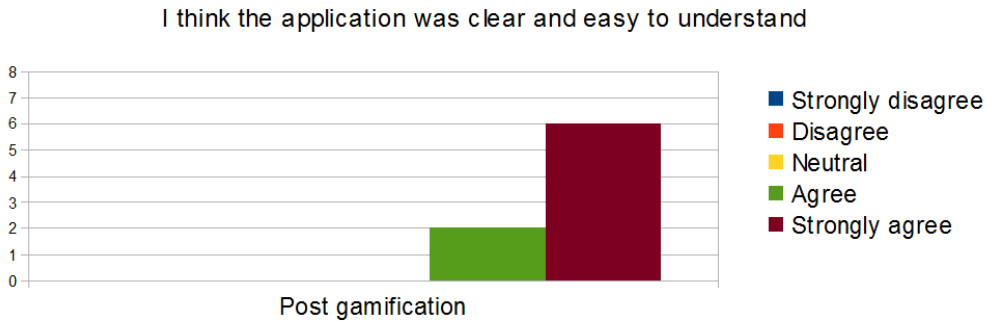


Figure 7.14: The system was considered easy to understand.

The badges and icons were designed based on what people usually associate with what they try to represent. They were made as clear in color and as big as possible.

> ”Nicely drawn icons and badges! Maybe change the quit button from the normal I/O (most known for on-off switch on modern devices) to a door or something. I feel the icon does not represent quitting the application right now”.

> ”Thanks for making the badges so big. Usually they are small and monochrome”.

These are feedback received during early testing and testing, and they are supported by the questions in figure 7.15.

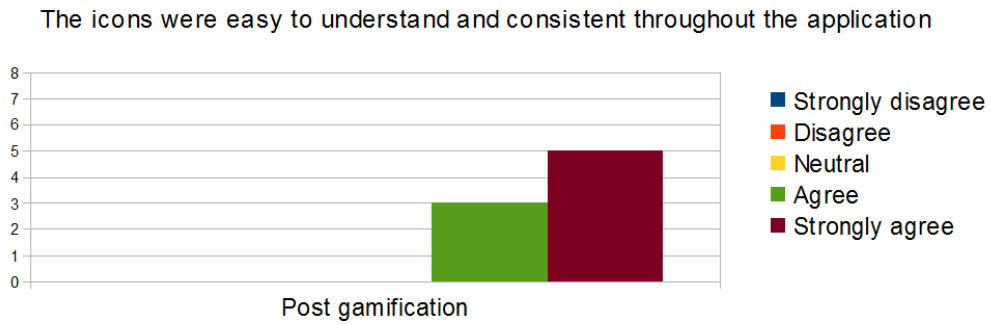
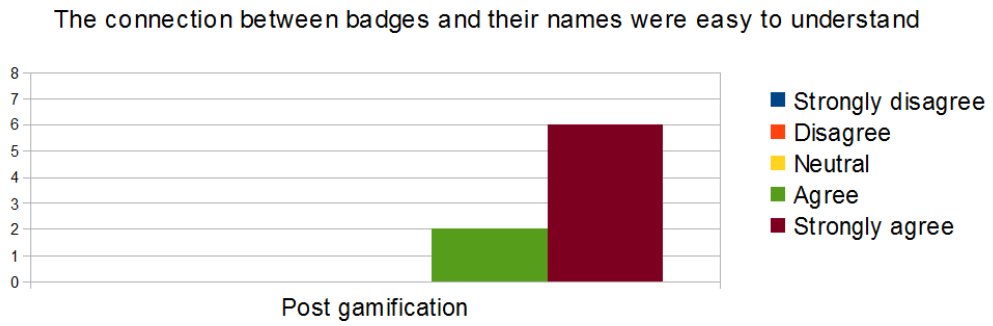


Figure 7.15: Easy to understand

One comment that was mentioned a few times during the evaluation was that the user status badge and name needed to be upgraded. They made sense, but they were to similar. And by this they mean the first three badges, whereas number two and three is just a ribbon with different colors. This is something to be taken into consideration for further development, and is supported by the question in figure 7.16b. Otherwise, the testers all agreed or strongly agreed that the connection between badges and their names were easy to understand(figure 7.16a), and two of the users neither agreed or disagreed that the different user statuses and points were easy to understand(figure 7.16b). All of the testers either agreed or strongly agreed in the fact that they perceived the application to be funny.



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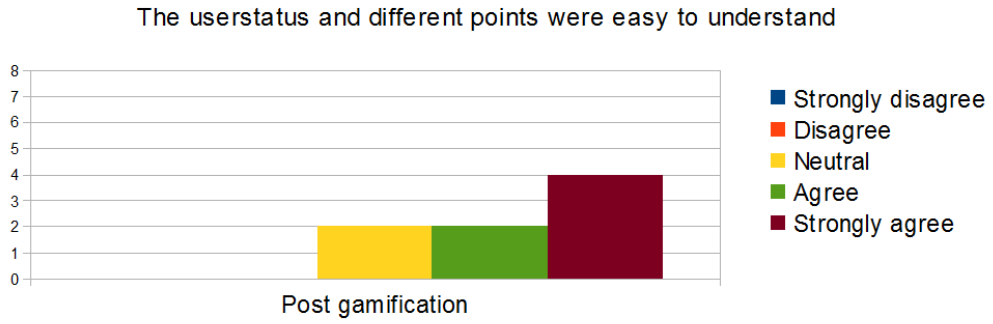

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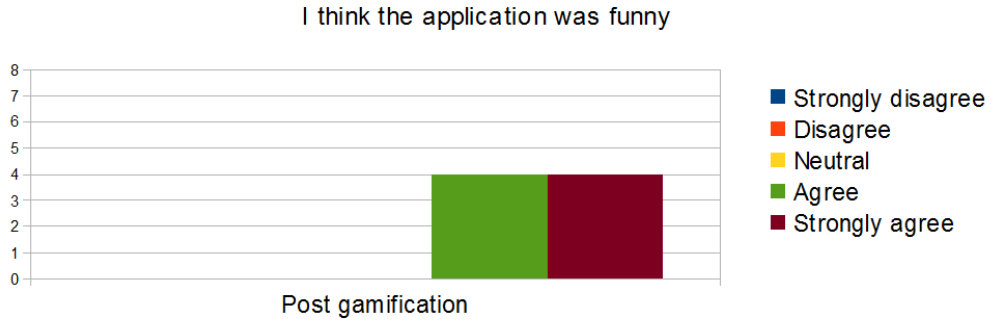

(c)

Figure 7.16: Perceived enjoyment

7.2 Interview findings

After the user evaluation period, the two users P5 and P6, had the fewest contributions after using Contribution Achievements, and was therefore selected

for further interviews about why they chose to lurk or not use the application at all. The questioning was conducted over the Internet since both live in another city. By asking them the first simple question, did the application motivate you to try contributing or continue contributing to Lingobee, the answer to why they lurked got clearer.

> ”I did not see any use in Lingobee itself, so I got bored after a few contributions”.
> - *P5*

> ”I did not feel I had anything to contribute with, so I just went through the other users contributions. And when checking the leaderboard I could see all the achievements the other users had”.
> - *P6*

The fact that they did not see any use in Lingobee and the concept of situated learning was one of the factors that they did not contribute or continue to contribute. But when asking if the implemented game mechanics changed their view or motivation towards continued use, they both answered that some of the mechanics motivated them.

> ”The points itself motivated me, but the fact that they changed with only one point for each post made me loose interest”.
> ”The visual feel of the application was good, And by that I mean the achievements, and I like that they were as big as they were”.
> - *P5*

> ”My user status had only changed one time, but was kind of motivating. Cool image. This you are not able to see when lurking on other users profile, and that was a smart move.”
> ”The application was nice to look at. Nice use of colors and the choice of a simplistic design. Everything that was implemented gave meaning”.
> - *P6*

The usefulness of the implementation of game mechanics in the application is on the positive side according to both subjects. They both found the user status to be a motivational factor, and they each found the rest of the mechanics to be somewhat motivating. If some changes had to be made to

the application to make it more motivating, they both agreed the possibility to see other users badges has to be deactivated and just show the amount of badges they had reached. By doing this, both will agree that the badge mechanic is a smart choice and works as a motivational factor. P5 felt that he was missing the option to see if anyone had favored anyones contribution. The choice not to implement this functionality was made during the development process, since retrieving information that is required for this takes to much time. It is an iterative process that need to be done in several rounds excluded the already iterative process of information gathering, and would easily double or triple the load period of the application. This is something that can be thought of for any future work.

7.3 Google analytics findings

Google analytics was implemented within the application to keep statistics of what screen was used the most(gamification feature), and by whom. It did not provide any direct feedback of who used the application and when, other than the type of device the user had at the time. So by asking the different users what types of devices they used it was possible to somewhat narrow down the mapping. Not surprisingly the persons with the fewest contributions were also the persons with the fewest sessions with the application, and the user with the most sessions had the most contributions. The gamification feature that had most views was surprisingly the User status screen. It consisted of 67% of the views.

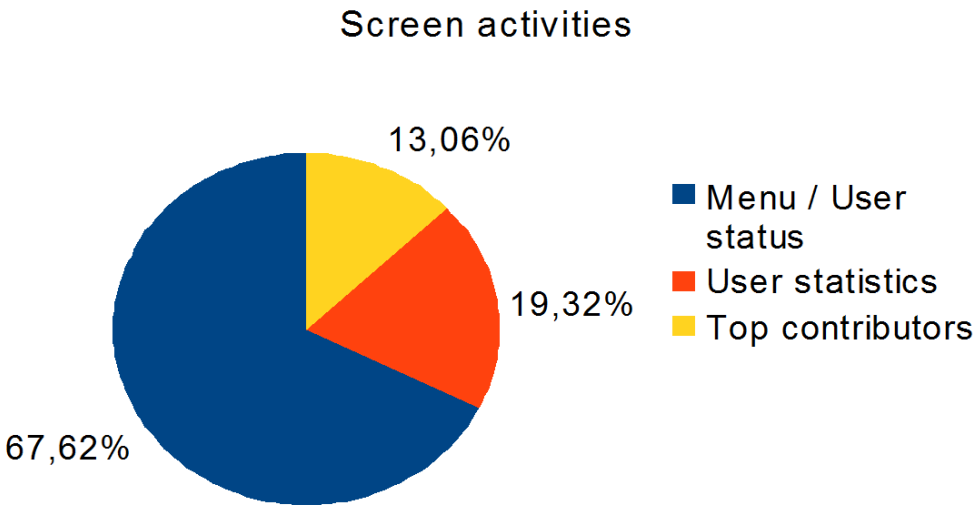

Figure 7.17: Screen activities

Chapter 8

Discussion and conclusion

In this chapter the results from the conducted user evaluation are discussed. The results are divided into sections that answers the research questions stated in the beginning of this thesis. Suggested implementation of the gamification attributes described and implemented in Contribution Achievements are also presented. Limitations and implications with this project are presented, followed by suggested future research. Finally a conclusion of this project is presented.

8.1 Research questions

The results from the user evaluation has given some insight and measures to discuss, and answers the research questions stated at the start of this thesis. This section addresses the research questions and are discussed in the light of the findings from the user evaluation.

8.1.1 RQ1

How can the theory of gamification be used in a collaborative learning application like Lingobee to make it more engaging and motivating?

Gamification is today used in many different types of contexts, and people have had both success and failure by introducing it to their system of choice to further try to reach their business / service goal. Gamification is the use

of game mechanics and attributes in a non-game context and is intended to motivate and engage the users of a given system, being either digital or in real life. Companies introduce it in grocery stores by presenting the workers with *employee of the month* to keep them motivated and engaged. In digital systems such as virtual communities the creators implement badges, levels, points and other mechanics to keep their users coming back for more. The main intent by implementing gamification attributes is mostly to be used as a motivational factor. It presents the users with both uncertain goals and visual goals, it provides them with milestones and gives them an indication that what they are doing, actually counts for something, being either positive or negative. But just implementing a point system is not enough for it to work. The use of gamification elements needs to be thought out thoroughly, and an appropriate game environment must be chosen for the given system.

It exists many types of game mechanisms that can be implemented in a system, and they all have an intended purpose. Different types of frameworks can be used based on what type of system you wish implement the chosen attributes in. Choosing to implement gamification attributes in a collaborative learning application, the attributes that can be implemented is the ones that bases itself on the users actions with the functionality the system has to offer. In Lingobee the users have the possibility to make use of the different types of functionalities such as contact other users, feedback to the developers, rate existing contributions, contribute with new posts, edit existing posts, update user profile and favor posts. The purpose behind implementing game mechanics in a systems like this, is to engage the users more. The goal is to design for engagement.

The functionality focused on in this thesis is Lingobees contribution functionality. Users can add posts and has the option to attach different types of media. By focusing on this, the game mechanics that can be implemented is the ones that has its foundation in user points. This can be divided into points based on:

- Contribution amounts.
- Amount of different categories the user has contributed to.
- Amount of audio attachments.

- Amount of image attachments.
- Amount of web-link attachments.
- Amount of flagged posts.
- Overall score accumulated from the above mentioned posts.

Achievements, points and leaderboards can all be implemented with Lingobees existing repository, and they all influence the users motivation in different ways.

Points are important regardless of whether the score is shared amongst the other users, and one of the absolute requirements for a gamified system [20], even if those scores only are visible to you as the designer. Tracking the users move and use is highly valuable for further development of the system. But points by themselves are not inherently rewarding. They can be a distraction if used inappropriately. The proper use depends of the reward schedule, which means when, how many and at what rate the points are given to the user, or taken away.

The purpose of the leaderboard is to make the users do comparisons of themselves against others. This is a feature that most people don't need an explanation for when presented to them. By default, when people see an ordered list with a score beside each name, they know what to look for and understand that it is a ranking system. There are two kinds of leaderboards largely used today.

1. The no-disincentive leaderboard - The user is put in the middle of the list. It doesn't matter if he is number 81 or maybe 998. Below him there will be other users who are on his tail, and above him he will see exactly how close he is to the next best score. By this he knows exactly what he needs to do to climb the ranks.
2. The infinite leaderboard - The leaderboard goes on and on, and no player falls of the leaderboard no matter how far down they are. When choosing this type, the designer needs to define how it should be displayed, i.e the leaderboard is displayed with a limited available view for the user, which can be an important tool in a system with millions of users.

Badges, also called achievements or ribbons by some, have been around for a long time. People desire badges of all kinds, and for many, collecting is a powerful drive which is deeply rooted in our brain. People enjoy the sudden rush of surprise or pleasure when an unexpected badge shows up in a system that has been gamified. It marks the completion of goals and the steady progress of use within a given system.

8.1.2 RQ2

How motivating towards further contributions can a gamification feature be when used in a collaborative learning application?

The initial hypothesis for this research question was that implicit competition drives, motivates and engages people in different types of context. It is a part of our evolutionary heritage, and triggers the same response in most of us [35]. To evaluate this, the chosen approach was to construct Contribution Achievements with attributes that uses the points game mechanism, and by that be able to present badges for user actions, set an user status and rank the users according to their points. This was done presuming that the users of the application will find the application motivating and engaging, and therefore continue contributing to Lingobee. Motivation and engagement are different from each other, but have the same underlying experience, and by introducing implicit competition to the application, it was possible to get an insight in both of them instead of just one.

Badges was implemented with the intended purpose of giving the users different types of goals to reach by contributing to Lingobee, and by that, engage them and give them the motivation for further use. It also provided them with direct feedback on their different types of actions, and gives them an indication on that what they contribute with, actually matters for the Lingobee community. These badges were based on the different contribution scores. Since Lingobee is based on the idea of collaborative learning, the users are the ones that keeps the application alive. Without contributions, the system has no meaning, and will eventually fail and further administration is useless. After testing the application, there was a positive increase in users posting in different categories, contribution amounts and adding media to their contributions. Badges was the gamification feature that had the most positive feedback, with 50% of the users agreeing or strongly agreeing that

they felt they wanted to achieve more when their user status was presented to them. 37.5% of the testers felt that the badges that focused on the users fixed action rewards had a motivating effect. But this was also the feature that had similar negative feedback by the two testers that were interviewed after the user evaluation. They both felt that the feature of checking other users badges needed to be restricted to either not viewable at all, or just the amount of achievements. By presenting other users achievements, they were able to lurk around and therefore get a view of what types of achievements that is available, and what they look like. Achieving a badge and by that see what it looked like was the motivational factor that engaged them within this gamification feature. The thrill of receiving a reward was gone when they knew what it looked like. All of the testers either agreed or strongly agreed that the names and design of the badges were clear and easy to understand. The design choice for the different badges made sense and were perceived as joyful and easy on the eyes, but more badges could have been implemented.

Points was implemented with the practical purpose of giving the users feedback on contribution amounts and their types of contributions. It gives an indication on what types of contributions an user favors, and implicit highlights the fact that there are other possibilities when it comes to contributions. The meaning attached to it for the gamified application is the feedback it gives. Are the selected user one of the few percents that actually contributes to a collaborative learning community, or is the user a lurker [10]. Half of the users agreed or strongly agreed that they felt the need to improve their overall score when it was initially presented to them. They felt it was easy to keep track of the different types of points and it was easy to understand what they meant. The two users that were interviewed stated both that the point feature somewhat motivated them, but after realizing how the overall score progressed, they somewhat lost interest. It was motivating to see what you were provided points for, and made them want to contribute with some attachments since the first contributions consisted primarily of just a simple word with a description. But if something were to be changed with the points feature, they both agreed on another calculation of the points, namely another reward schedule, and implementing points for the other functions that Lingobee has to offer. So by this feedback, the chosen reward schedule was not satisfying. Just adding one point for each type of contribution was not enough in the long haul. The rate that the badges was given was simple adjusted to be as minimal as possible. Users got a new

badge almost every other post, and this was done because of the length of the test period, and is easy adjustable.

The leaderboards main intention was to introduce direct competition amongst the users when it comes to the overall score, and the chance to view the other users statistics and badges. This gamification feature was implemented with caution, and only the top users were shown so that no focus on the users with few to none contributions are given. 37.5% of the users felt that they wanted to improve their ranking when they saw the leaderboard. When asked how they felt about competition, 50% answered that they like to compete. The question, why was it not 50% that answered that they wanted to improve their ranking after viewing the leaderboard stands after the user evaluation since the leaderboard can be seen as a direct motivational factor for those who like competitions.

> "The leaderboard motivated me, but it was far up to the top!".

This quote by one of the testers may provide some insight to that question. He felt that the score should not have been shown, and only rank and name. By doing this you would not know how many points behind the next person you are. Checking the leaderboard will then be engaging and exciting each time you have contributed with something, and by that motivating for further contributing.

Despite some negative feedback on some of the implemented gamification attributes, the overall impression of the mechanics implemented was on the positive side. 37.5% of the tester strongly agreed that they felt the gamified application gave them the motivation to continue contributing, and 12.5% agreed, while only 12.5% disagreed. The score could likely have been higher, given the chance to further develop Lingobee instead of creating the side module. Feedback suggested that using two different applications was somewhat troublesome and demotivating.

So if 50% of the users of a collaborative learning community agrees that using gamification attributes increases their motivation to contribute, and only 12.5% disagrees, it can be considered as a successful choice of game mechanics and gamification implementation. Being a system that normally has a lurker rate of 90% [2] or were under contribution is a problem [10], implementation of gamification attributes should be taken under consideration. The users

get value for their time spent, it increases their motivation, engages them, and are efficiently driven towards continued use and contributions.

8.1.3 RQ3

Did the test persons of the application with gamification attributes find it usable and useful?

This questions was chosen to give an indication of whether or not the use of gamification attributes had any influence on the factors of usability and usefulness of the application. The usability is a factor that could influence negatively through hindering proper use of the application. High perceived usefulness could also prevent the users from using the application less.

The feedback from the SUS questionnaire calculated the score to be 88 points after the user evaluation, which supports the statements and the statistics from the questionnaires answered by the users after the evaluation period. Using the SUS tool is a safe and valid way to show the usability of a system or application. It has been shown to effectively distinguish between the systems that are unusable, and those who are usable. The usability of the system was not considered to have a negative impact on the perceived experience of the system. There are few user interactions through input within the application, and 75% of the testers strongly agreed that it was clear and easy to understand and the rest of the testers agreed. So any negative experience of the application resulting in it being a demotivating factor due to any usability problems is unlikely. Feedback on the loading period suggested otherwise, but after implementing a loading screen with a progress bar that indicates that the system is working during this period, changed the users view about that.

The usefulness of the application was considered through evaluating the surveys and the contributions the users made during the test period. Half of the users either agreed or strongly agreed that the application gave them the motivation to learn more and to continue contributing, thus continue the use of Lingobee. This was one of the main intentions with the application. Although half of the users did not consider the application to be useful, which was a higher number than hoped, the response isn't necessarily a bad one being an online community which is driven on contributions, and a major

problem with that type of systems is under-contribution [10]. It might also not be realistic to expect full score on that question with this prototype since it is a side module of Lingobee. Feedback from the testers suggested that this would have been easier and more entertaining if it had been in the same application.

Another explanation can be the length of the evaluation period. There were no demands on how much they needed to use it, and how, so they were not forced into contributing. But they only had a certain amount of time, and it could have been a busy time for some of the testers. According to Google analytics which was implemented with the application, the users had an average of 24 sessions of the application during the test period, but 75% of these sessions belongs to half of the testers. Which is supported by the fact that half of the testers either agreed or strongly agreed that the system was useful.

8.2 Suggested implementation with Lingobee

The gamification attributes that is evaluated in this project and implemented with the application Contribution Achievements can all be implemented in Lingobee if the developers choose so. The current system architecture allows for the attributes to be implemented, but are not adequate when it comes to loading time. By making some changes on their servers, and adding methods for retrieving the necessary information, and / or adding columns that are intended for storing the statistics for each of the users, the loading period will be severely reduced.

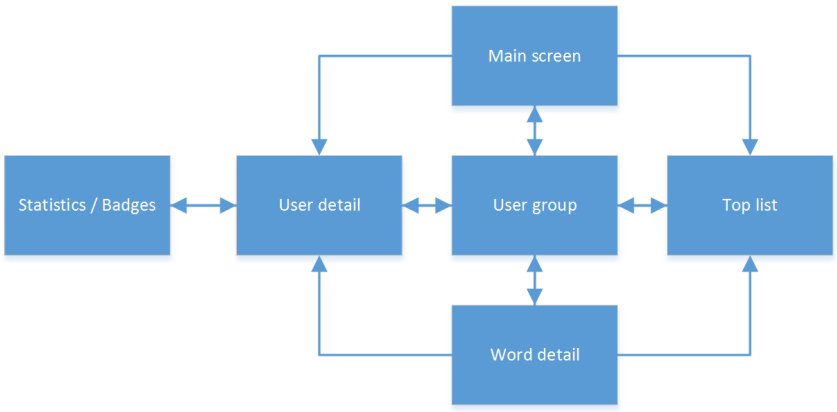

Figure 8.1: Suggested flow for gamification implementation in Lingobee

8.2.1 Screens

In figure 8.1 a suggested design for the screen flow of Lingobee with the gamification attributes implemented is presented. The *main screen* is the first screen which is presented to the user when starting the application, and from here the user can to go into the *user group* to view contributed posts. By entering the menu from the users device, the user is able to reach his/hers *detailed profile* presented in figure 8.2a. This screen is reachable from the menu button anywhere inside the application. From here the user can choose to see his own badges as displayed in figure 8.2b. A button displaying the logo of the Contribution Achievement application is displayed in the down right corner of the different screens, presented in figure 8.2a, which when clicked will take the user to the *top users* list in figure 8.2c. In this screen a set number of top users are listed. These users are, as in Contribution Achievements, click-able, and when clicked it will take you to the profile view in figure 8.1. Here the user can choose to view the other users badges, or a list of how many badges the user have achieved, depending on choices made from the result of this thesis.

(a) Detailed profile (b) Achievements (c) Leaderboard

Figure 8.2: Suggested screens for Lingobee

8.3 Limitations and implications

8.3.1 Method

Based on the data gathered in this study, the method of using surveys and doing interviews with the testers of the application seems to be adequate. Briony J. Oates [5] does recommend using three to six people when conducting interviews, but since the application was tested by people living in different cities, and only two of the users stood out regarding their contribution amounts and types, this was narrowed down to the lower end of that spectrum and the interviews where conducted over Skype[1]. Observing the users during the user evaluation through Google Analytics and the contributions being posted gave more insight in the perceived usability and usefulness of the application. The interviews were conducted to get a deeper insight in why some of the users chose to not engage themselves more in Lingobee, and answered a few somewhat unanswered anomalies, and were therefore considered adequate.

[1] A voice-over-IP service and instant messaging client.

The early testing was a simple task for the testers. Since Contribution Achievements does not have much user input, the possibility for it to crash or do anything unwanted are limited. The user evaluation went well. There was some questions about Lingobee, the privacy settings of installing non-market software, and what the concept behind it was, so this was taken into consideration and added to the website used for providing information to the users. Some experienced issues with the Lingobee server were encountered. A few of the testers had trouble of logging in during second week of the user evaluation period, so the time period was extended due to the loss of time.

The discussions and feedback provided by the early testers gave some very good insight in the form of discussions and agreements about the usability. Since they were previous participants in the same subject and had general knowledge about usability guidelines and android programming, they were able to agree in changes that needed to be made. The interviews with P5 and P6 also provided good insight in why they chose to do what they did with their time during the user evaluation.

8.3.2 Testers

The testers chosen for the user evaluation produced good data about the motivational effect of gamification. Their different backgrounds, age and knowledge about games and social media were highly wanted and highly appreciated. The main issue about the testers was the amount, which could have been higher for more generated data and by that better results. The number of volunteers to spend some time testing the application was quite lower than expected and hoped for. As anticipated, some were more active than others, more serious about their contributions, but that is how virtual communities and social media works. There will always exist lurkers.

8.3.3 The prototype

The prototype created for this project, *Contribution Achievements*, was created to explore the changes in motivation and engagements in users of Lingobee when introducing gamification attributes. The attributes of the prototype was created as initially planned, but with some modifications. There are some elements that can be used as statistics, e.g how many people has

favored your posts. But implementing elements like this will generate a critical high loading period due to new queries needed to be made, and therefore a change in the server architecture is a necessity. The prototype showed to be very usable amongst the testers, but the general negative feedback were almost the same from most of them:

> "The application takes too much time to load!".

This is an issue that can't be solved without editing the methods on the Lingobee server or retrieving information.

The prototype was developed with the mind focused on the findings from the literature review about gamification, gamification attributes, colors that motivate, usability and android guidelines, and therefore the color scheme is different from Lingobee. Following these guidelines and rules was of importance to give the users a positive impression and for the application to be easy on the eyes.

8.4 Future research

Gamification is still fairly a new concept when used in digital systems. Implementing it in a collaborative language learning system proved to be motivating, but the user evaluation period used in this thesis could have been extended both in time and amount of testers. A later study should use the data and conclusion derived from this thesis in a new study which lasts longer and has more participants.

Contribution Achievements is just a prototype, and further development will therefore consist of implementing the same functionalities in Lingobee. Other attributes that can be implemented can consist of creating a feature out of the rating functionality Lingobee already has to offer, implementing overview over the most favored contribution the current week, month or year, and the highest rated contribution that week, month or year. With basis from the feedback given during the evaluation period of Contribution Achievements, further development should consist of:

- Eliminating the loading time as much as possible.
- Implement more badges.

- Remove the option to see other users badges, and only view their amount of badges.
- Change the point system.
- Progress bar on badges.
- More unique badges.

This is the general feedback provided by the testers of the application. Many of the testers agreed on several of these, so they are noteworthy if further development of the application is to take place.

8.5 Conclusion

This thesis have presented a research of implementing gamification attributes in the collaborative language learning application Lingobee, and which game attributes that can be successfully implemented with Lingobees current repository and the effect they have on further engaging and motivating their users.

The gamified application, Contribution Achievements, was created as a side module to Lingobee. After a literature review of what gamification is and which game mechanics exists, elements such as points, fixed action rewards, and leaderboard was chosen for further study as they were the most popular choice of gamification attributes and therefore a possible attribute for implementation with the application(RQ1). These elements have been successfully implemented in other applications and services and are well known as the most basic gamification attributes.

The application was created as a native android application, and an user evaluation was conducted to see how motivating towards further contributions to Lingobee the chosen gamification attributes is. It was found that the newly implemented attributes was considered a motivational factor towards continued use by 50% of the participants from the user evaluation. The user status badges was considered to be the most popular feature implemented with 50% of the users either agreeing or strongly agreeing on it being a motivational factor towards continued contributions(RQ2), and as supported by the fact that 62% of the screen views during the user evaluation was this

feature.

The usability of the application was considered through a questionnaire and by using the SUS tool. It scored a total of 88 points whereas 100 is the highest and the average is a total of 68. 75% of the testers strongly agreed that the system was clear and easy to understand. A negative aspect that affects the usability of the application that presented itself during the user evaluation is that it was created as a side module, and not directly implemented in Lingobee. Direct implementation was not possible due to no open source code for the application, and therefore the choice fell on a side module. Half of the testers either agreed or strongly agreed that they found the application to be useful and provided them with motivation to continue contributing to Lingobee(RQ3), and was supported by the fact that 60% of the contributions made during the user evaluation period was after being presented with the gamification application.

The user evaluation showed that implementing gamification elements in Lingobee will increase the users motivation and engagement in the application, thus gamifying a collaborative language learning application can work as a positive motivational factor. The approach needs to be further assessed in greater user studies over time, but it is the authors perception that gamification of systems based on collaborative contributions from the users has great potential when it comes to motivating and engaging the users, and therefore provide them with the elements that make them continue with their contributions and come back for more.

Appendix A

Installation guide

Android has some security configurations when it comes to installing applications that are not approved for Google Play / Android marked. So to be able to install Contribution Achievements, you need to change a setting within your phone. What will happen then is that you are able to download and install applications that is not approved for Google Play. There is no reason to worry for this, and when the user evaluation period is over, you can just restore your setting back to normal.

Android 4.x

1. Click the menu button
2. Go to settings
3. Click on more
4. Click on security
5. Scroll down, locate âĂIJUnknown sourcesâĂİ and make sure it is checked.

Earlier android versions

1. Click the Menu button
2. Go to settings
3. Click in Applications
4. Make sure that âĂIJUnknown sourcesâĂİ is checked.

When this is done, you are ready to download Contribution Achievements. Just follow your phones instructions to install it, and log on with your Lingobee user name and password.

A.1 Screens

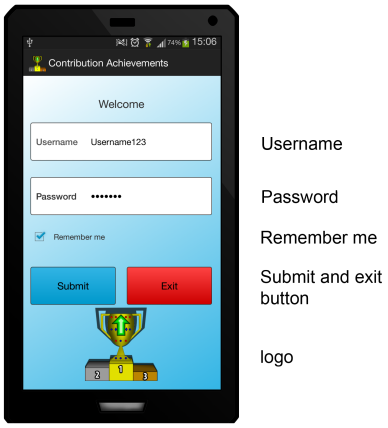

Figure A.1: Overview of main screen

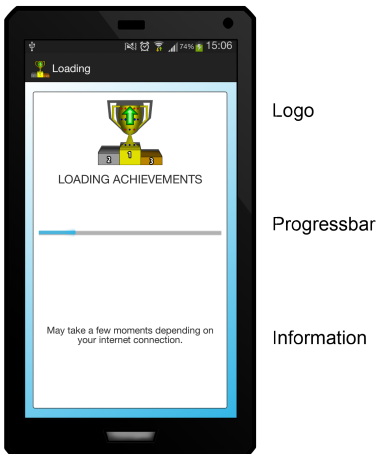

Figure A.2: Overview of loading screen

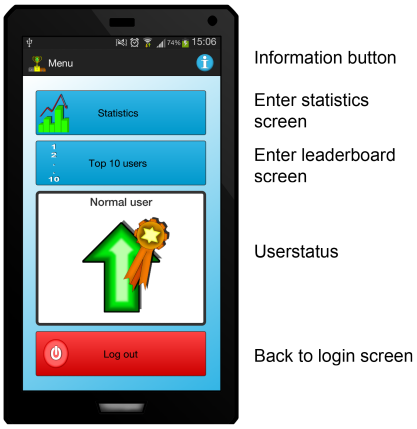

Figure A.3: Overview of menu screen

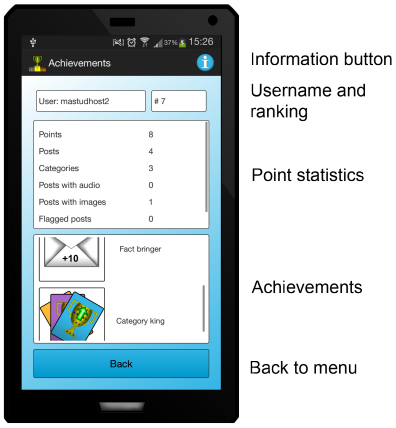

Figure A.4: Overview of statistics and badges screen

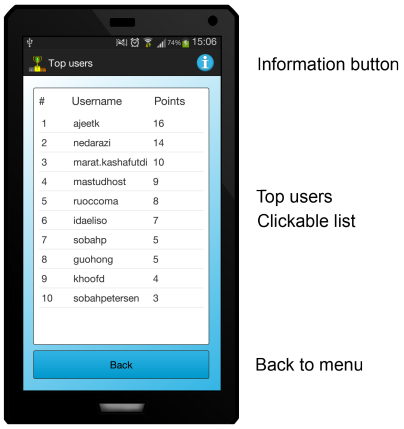

Figure A.5: Overview of top users screen

Appendix B

Contributions

B.1 Added words during user testing

Ord	Category	Image	Audio	Link
sløkkis	daglitale			
brunost	daglitale	x		x
tvslave	daglitale			

Figure B.1: Contributions ”Daglitale” category

Ord	Category	Image	Audio	Link
rypejakt	typisk norsk	x		
å gå langrenn	typisk norsk			
karsk	typisk norsk			

Figure B.2: Contributions ”Typisk norsk” category

Ord	Category	Image	Audio	Link
Rau sprut	mat og drikke	x		x
heimbrygga øl	mat og drikke	x		
kjøkkenmaskin	mat og drikke	x		

Figure B.3: Contributions ”Mat og drikke” category

Ord	Category	Image	Audio	Link
Sodd	annen			
20 speik	annen			
Å råne	annen			
Klein	annen			
Sjark	annen			
flæsk	annen			
sprut nerd	annen			
sjett peis	annen			
fettoter	annen			
Æ føle mæ så klar	annen			
krimbok	annen	x		
flæsk	annen			
Noob	annen			
vors	annen	x		
koking	annen			
ostehøvel	annen	x		
heimlagaburger	annen	x		
lørva	annen			
gomslork	annen			
på fetthåre	annen			
møsbrømlefse	annen			
tilbakestående	annen			
pumpe sjarken	annen			
hæstkuk	annen			
tættis	annen			
Skoiltlampætt	annen			
hæstkuk	annen			
sol	annen			
achievementhore	annen			
sau	annen	x	x	x
Kæltøka luggumt	annen			

Figure B.4: Contributions "Annen" category

Ord	Category	Image	Audio	Link
stinke digg	utrykk		x	
Klæbb	utrykk			
adventskalender	utrykk	x		
kjærre	utrykk			
Tussi	utrykk			
Godemt	utrykk			
kleimen	utrykk			
Kløne	utrykk			
Kløne2	utrykk			
kjæftsmurning	utrykk			

Figure B.5: Contributions "Uttrykk" category

Ord	Category	Image	Audio	Link
strømming	sport,vitenskap	x		
dekoder	vitenskap	x		
løfte skrot	kropp og helse			

Figure B.6: Contributions misc categories

Appendix C

Design templates

The blank phone image is drawn with Adobe Photoshop, and the screen shots are edited inn to fit the screen.

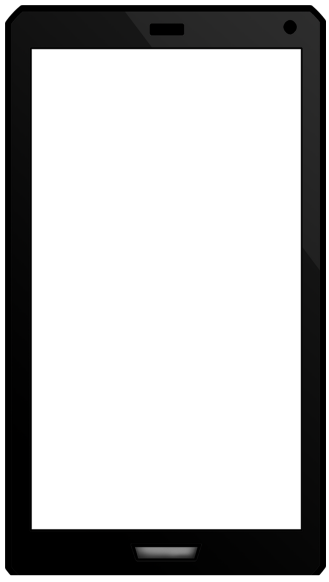

Figure C.1: Blank phone image

Appendix D

Questions from interviews

Questions were asked in Norwegian, and has been translated to English and transferred to the lists below for better viewing.

1. Do you feel that you were motivated to contribute with a post or continue contributing to Lingobee after trying my application?
2. How many posts did you create?
3. Did you feel an increase in motivation after seeing your points? Why / Why not?
4. Did you feel an increase in motivation after seeing your achievements / badges? Why / Why not?
5. Did you feel an increase in motivation after seeing your user status? Why / Why not?
6. Did you feel an increase in motivation after seeing the leaderboard? Why / Why not?
7. If you were to choose a game mechanic to implement, what would that have been?
8. What did you think of the visual representation of the application?
9. What did you feel was missing, and what could have been done differently?

Appendix E

Questions from questionnaires

Questions were asked in Norwegian at https://no.surveymonkey.com/, and has been translated to English and transferred to the lists below for better viewing.

E.1 User evaluation questionnaire

Questions were answered on the Likert scale with a value from 1 - Strongly disagree, to 5 - Strongly agree

1. I think I will continue using Lingobee.
2. I don't feel the application changed my view on Lingobee.
3. When I saw the top 10 users, I wanted to improve my own ranking.
4. I like to compete.
5. When I saw my overall score, I wanted to try to improve it.
6. When I saw my user status I wanted to try to improve it.
7. When I saw my badges I wanted to achieve more.
8. I feel that collaborative learning is an effective way to learn new languages.
9. I've learned something new using Lingobee.

10. I feel that the application gave me the motivation to learn more.
11. I feel that the application gave me the motivation to continue contributing.
12. I used the different functions Lingobee has to offer: Add new words.
13. I used the different functions Lingobee has to offer: Add new phrases / sentences.
14. I think the application was clear and easy to understand.
15. The icons were easy to understand and consistent throughout the application.
16. The connection between badges and their names were easy to understand.
17. The user status and different points were easy to understand.
18. I think the application was funny.

E.2 Badges questionnaire

What are the first *image* that enters your mind when hearing these words:

1. Points / karma
2. Post / Entries
3. Categories
4. Audio
5. Images
6. Web links
7. Flagged / downvoted

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