

Designing a language learning application utilizing cloze test and gamified features

Case study: Challenge Me application

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<p>Language education field has constantly developed with the increasing technological advances. Especially with the integration of gamification in language learning and teaching, creative and efficient solutions have been established and proved by various popular tools, platforms, and applications. In this thesis, the author seeks insights on the gamification and cloze test method, the target users' needs, and the process of designing a language learning application which provides valuable benefits for both teachers and students.</p> <p>The theoretical framework covers cloze test benefits, along with the effects of gamification in language learning, targeting the improvement of the Challenge Me application. The employed cloze test model in the Challenge Me application is affirmed to be productive for revising grammatical and vocabulary structures in different contexts. The method supports enhanced words memorization compared with isolated words learning technique. Next, gamified systems in language education increase learners' interest, engagement, and motivation. In turn, repetitive and tedious language grammar and vocabulary practice is transformed into an engaging activity with the effects of gamification. Furthermore, performance tracking and weakness identification are the highlighted advantages of gamification for students and teachers. Moreover, existing solutions in the current market are elaborated, clarifying the competitive advantages derived from the Challenge Me application.</p> <p>After that, quantitative research using survey distribution to language students along with qualitative research with various language teachers including the commissioning company and students are facilitated. Through the extensive user research, knowledge related to potential users' needs and wants, motivation and fears, gains and pains are revealed and discussed thoroughly. The valuable data aggregation and comprehensive analysis promotes the establishment of Challenge Me application essential features.</p> <p>The research serves as a solid basis for the product-based thesis of designing a Challenge Me language learning application whose values are aligned with the requirements and the principles discovered. Ultimately, the design of the Challenge Me application aims to tackle the current issues and brings innovative perspectives for the commissioning company Teacher Roosa Tmi., aiming at students' interaction, satisfaction, and performance improvement. The total time dedicated for the project is 300 hours during a five-month period as the project started from 1 June 2020 to 28 November 2020.</p>	
Key words Gamification, Cloze Test, Design Thinking, Language Learning Application	

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List of Abbreviations

RQ	Research question
UX	User Experience
EM	Empathy Map
VPM	Value Proposition Map
DT	Design Thinking

1. Introduction

Nowadays, learning a new language is extremely useful for people to achieve various purposes such as studying abroad, seeking a job, communicating, etc. However, there are challenges in language education related to learning and teaching dimensions such as lack of interaction, deficiency of motivation, along with other difficulties. Interactive sessions are significant because the concept encompass development of an enjoying environment through interaction with peers and consideration of students' perspectives through interaction with teacher (University of Virginia Center for Advanced Study of Teaching and Learning 2020.) Furthermore, motivational support is a crucial quality and a challenge in facilitating successful lessons. Tackling the difficulties, teachers and students consider abundant methods including inducing educational competitiveness (Adil 2020; Stevie 2020.) Therefore, teachers and students need a solution which brings about more engaging, trusted, fun and motivated learning experiences. Especially with the increased utilization of online learning, it is important that teachers and students achieve better connection, engagement, and interactivity.

At present, there are abundant language learning applications available in the market such as Duolingo, Kahoot, and Quizlet. However, the big competitors in the language education industry acquire downsides related to the application operation, introducing adverse effects into language learners' acknowledgement. Few disadvantages utilizing the current applications include the lack of peer and teacher interaction and outdated language teaching method in Duolingo (Rego 2015, 9), prioritization of speed over quality (Beverly Highlights 2018) in Kahoot and limited teaching method in Quizlet. The common quality from the renowned application is gamification integration, which concentrates in solving the core problems in language education faced by students and teachers regarding interaction and motivation. Furthermore, effective language teaching methods such as cloze test must be contemplated for the usefulness advancement of the application development.

Therefore, the thesis aims at designing a digital solution utilizing cloze test practice method and gamified features for the current language education problems encountered by students and teachers. By designing a language learning challenge application utilizing gamified experiences, students enjoy a trusted, fun, engaging, and motivated learning environment whereas teachers can support students and increase student interactivity.

The cloze procedure approach maintains as the crucial distinction and differentiation quality of the Challenge Me application in comparison with the competitors. The digital solution is known by the Challenge Me application, which serves as the future use case and helpful tool for the commissioning party Teacher Roosa Tmi.

1.1. Research objectives and deliverables

The product-based thesis targets at developing a solution for language learning students and teachers by designing a language challenge application utilizing gamified experiences and cloze test, where students enjoy a trusted, fun, engaging and motivated learning environment. The research goals for literature review aim at revealing the importance of cloze test, gamification, and design thinking philosophy while the objectives for user research uncover potential users' needs and wants. The digital solution design represents a foundation for developing a useful application which benefits teachers and students in the commissioning company. The writer of the thesis will be able to formulate, research, test and verify the digital solution for language learning to validate if the current issues in language learning methods are tackled with the digital solution. The writer can relate to early user testing results to identify the needs of the product, as well as initiate iteration cycles to create a more user centric design. The concrete results of the project are producing high-fidelity prototyping of the language learning application which acts as a tool for increasing connection, interactivity, motivation, gamified experiences, and lesson quality for both teachers and students. Additionally, user research surveys and interviews, needs mapping methods as well as usability testing results will be created and verified during the project.

1.2. Research questions

The theoretical framework unfolds cloze test benefits, along with the effects of gamification in language learning. After that, quantitative research using survey distribution to language students blended with qualitative research with Teacher Roosa Tmi, language teachers and students are carried out. Through the extensive research, knowledge related to potential users' needs and wants, motivation and fears, gains and pains are evaluated. The valuable data aggregation and analysis promotes the establishment of Challenge Me application essential features. The research questions which navigate the theoretical framework and research process include:

RQ 1: How is cloze test efficiency applied in the application?

RQ 2: How is gamification applied to improve the application?

RQ 3: What are the users' needs and how the application tackles them?

1.3. Thesis scope

The thesis scope mainly focusses on designing a language learning application which brings advantages and satisfies the needs of students and teachers. Theoretical framework emphasizes the efficiency of cloze test and the application of gamification methodology in language education. User research conducted with qualitative and quantitative data collection reveals insightful knowledge related to target users' needs and wants. Based on the groundwork of research findings and literature review, design thinking philosophy is utilized for tackling, defining, ideating, and iterating of a digital language learning solution known as the Challenge Me application.

There are 232 respondents to the survey for students for quantitative data while a total of six students and five language teachers including the commissioning party were interviewed for qualitative data. Most of the language learners in the data collection phase studied, have studied, or are currently studying Finnish language. The conducted time frame for survey lasted from June till August 2020 and interview process started from August to October 2020. The survey was distributed through Google Survey platform while responses were collected from the Facebook group for Finnish learners. The Interviews were implemented mostly through Zoom and Google Meet. Concerning the total time spent, 300 hours have been reserved for the project. Other budgeting matters are agreed separately between the thesis writer and the commissioning party. The starting date of the project is 1 June 2020, and the ending date of the project is 28 November 2020. Activities and objectives which do not belong to the project include application coding with different programming language stacks, user research nonrelated to language learning challenges and solutions, design work nonrelated to the digital solution for language teachers and students, design work which are not approved by the commissioning company.

1.4. Thesis structure

The structure of this thesis is divided into four key chapters, ranging from introduction to building theoretical framework, primary research methods, and the final application design implementation (Table 1).

Table 1. Thesis structure

Chapter	Name	Main contents/goals
Chapter 1	Introduction	Elaborating on the background of the product design. Additionally, the author identifies research objectives, research questions, research scope and thesis structure.
Chapter 2	Theoretical framework	Providing a theoretical framework regarding cloze test efficiency along with gamification effects.
Chapter 3	Research Method	Discussing data collection and data analysis method
Chapter 4	Application Design	Design implementation based on discovered requirements from the research process and the application of design thinking process

2. Theoretical framework

In the language education dimension, the application of cloze test is common for implementing examinations and assessment of students' performance while gamification is integrated to provide advantages to students in terms of motivation, incentives, encouragement, and good habits nurturing. The chapter is dedicated in elaborating the background history, rationales and perspectives regarding cloze test method and gamification approach in language learning.

2.1. Cloze test in education

Cloze test procedure as a measurement tool in the classroom, which dates back from the 1950s, is created based on "closure" philosophy from Gestalt school of psychology. The "closure" theory established by Gestalt elaborated on the psychological functionality of human brains when seeing missing elements as they recognize the subject as a whole and attempt to fill in the blank spaces based on past knowledge. During the process of closing the gaps, humans recall missing information from memory while conducting reasoning abilities and critical thinking skills to fulfil the subject (Walter 1974.)

Regarding the variety of cloze tests, at least five categories of cloze tests were introduced in language education: fixed-rate deletion, selective deletion also known as rational cloze, multiple-choice cloze, the cloze elide and C-test. Of the mentioned cloze methods, it is critically effective and reliable for language learners to experience selective-deletion cloze tests where specific word elements are omitted from the text passage by the tester's intention. The rational cloze method assists in assessing the grammatical and vocabulary knowledge simultaneously, permitting language teachers to adjust the difficulty level of the exercises. Researchers confirmed that the implementation of selective-deletion cloze test increases the trustworthiness of test results compared with other methods as well as saves a tremendous amount of time for teachers (Hadley & Naaykens 1997, 112.)

The abundant advantages from cloze test for language learners are presented by Ross (2017) in three major sectors concerning social elements combination, natural context delivery and practice effectiveness. Firstly, cloze procedure contains authentic information from surroundings related to cultural environment and social behaviour. Research completed by Ahluwalia (1993, 83) indicated that cloze test is a common means to assess language competence based on the combination of cultural, linguistic, and social aspects.

Secondly, exercises with cloze process project a more natural context for learners to comprehend (Ross 2017.) Specifically, context is defined as the environment constructing the language. The lexical and grammatical structures of language are involved in its context of culture whereas language in use such as texts, sentences, paragraphs, and speech are operated within context of situation (Ghadessy 1999, 3-5.) Language contextual meaning encompasses the relevance and correspondence between the inner language structure and overall situational context. Not only does it involve the linguistic dimension but also concerns social and cultural aspects (Ibrahim 2008, 165.)

In traditional textbooks, language structure is presented in single words or single sentences which are in isolation without any prior contexts. However, explanation of lexical and grammatical systems should be accompanied with language usage references, rather than in isolation (Ghadessy 1999, 10.) Context in language can be spotted in situation and communication, which contains certain components such as location or situation settings, participants, conversation or discussion topics in speech or writing (Ibrahim 2008, 165-166). Thus, contextualization approach helps improve language materials and enhance learning coherences by applying situational themes such as “in the restaurant”, “in the hotel” in the exercises (Ghadessy 1999, 10).

Language exercises implementation should emphasize natural language absorption rather than segregate language practice into isolated and random sets of separate subjects because words isolation brings about adverse effects (Bright & McGregor 1976). The primary issue in studying isolated words is the fading memory after a brief time interval as vocabulary is not visualized in various use cases. Learning new words in context is confirmed to be more compelling since learners acknowledge the context of use and will be able to embed words in speaking or writing sentences. It is proven by researchers that words provided with detailed history behind the meaning and extensive information of applied context are memorized longer. Additionally, there are words which go together to create common phrases and collocations. It is important that the phrases and collocations knowledge is thoroughly gathered and revised. Isolating words will result in meaning segregation for common phrases and collocations, which diminish the language learning productivity. Especially, the habit of guessing word meaning when listening or reading is nurtured by learning language through context. With the urge for guessing and seeking word definitions, the memorability after searching for dictionary meaning is strengthened and fastened (Basic English Speaking 2020.) Based on the findings, the context-based learning approach which cloze test embraces is proved to be efficient in various aspects such as vocabulary assimilation.

Finally, teachers and students find cloze test exercises type to be timesaving, effective, and especially, flexible in needs tailoring (Ross 2017). An experiment completed by Tremblay & Garrison (2010, 77) assured the practicality of the cloze test as students' completion time interval is 35 minutes in total. With time efficiency characteristics, cloze test is considered the effective tool for measuring second language performance for adult learners.

Not only are the core benefits stated by Ross (2017) are achieved when implementing cloze test, but integration of different skills identified by Guangling (2006, 19) is also a valuable highlight in language learning assessment. The cloze method has been widely used in different language tests as it is announced to be effective in measuring language proficiency. When testing with cloze procedure, a variety of language skills such as reading, writing practice, grammar structure revision, vocabulary absorption is integrated within the method. Cloze test facilitation enforces learners to utilize the capability of combining vocabulary, grammar, lexical, meaning cohesion and prior experiences to successfully overcome the test. The integration of cloze test is consequently revealed as it unites different language components to form a purposeful context of learning (Guangling 2006, 19.) During an experiment, utilizing "passage-completion" exercises based on cloze test features for measuring students' reading level, Helfeldt, Henk and Fotos (1986) fruitfully figured out the learners' performance and advised teachers to adjust lesson planning based on cloze test results.

Utilizing in college settings, an experiment related to cloze test procedure in testing participants' language fluency exhibits the cloze assessment validity, reliability, and proficiency classification. Concerning the cloze test validity, the score results retrieved after the cloze implementation were corresponded with the French learning experiences of participants. The consistency of the test results in the classroom refers to the noticeable reliability for language proficiency measurement. During the cloze test results discussion, it is interesting to note that there is a wide range of scores generally and exercise-specifically recorded in a variety of participants in different levels. The findings indicated that the classification and level categorization ability of cloze test is correlated with the language levels fluctuation (Tremblay & Garrison 2010, 84-85.)

In contrast with the beneficial perspectives, there are claims that cloze exercises create dissatisfaction, distress, and discouragement for the students. Several disadvantageous attributes of cloze test including insufficiency of grammar and vocabulary, lack of fluency

in synonyms and prepositions along with failing text structure comprehension are the core cause of students' frustration. The various fulfilling preconditions for understanding and undergoing cloze test suggests that cloze test might not help students in incrementing reading competence under specific circumstances (Guangling 2006, 30.) According to the research organized by Zou (2016), while filling in the blank of a passage based on context data, students frequently focus on the micro-context within the sentences instead of the macro-context reflected through the connections of the paragraph delivered in cloze test. This results in the negligence towards the overall meaning provided as "sentences without blanks" are omitted from learners' acknowledgement and difficulties in recalling paragraph content for learners. Therefore, reading comprehension skill utilizing cloze test is limited depending on learners' prior learning, knowledge, and performances. Context clues found in cloze test contribute as an efficient technique for learning vocabulary if explicit strategy is conveyed to the students. It is advised by the researchers that the context of reading or speaking should be familiar to the learners while the majority of surrounding vocabulary are comprehensible through prior learning (Karbalaeei, Amoli & Tavakoli 2012, 74-75.)

Furthermore, another disadvantage from cloze test is the lack of proactiveness in establishing contexts based on the given vocabulary, meaning that the production skill of texts and paragraphs is not practiced and improved (Zou 2016). Besides, cloze procedure also demonstrates limitation in aural or oral skills level assessment. The deficiency in speaking skills judgement is an obstacle when cloze test practice is planned. Researchers advised one solution for the problem is to integrate a cloze test with listening and oral assignments. The variety of practice concerns listening comprehension tasks and read-out-loud exercises blended with cloze method application (Tremblay & Garrison 2010, 84.)

2.2. Gamification in language learning

Gamification trend has been introduced since the 80s and implemented in various industries on a large-scale basis. The Gamification concept is defined by Werbach and Hunter (2012, 26) as the application of game elements, systems, and techniques in non-game circumstances. With regards to the gamification concept, it is critical to fully comprehend the meanings of game elements and non-game context to further precisely analyze the influence of gamification on specific subjects. Sailer, Hense, Mandl, and Klevers (2013, 29-30) shared their perspectives that the game refers to a situational setting with goal determination, rule guidelines, immediate feedback cycle and voluntary users' participation. Whereas game environment emphasizes on the serious playing for entertainment and achievement purposes, game elements produced by gamification

influence are introduced in non-game contexts with specific features usage, aiming to apply the positive game patterns such as motivation and dedication (Sailer et al. 2013, 29-30). Human psychology discovery along with the game industry accomplishment suggested that gamified tasks implemented in different industries construct advantageous effects towards the users involved (Osipov, Nikulchev, Volinsky & Prasikova 2015, 76).

Gamification employs various game components with the aim of boosting motivation for users in non-game environments (Domínguez et al. 2013, 2). Sarah Smith-Robbins (2011) specifically stated that there are three fundamental components in every game design which are clear and definite goals established in accordance with levels awareness, obstacles of enhanced difficulties served as educational tools for assignments, homework, tests and finally, collaboration and competition among platform users. Explicitly discussed about collaboration and competition factors in gamification, there are two types of games commonly comprehended among players. In the first game genre, users would dedicatedly defeat their opponents to claim the first position as a winner whereas the other game type requests users to completely beat the system and overcome challenges, also acknowledged as beating your previous self. The characteristics of two game types are associated together, forming an enthusiastic and dynamic platform, promoting users' efforts to overcome challenges while earning scores and defeating peer players (Florczyk 2012.)

As the ultimate implications of game elements implementation are advancing the non-game environment such as theoretical concept embellishment, education training programs and industry-specific guidance, understanding in-depth components of game design patterns is critical. Such integral compartments can be found in various common gamified principles, including points system, rewarding badges visualizing users' achievements, positions and levels, leaderboards illustrating users' ranking compared to peers, personal progress and review charts, main challenges and quests, avatars and social network features (Flores 2015, 39.) During the process of perceiving and embellishing social appearance and interactions in a gamified environment, people experience a spectrum of feelings in different aspects naturally, which advocates the use of social responses to gain specific objectives regarding learning, sharing, empathizing and exhibiting (Fogg 2002, 89). With the basis of game environment attributes, Malone and Lepper (1987) suggested that to flourishingly develop the gamified system for non-game context, four certain dimensions contributed to the system foundation concerns challenge, curiosity, control, and fantasy. Furthermore, Flores (2015, 38) pointed out the incorporated gamified aspects contributing to the positive changes in users' behaviour

consist of leaderboards, immediate feedback, rewards system, incremental levels unlocking, etc.

Users experience improved motivation level through gamified features. By fortifying the performance of tasks conducted with gamification, users' participation percentages along with motivation towards certain goals are vividly increased. Constant engagement and incentive supplies facilitated by the gamified process provide users with consistent motivation throughout the training or learning procedure, encouraging them to achieve better than previous performance (Flores 2015, 43.) Gamification characteristics in combination with motivational advancement are the compelling elements for inspiring users to utilize the system more frequently in a longer time interval (Osipov et al. 2015, 72). The gamified platform attractiveness promotes regular return of users, also known as retention cycle (Osipov, Volinsky & Grishin 2014, 12). In the dimension of education, gamification thrives as a modern and innovative instructional tool which is recommended by professional educators for online learning improvement. A pilot educational program was launched consisting of gamification software declared in the report analysis that the percentage of students' results improved moderately while the proportion of students' test failure diminished significantly (Flores 2015, 42.)

Adapting to the researched beneficial principles of gamification, e-learning system architecture is founded and investigated by Osipov et al. (2015, 72-73), targeting the enhancement in students' participations, skills drilling, and mastery based on the provided materials quantity and quality. During a conducted experiment, an e-learning application was deployed using core features of gamification including a time exchange system where users acquire limited minutes for learning and teaching, lessons displayed in sequence which permits users to unlock higher level lectures, achievements and badges vividly placed near username and peer evaluation to fortify internal communication such as likes or dislikes.

Results of the study implied that gamification is a potential methodology for supporting motivated and engaging education as well as upgrading the assessment system quality. The gamified tools applied in the e-learning system were validated to be effective in high quality education coaching delivery as well as extremely potential in statistical analysis which assists researchers and lecturers in assessing pedagogical planning. According to the study findings, the platform integrated with gamification features not only appeals to a variety of users in different backgrounds and levels but also preserves the communication dialogues among users. Motivation goals set for the gamification implementation were

fulfilled as the user's retention cycles appear to be at an optimized stage. Related to the training materials developed in the e-learning platform, professional teachers were enlisted to conduct materials enrichment based on verified and credible sources. With the convenient and detailed materials planning, students were dedicated to practicing language learning without the lecturing from on-site teachers while still producing standardized results. It is noteworthy that the completed experiments strongly confirmed and recommended the collaboration of users in studying within the e-learning system as external social factors were put into effect generating the fascination boost for students to work together. Hence, inviting friends to join the learning process is one of the most necessary attributes for a majority of users (Osipov et al. 2015, 73-74.)

In an experiment implemented by Florczyk (2012), researchers pondered at the opportunities for utilizing the effect of gamified principles in designing language learning models for Polish. Specifically, in the experiment with input as the Polish language education system, the challenges were split into seven sub-themes in which lesson materials were broken down to simpler and smaller issues such as different types of noun inflection. The disintegration of challenge goals helps divide the knowledge into bite-size chunks while boosting the knowledge absorption and urges to overcome hindrances (Florczyk 2012.) Gamification applied for educational goals requires system users to utilize their knowledge and reach certain learning objectives which are divided into smaller themes and subjects. The segregation of educational topics not only optimizes the lessons organizing and distribution structure but also creates a game-like environment where users act as game players putting efforts in passing levels. The pedagogical approaches with motivational elements incorporation require students to understand and complete different levels of educational themes, units, or modules to move forward during the learning process while experiencing interesting and motivated events. It is especially increasingly effective when the segregated themes range from low to high level of difficulty as well as the amount of time dedicated for the higher-level unit of study gradually increases. Through the challenges accompanied with gamified experiences, students acquire a motivated attitude towards learning while their fluency of knowledge or language is nurtured simultaneously (Flores 2015, 43.)

In addition, important aspects in the learning platform utilizing gamification are fantasy and control. The gamified tasks become more fascinating with suitable plotlines or with intriguing context structure from creative language materials in the experiment case. The experiment concluded and verified the purposes of gamification through students and teachers' viewpoints. By implementing the gamified platform model for teaching and

studying, teachers gain control over the vital information needed in lecturing sessions based on students' preferences while students exhibit positive traits of improved motivation and proactiveness. The control and supervision responsibilities of teachers during the gamified activities are essential because of the assuring, trustworthy and comfortable feelings provided to the students (Florczyk 2012.)

3. Research methods

Research is conducted to understand users' needs and wants related to language education, exercises, and gamification through primary data collection. Consequently, the obtained results are utilized to verify the design hypotheses stated in the design phase. The relevant steps include facilitating user research planning. A different set of research tools are efficiently incorporated in the process such as Google survey, Zoom interview, Whimsical and Figma prototyping software, Miro for online collaboration space, etc.

3.1. Data collecting method

Collecting data by asking the right questions can help reveal qualitative and quantitative data and can be applied for a large number of participants within the study scope. User research methods vary greatly in different phases of the process. Furthermore, the techniques decided for the user research depend on the research questions type. For early design stage where background requirements need to be collected from different potential users, methods such as surveys, observation, focus groups, interviews, card sorting, and personas are utilized for maximized benefits (Phillips 2020.) The research utilized both qualitative (user research and usability testing interviews) and quantitative methods (survey).

With focus interviews, qualitative data are achieved to assess the highest values of the solutions or features. In the next stage of design and development, different methods are put into action including prototyping, usability testing, and task analysis. Usability testing is considered an ultimately beneficial tool for testing the solution efficiency based on reality-like scenarios (Goodman, Kuniavsky & Moed. 2012, 259.) Face-to-face interviews with key students and teachers were implemented during the user research phase. Interesting and useful qualitative data was gathered and prioritized utilizing data collection method for further investigations and analysis. After the prototype was launched and tested with crucial participants, usability testing method involving interview potential users was implemented. The interview data were collected analysed carefully to identify the prioritized feedback.

The questionnaires facilitated within a survey enables researchers to collect quantitative responses in a structured format without having to directly converse with many respondents. Moreover, the survey method is substantially cost-effective, time-saving, and useful for implementation in a large geographical area. It is especially notable that the

survey method is efficient in eliminating the emotional or personal biased elements from the researchers, allowing the respondents to give more honest and truthful responses. Online surveys are most useful and widely used because they are largely flexible, fast, timesaving, cost-efficient as well as powerful in data collection and analysis. Additionally, questionnaires are advantageous because researchers can apply two types of structure within the survey, which are closed format questions, allowing respondents to be fast and quick, or open format questions, promoting the freedom of content from participants (Walliman 2011, 8.) Online surveys distributed to students during the research was originally created with Google Survey software, prompting trustworthy data collection related to language learning in visualizations such as charts and graphs.

In particular cases, conducting interviews is more effective than facilitating questionnaires because of the constraints in questionnaire establishment. In some circumstances, interview methods produce more thorough information within a suitable scope of research. There are three types of interview methods, namely, structured interviews, unstructured interviews, and semi-structured interviews, demonstrating a large collection of options. Choosing the most suitable interview type will generate useful qualitative data. Especially with face-to-face interviews, researchers can apply the observation framework into the methods and collect the appropriate and helpful responses (Tyreman 2020.) Hence, interviews with potential students and teachers were conducted in combination with students' surveys.

Research needs to be conducted with key people involved in the process. During the facilitation of questions, a number of good questions which bring about interesting perspectives can be turned into bad formulation with factors from outside. There are several vital elements which help prevent the damage of bad questions during the research process including leading questions, shallow questions, personal bias, unconscious bias. Leading questions can create damaging effects to the research and data collection. If the questions are asked with details from researchers' desires, participants tend to produce the misleading answer even though it does not apply to them since they are prone to assist during the interview. Therefore, it is crucial that the questions are not leading and biased so participants can provide correct values from their individual experiences. Next, shallow questions can be reflected from the yes/no question model which is recommended to be avoided during the research. Shallow questions provide little or no values to the data collection because yes/no questions can easily be tackled or dismissed without in-depth thinking and valuable insights from customers. Yes/No questions should be transformed into open-ended questions to obtain more

insightful understanding of customers' behaviour. Finally, biases exist in many forms, particularly they are displayed as personal bias and unconscious bias in the user research process. It is essential that personal thoughts and perspectives are completely removed from the research process, instead the questions should remain subjective and taken from other main viewpoints such as customers' opinions, products offering aspects, stakeholders' angle. While personal bias is easier to recognize, unconscious bias is more difficult to be distinguished as they are a combination of personal experiences, social norms and cultural expectations blended in our mindset. Unconscious bias blocks researchers' understanding from recognizing the differences between their own situations and others' circumstances. Therefore, it is critical to contemplate the research questions to recognize the unconscious bias implied within (Nunnally & Farkas 2016, 20-21.) The research questions must encompass subjective perspectives instead of leading questions, shallow questions, personal bias, unconscious bias. Different user research and usability testing questions adapting the principles can be observed in Appendix 1, Appendix 2, Appendix 3, and Appendix 4.

3.2. Data analysing method

Collected qualitative data are analyzed based on affinity diagram method also known as affinity chart, K-J method and thematic analysis. Using affinity diagram, the thesis author is able to organize a huge collection of brainstorming ideas or research results into a meaningful order. The major characteristics of affinity diagram are grouping ability according to the similarity of ideas. The method originally formulated by Japanese anthropologist Jiro Kawakita in the 1960s (ASQ Quality Press 2020.)

Grouping and categorizing data in specific themes are the key purpose of affinity diagrams. There are several helpful themes for categorization of UX data including producing answers to research questions, frequently encountered topics and summary of information. Specific steps for creating an affinity diagram are elaborated to demonstrate a clear perspective on the method. Firstly, recordings of ideas, data or observation based on the questions defined is crucial. Next, the mapping facilitator figures out the grouping pattern among the ideas and data provided. Each idea should be organized into groups and themes which share similarities. Finally, each theme created is given a name or a summary based on the content also known as key insight in UX research (Naylor 2019.) Based on the findings, the thesis author grouped the information in specific themes as observed in tables in appendices (Appendix 19, Appendix 21 & Appendix 22). The voting number refers to the number of times the ideas were repeated, specifically, only when the

number of votes equals or exceeds 2 did the author note down. The approach mainly emphasizes the prioritized insights.

4. Application design

Design Thinking (DT) philosophy and methodology concerning process, efficient mapping methods and prototyping procedure are applied in the application design process. Along with the foundation of the theoretical framework regarding language learning and gamification, the application provides solutions which are aligned to the values and principles discovered. The DT process encompasses five essential stages involving empathizing, defining, ideating, prototyping, and testing (Interaction Design Foundation 2020a). Additionally, case description regarding the commissioning company and competitive advantages deducted from the existing solutions are elaborated.

4.1. Case description

The application is designed originally as an entrepreneurial idea with the aims of helping create a trusted, fun, and engaging environment between students and teachers. During the implementation of thesis research, the thesis author encountered with an enthusiastic, motivated, helpful, entrepreneurial, and skilled language teacher who works as a private trader in the field of language education known as Teacher Roosa Tmi. Roosa is a Finnish teacher who currently lives in Melbourne, Australia. Teacher Roosa is an entrepreneur in the field of language education, specialized in teaching Finnish languages and primary school subjects via online and onsite platforms. She attained master's in education from Finnish teacher education and has worked as the primary school teacher and Finnish language teacher. Combination of cultural knowledge and language education as well as game-based teaching efficiency are employed in her teaching methods (Teacher Roosa 2020.)

The private teacher presents thorough understanding and interest in the project, demonstrating her professional assistance with expertise knowledge during the user research and usability testing phase for the design establishment of the product. The thesis author contacted Teacher Roosa for commissioning of the Challenge Me application as the application aims to provide an innovative method for teachers to improve lesson quality for the students. Teacher Roosa comprehended the mission and vision of the application and agreed to commission the thesis project as it would provide advantages for her future teaching methods. Therefore, the application will be utilized as the future use case and assistant tool in Teacher Roosa Tmi.

Concerning communication between the commissioning party and the thesis author, online video conferencing via Zoom and Google Meet and regular email exchange are the most common methods. The communication takes place weekly during September and in addition meeting or information request can be organized in advance. Since there is a huge time difference between Finland and Australia, the meeting period usually happens during daytime at 9am. The purposes of the meeting mainly focus on articulation of the commissioning party's teaching methods and materials, needs and wants based on the product design, expertise advice for the design process, crucial interviews related to user research and usability testing as well as concrete feedback regarding the thesis conduct.

4.2. Existing solutions

Competitive edge with competitors' applications are essential to be implemented in the application since there are a number of strong competitors in the field of gamified language education applications. The biggest competitors which are operating in the industry consist of Kahoot, Quizlet and Duolingo as they are frequently mentioned by the interviewed students and teachers (Appendix 19 & Appendix 21). The detailed findings concerning the competitors' game structure, e-learning model, gamification integrated elements, benefits for students and teachers if presented along with disadvantages of the applications are clarified in the sub-chapters. Through the investigation, competitive edge for Challenge Me application when brought into comparison with the big players are uncovered with potential opportunities for the product to thrive in the current market scenarios.

4.2.1. Duolingo

Duolingo was repetitively referred to by interviewed students as the most favourable application for language learning (Appendix 19). According to Duolingo (2020), the application is currently the most preferable language education tool with over 300 million users, emphasizing on free usage, fun learning with gamification and accessibility to all language learners. Other than the fascinating and efficient implementation of gamified elements in Duolingo, the application encompasses diverse practice exercises types, focusing on translation such as translating sentences into the native tongue, dictating audios and pronouncing specific sentences (Munday 2016, 87).

The gamification principles in Duolingo are applied thoroughly, highlighting elements such as mechanics, aesthetics, feedback, and level of progress. The mechanical factor refers

to the clarified rules through the level advancement. The user experience is emphasized with visualizations helpful to the language learning process, illustrating the aesthetics side. The instant feedback after exercises completion is considered one of the most crucial constituents in gamification (Rego 2015, 5-6.) Users can immediately observe the results as incorrect or correct after fulfilling the questions. The visual cues for feedback interface embellish meaningful responses to the users, such as the green text reflecting encouragement for correct answers and “You are correct!” as a positive indication (Karjo & Andreani 2018.) Level progression is integrated by segregation of topics, requiring users to unlock a certain level before advancing. An alternative way to overcome challenges is taking a test as a shortcut to have the prior knowledge evaluated (Rego 2015, 9.) Other than the four factors for measurement, Duolingo is famous for the streak count, boosting motivating and exciting gameplay atmosphere. Depending on different learning intensity, a variety of XP known as platform virtual money are given to the users. For example, 10XP are awarded to users progressing on a casual learning plan while 50 XP are distributed to insane learning users. The language proficiency increases as the level of XP rises (Karjo & Andreani 2018.)

Advantages for Duolingo are declared not only in the user research but also in various literature reviews. Interviewed participants gave prominence to the application gamified features including points system, progress level and competition with friends (Appendix 19). Munday (2016, 87) pointed out that students prefer the platform on mobile because of the flexibility and game-like environment along with the instant feedback unlike traditional homework. Moreover, materials developed in Duolingo application are comprehensible, constantly improved and significantly compatible with students’ learning capabilities. Next, Duolingo provides necessary and fascinating features in a free model, unlike other education applications which demand high subscription fees. Apart from the promising features related to gamification and business model, Duolingo helps learners promote motivation, enthusiasm, and desires for language learning (Habibie 2020, 22.)

Despite the favourable compliments, Duolingo acquires a number of disadvantages, mainly due to the old teaching methods, lack of peer interaction and teacher assistance, implicit grammar knowledge, repetitive vocabulary and pricing model. The popular language application makes use of the Grammar Translation Method for asserting text translation exercises and delivering grammar and vocabulary knowledge in isolation, which are outdated approaches. Besides, students’ collaboration is not utilized during the gameplay, neglecting the positive influence of peers learning (Rego 2015, 9.) Not only are peer support not introduced in the application features, teachers’ assistance and

interaction are not developed and highlighted. Hence, students do not acquire the ultimate knowledge delivery using the application without teachers' involvement (Habibie 2020, 22). Concerning materials within the application, although it is confirmed that the content is compatible to learners' level, grammar teaching aspects are not prioritized or even mentioned at all during the application. Since grammar knowledge is given through example sentences, students need to deduct the grammar detailed rules by themselves. If the grammar understanding is not noticed, the grammatical rules will be faded away (Karjo and Andreani 2018.) Finally, while analysing the research results featuring comments from the application review area, researchers indicated that the lessons contain repetitive vocabulary rather than diverse sets of new words, and especially, the application pushes users to buy Plus version to get more hearts (lives) (de Araújo & Eddine 2020.)

4.2.2. Kahoot

Kahoot is one of the favourite platforms for education technology in professional environments such as schools, universities, and institutions. Few interviewed students and teachers briefly mentioned Kahoot as an interesting tool (Appendix 19 & Appendix 21). Kahoot gameplay essentially generates multiple-choice quizzes which are originally created by users, featuring diverse content and topics (Kahoot 2020.) Embedded gamified characteristics within Kahoot learning platform involve challenges, fantasy, and curiosity. Challenges are presented as intriguing questions and obstacles, requiring users to rapidly brainstorm, and overcome. The gameplay fantasy factor is revealed through the captivated activities with teachers as the host and students as participants. A variety of curious cues are placed within the platform, triggering users' imagination through graphics, audios, and fascinating puzzles (Tan, Ganapathy, Mehar & Manjet 2018, 570.)

Students' feedback for learning through Kahoot reflected a fun and understandable platform. A variety of utilizations were documented from the research such as fresh topic introduction, facts revision, exam revision, opinion collection, insights aggregation, discussion establishment and active learners' rewards (Putri 2019, 13). Sharing similarities to the previous statements, Yürük (2019, 97-98) concluded that Kahoot brought about significant advantages compared to traditional teaching methods. A more permanent approach was confirmed to be one of Kahoot characteristics due to the feasibility of practice inside and outside the classroom. Related to learners' capabilities after Kahoot usage, many students' success rates were promoted while their fascination for the subjects presented were enhanced. Excitement was not only advocated in

understanding the learning topics but also reflected from gamified elements such as time limitation and scoring structure. Additionally, the brief timer as an effective gamified factor delivered rapid-thinking practice for students. Boosted motivation and proactiveness level were recorded as the major improvements among students participated in the research. Most students admitted that a more diverse and well-supplied content was discovered through Kahoot platform. Moreover, students' participation and retention during the lesson were improved. The beneficial aspects of Kahoot not only were crystalized in students' performance and perception, but the surrounding atmosphere during lecture was positively influenced with more collaborative efforts and relaxed moments from students. Upgraded lesson quality and effectiveness facilitated and achieved by teachers were one of the key points delivered in the research (Yürük 2019, 97-98.)

Distinctive applications could be implemented with Kahoot in classroom circumstances. The most common activity using Kahoot is "warm-up" facilitation, grabbing students' attention, engaging with students for opinions and promoting students' participation while measuring their knowledge absorption. Not only do students become more enthusiastic in the subjects but sophisticated learning topics would be more feasible to comprehend. The utilization of Kahoot is immensely suitable for flipped learning methods, where students were tasked with materials comprehension before participating in Kahoot quiz game. Another helpful activity which Kahoot delivered was knowledge review. The questionnaires developed in Kahoot is a flexible tool for evaluating and determining students' performance and activeness. Feedback from Kahoot's report is valuable in supplying meaningful changes to the teachers' class planning process based on the needs of learners (Yürük 2019, 94.) Kahoot platform benefits teachers with the formative assessment, indicating students' progress, goals, strengths, weaknesses in systematic approaches while supporting teachers in advantageous lesson planning adjustment (Putri 2019, 12). The excel structure of the performance report demonstrates precise and useful assessment methods, revealing students' correct answers and errors, articulating the time spent for each answer and illustrating the regular mistakes confronted by the majority of students. Nearly all teachers in Nguyen & Yukawa (2019, 291) research confirmed the time efficiency characteristics of Kahoot as they could rely on the automatic generated statistics. Hence, the correct, incorrect responses and individual speed are counted by Kahoot system, referring to the ultimate trustworthiness in results calculation and time sparing aspects. Lesson planning time and rapid assessments are the highlighted qualities for teachers when adapting with Kahoot platform (Nguyen et al. 2019, 291.)

Though the benefits of Kahoot platform are tremendous, the problems with the gameplay were the prioritization of speed over quality as learners must answer the questions faster than competitors. Frequently, each question delivered in Kahoot challenge allows students to tackle within only five seconds, focusing on the prompt reaction rather than content comprehension. The fact that many students might have got the right answers and acquired deepened knowledge about the subjects without the timer brought about injustice and frustration during the gameplay. Not only are students influenced negatively due to the downside of Kahoot, but teachers also received adverse effects from the platform. As students are restrained by the timer, teachers are not recommended to distribute sophisticated or lengthy questions, indicating the obstacles in teaching complex knowledge. Besides, reviewing content through Kahoot platform highly depends on teachers' proactiveness on after-question discussion. Even though the questions might be incorrectly tackled, teachers might not explain the reasons leading to the mistakes due to various rationales (Beverly Highlights 2018.) Based on a research conducted by Nguyen et al. (2019, 291), a vast number of teachers agreed that the preparation phase including tests design, categories selection, questions and answers facilitation and timer modification was extremely time-consuming. However, once the teachers got used to using Kahoot during lessons, preparation time for Kahoot quiz gradually became easier because the templates for the previous questionnaires were maintained and recycled efficiently (Nguyen et al. 2019, 291.) Aside from the negative effects of Kahoot on target users, Kahoot system contained limitations in question structure for learners as only true/false, yes/no, multiple-choice and ordering words questions are allowed. Recently with the Kahoot platform development, more question structures are introduced but the subscription must be paid in order to integrate them (Hodson 2017.)

4.2.3. Quizlet

Utilized for intensive vocabulary learning, Quizlet was referred to as a potent digital solution as the application core features are creating flashcards and reviewing words via delightful games. The application originated from an American creator, affirming students' preparation for words learning and examination (Quizlet 2020.) A number of advancements are affirmed during the research carried out by Sanosi (2018, 76), indicating that Quizlet provides proactive and collaborative learning approaches for students inside and outside lectures. The application supplies a platform for students to present joint efforts for learning vocabulary and sharing information. The cooperative atmosphere especially boosts confidence for the less motivated with weaker performance students. Other than that, the autonomous language learners are supported with self-

studying tasks outside the classroom and gamified features such as score system and review chart (Sanosi 2018, 76.) Specific modes for reviewing vocabulary incorporated with gamified elements can be listed as learn, flashcards, write, spell, match. Therefore, teachers acquire advantageous qualities utilizing Quizlet in class as they can differentiate the methods for review based on students' preference instead of traditional teaching methods. Next, collaboration among peers is boosted, reflecting a motivated atmosphere for lesson progress. Preparation for tests can be effectively implemented for students. On the other hand, since Quizlet flashcard sets can be created by any user, students might encounter incorrect data without realization and embed them into their memory (Stauffer 2019.)

4.2.4. Competitive advantages

Compared to Duolingo

The biggest competitor for the Challenge Me application in the field of language education is currently Duolingo, a language learning application using the freemium model. While Duolingo maintains diverse types of exercises, Challenge Me application contains a variety of different challenges. Five essential elements of gamification are designated within the Duolingo platform, including mechanics for game rules, aesthetics with visualizations and user experience, instant feedback after each question, progressing levels and XP streak count level as a factor in the reward system. The integration of gamification phenomena is immensely advanced compared with the Challenge Me application in terms of levels advancement and XP streak count. Challenge Me application incorporates game rules for each language challenge, visual cues, immediate feedback for correct and incorrect answers but no levels advancement, unlocking or streak count for virtual money are provided. With respect to gamification effects, materials supplied and freemium model, Duolingo shares large similarities with Challenge Me application, such as boosted motivation, eagerness, game-like environment, comprehensible materials, and compatibility in students' levels. Especially in the business model, Challenge Me offers application users free usage at the basic level for students with a variety of interesting and helpful challenges. However, if students want to experience higher levels of challenges, a subscription fee will be charged. Thus, students can enjoy content-rich and fascinating challenges in the fundamental stage without paying any fees.

Based on the findings of Duolingo adverse aspects, specific competitive edges are figured out for Challenge Me application. Firstly, while Duolingo applies outdated teaching

methods of Grammar Translation Method and vocabulary and grammar delivery in isolation, Challenge Me application utilizes cloze test procedure with context-based language teaching which is scientifically confirmed to be highly effective in grammar and vocabulary absorption. Peer collaboration and interactive competition are one of the major features in the Challenge Me application as fellow learners can work in teams during the challenge gameplay. However, Duolingo users mainly use the application for autonomous learning purposes instead of collaborating with friends. Hence, Challenge Me brings about more advantages in peer support. Additionally, teachers' assistance is demonstrated vividly in the Challenge Me application since the game structure aims at increasing interaction between students and teachers. One of the core features for advocating interaction and support is the discussion box. Related to this aspect, Duolingo application is completely lacking advanced guidance. While grammar knowledge is not explicitly taught in Duolingo, Challenge Me application provides an area for demonstrating grammar rules and examples, clarifying knowledge flow for students. Next, a variety of meaningful and interesting vocabulary are developed from trusted sources for students in Challenge Me application, unlike Duolingo's generated sentences examples which sometimes provide meaningless and contextless structure with repetitive vocabulary. Finally, there is no heart system in Challenge Me application, meaning that the application is not driving users to purchase the product in a frustrated way. The business and pricing model in the Challenge Me application orients students to experience the basic content of the application for free until they decide to advance to the next level and purchase the subscription to fulfil their desires.

Compared to Kahoot

In the gamification aspect, Kahoot shares large similarities with Challenge Me application because of the common structures in challenges, fantasy, and curiosity elements. Challenge Me application presents users with fascinating language challenges as obstacles to overcome. The platform offers a content creation network where teachers are the gameplay host while students are the players, enjoying the game journey. Curiosity is revealed through different puzzles and graphic displays.

Positive notes on students' behaviour and attitudes while using Kahoot demonstrates analogous effects of Challenge Me application to its users because of the similar "live game" features. A variety of beneficial qualities are founded as students testing Challenge Me application, indicating the comparable advantages with Kahoot such as flexible practice, increased students' success rates, excitement with gamified elements, enhanced

motivation, boosted students' participation and retention, fresh topic introduction and content-rich subjects. The Challenge Me application shares the comparable "live game" features with Kahoot, which is the core function of both applications. Hence, the reality application and benefits for teachers are relatively the same in both platforms. Activities such as "warm-up" questions, knowledge review, flipped classroom methods integration represents the essence of the Challenge Me application. Teachers benefit from Challenge Me application with formative assessment structure, automatic statistical measurement for time efficiency, lessons planning adjustment.

Even though Challenge Me application shares a number of comparable features such as gamification and "live game", the target users and established challenge structures in Challenge Me are completely distinctive. The application key users are centralized in language learners and educators while the challenge structure targets solving language learners issues with "cloze test" implementation and other question types such as open-ended question, phrases ordering, grammar check, listening skill, speaking skill, etc. Therefore, the Challenge Me application differentiates from Kahoot based on the flexibility of question structure rather than the limited types in Kahoot.

Another competitive edge is that the Challenge Me application does not present a timer for each question as a measurement because the competition within the app focuses on getting the correct answer rather than speed over quality. Thus, complex questions can be asked from teachers' perspectives while students emphasize on understanding content and achieving the correct responses. Reviewing activities utilizing Challenge Me application is not hindered by the teachers' willingness to discuss the rationales for wrong answers as in Kahoot platform. Since Challenge Me application provides teachers with areas for elaborating on answer explanations, students can feasibly read and comprehend notes from teachers without depending on teachers' responses during the gameplay. Regarding the preparation time, Kahoot and Challenge Me application are matching due to the massive efforts spent during the first-time usage for teachers. However, the more the Challenge Me application are in usage, the less time teachers spend to create questions thanks to the maintained templates and challenges library.

Compared to Quizlet

With the "live game" feature emphasizing on class interaction and fun learning purposes, Quizlet and Challenge Me application both encourage students to be more collaborative, confident and motivated while enjoying the competition. Quizlet acquires a variety of

vocabulary review modes for students while Challenge Me does not encompass, which is a feature which should be considered for the further development of the Challenge Me application. Recommendations based on the competitor Quizlet application analysis include features for vocabulary flashcards, new words saving, and review mode based on cloze test approach for future development of Challenge Me application. Related to the method of delivering fresh vocabulary knowledge, Quizlet's main purposes are articulating new words in sets of flashcards, demonstrating the emphasis on isolation of words. Since words learning based on isolation and decontextualization is not entirely recommended as it is an outdated method, the Challenge Me application introduces a more influential method which is cloze procedure, inducing better memorization of words in different contexts. Furthermore, problems arise since any user can create a set of flashcards in Quizlet while in Challenge Me application, users are clearly classified as “professional teacher”, who provides appropriate and certified qualifications, “community teacher” who contributes content without any certificates and “students” who utilize the platform for practicing. In a nutshell, the competitive advantages for Challenge Me application in comparison with Quizlet are crystalized in the contextual teaching method and the classification of users, promoting trusted and reliable content flow for the Challenge Me network.

4.3. Empathize phase

The initial phase for problem comprehending in DT process originates from the awareness of problems, challenges, and existing requirements. Starting the process, empathizing with customers using methods such as interaction and research is extremely critical (Chasanidou et al. 2015). Designers can utilize several methods for acquiring users' comprehension such as face-to-face or remote interviews, surveys distribution, observations along with recordings for further analysis (Christian 2018, 5). During the initial stage of empathizing with users, certain methods are implemented to investigate users' behaviour and feelings including affinity mapping and empathy mapping from interviews and surveys.

4.3.1. Research findings

The research results are collected from students and teachers to understand the collateral needs and influence. The results support and navigate the Challenge Me application design via methods such as empathy map, personas development and value proposition map. The research results are categorized and prioritized based on affinity mapping methods reflected in Appendix 19 & Appendix 21.

4.3.1.1. Students' needs and wants

The survey was distributed to students via Facebook platform, specifically, to Finnish learners' group. The conduction time frame lasted from June to August 2020. A total of five questions regarding language learning background, challenges, activities, and methods are elaborated. The survey received 232 responses, mostly from Finnish learners. For each question, participants chose maximum two choices to prioritize their needs.

Appendix 7 depicts the biggest problems encountered by language learners. Lack of communication is the biggest difficulty while lack of learning materials, motivation and reliable teachers are the second important issues. In order to achieve language progression, consistent practice should be implemented in learners' habits. In Appendix 8, the survey participants largely agreed that engaging in constant communication with teachers and/or advanced speakers is the most influential activity. Other than conversing, learners were indulgent in interacting with creative media contents. A high number of participants were interested in doing homework and acquiring grammatical knowledge from advanced speakers. Concerning the learning environment, early half of the survey responses confirmed that traditional classroom learning, and self-study are the most common language learning environments. Receiving tutoring sessions along with reading media materials are the next favoured types of learning method (Appendix 9.)

Moreover, trust is the groundwork for students to increase engagement and interaction with teachers. Additionally, trust promotes student retention. Over 80% of survey participants chose support during studies as the critical factor for building trust. Besides, useful contents composed by teachers increased teachers' trustworthiness (Appendix 10.) It is shown in Appendix 11 that involving language activities with teachers, obtained results share similarities with consistent practice in the dimension of communication. It is interesting to note that students were fascinated by practice corrections and advice supplied by teachers. Fun learning games and personalized study plan were listed as the second most popular activities (Appendix 11.)

Other than the survey results, the author also carried out an interview which was conducted with six potential users. As observed from Appendix 18, most of the interviewees are full-time or part-time students. The age group of the interviewees is 23 to 28. The interviewees are currently studying different languages, but the most common

one is Finnish language. Main language learning themes were presented in Appendix 19 including language learning methods, grammar and vocabulary learning, learning materials and assignments, expected activities in a language learning class, grammar and vocabulary exercises, language self-study activities and reviewing previous lesson knowledge. During the interview, interviewees gave responses to the question related to each theme as well as the follow-up questions based on their answers.

Firstly, for choosing regular methods for learning a language, 50% of the interviewees preferred making their own vocabulary and phrases library. Additionally, learners frequently communicated with colleagues, friends, spouses, and relatives in the target language. The second popular method was listening to music, watching movies, and immersing in entertainment. Specifically, for grammar and vocabulary learning, 67% learners agreed that they prefer to learn with textbooks content and exercises. A few learners would only do exercises during language class because of the insufficiency of time and motivation. Another highly effective method was constructing their own vocabulary library and repetitively noting down frequently encountered words from the learning materials. Regarding language learning materials, more than 50% of the learners used textbooks such as Suomen Mestari for Finnish. Other critical learning platforms mentioned were language learning applications such as Quizlet, Duolingo; Youtube videos and music; Yle language school, Yle Selkouutiset, Yle areena kid. In the classroom, most learners expected teachers to provide grammar assignments typically from textbooks, which share the same purposes and characteristics as "cloze test". Another favoured type of material was speaking exercises and correction from teachers (Appendix 19.)

Regarding activity expectation in a language class, interactive sessions between teachers and students where teachers gave questions and sought answers from different students were mainly focused. One third of the interviewees were interested in games such as Kahoot for learning and reviewing important new words; communication and discussion with fellow learners regarding different topics such as reflecting on novels and articles. However, two learners were not enthusiastic about playing games as they were time-consuming and did not provide additional value as traditional teaching methods. When self-studying, half of the interviewed learners enjoyed watching movies, being immersed in entertainment, and doing grammar exercises in the textbooks. Furthermore, doing exercises helped the learner to understand and remember grammar and vocabulary structure in different contexts. The next preferable self-studying activities involved building their own vocabulary library where the learners collect useful words; regularly writing new

words; communicating with spouse, colleagues, and friends by speaking or writing; reading newspaper and articles. Concerning knowledge review, most learners received knowledge review sessions from the teacher with brief recaps at the beginning of the class. Additionally, the teacher frequently revealed answers to the homework during the lesson. Extra exercises and assignments based on previous knowledge were occasionally organized by the teacher (Appendix 19.)

When defining the problems for learners when learning languages, the lack of motivation was mentioned frequently by 67% students as one of the biggest problems in language learning. Other than motivation issues, being afraid to speak in public and difficulties in vocabulary and grammar memorization was declared. Therefore, methods for tackling the issues involved revising knowledge in conversations and exercises, noting down the vocabulary, and frequently communicating with friends. When inquired about the tools for solving the issues, most interviewees were enthusiastic about Duolingo application. One downside of the application was that the knowledge was random, unstructured, and not practical and only suitable for beginner level. On the other hand, the advantage of Duolingo was the competitive feature where learners can see their own progress and the ranking system. According to the participants, Duolingo and Quizlet are regularly mentioned as fascinating applications with gamified features for learners, reflecting one of the competitors of language learning in the field. Furthermore, interviewees elaborated that one of the disadvantages of Quizlet is the inability to help learners understand language grammar. Other than the main competitors, Kahoot and Socrative were briefly related as an interesting application for language teachers. A majority of learners approved that competing with her/himself and with friends is effective in language learning as gamified activities provide enhanced motivation (Appendix 19.)

4.3.1.2. Teachers' needs and wants

The interview was conducted with five potential users for the teacher's interface as observed from Appendix 20. A large number of interviewees were working as private teachers. The age group of the teachers varied from 24 to 39. The interviewees were teaching different languages but the most common one was English. The target student group varied from third graders to university students and adults. During the interview, the teachers expressed their opinions about language teaching background which is reflected in Appendix 21, involving language teaching methods, grammar and vocabulary teaching, language teaching materials, assignments, grammar and vocabulary exercises, creating own content, activities in class, students' performance and knowledge review.

Nearly all teachers followed the interactive and student-centred teaching model where students' needs, and engagement were emphasized. Respecting grammar lecture planning, all the teachers concurred that grammar and lexical knowledge were always presented with context such as giving articles for students to read. After the students discovered the knowledge by themselves, assignments related to the topics were distributed. For grammar assignments in specific and learning materials in general, teachers provided grammar exercises from textbooks or students' curriculum materials. All teachers emphasized on using textbooks for grammar revisions because there was in-depth knowledge in the books and students could check their answers at the back of the book. Other than books, free grammatical exercises from credible sources were sought after by few teachers. One of the most essential findings was that 60% teachers did not create grammatical or vocabulary assignments, but few teachers put effort in modifying the authentic content to create more interesting assignments to the students. Concerning vocabulary lessons, more than half of the teachers applied visualizations including pictures, drawings, audios to make the vocabulary more memorable. Besides, 60% teachers searched for free online authentic materials including pictures, journals, videos, etc. Most of the assignments given by teachers were written assignments utilizing introduced vocabulary and grammar structures in contexts. Furthermore, most essential assignment types discovered during the interview included grammatical exercises with "cloze test" structure, game-based learning, and interactive conversation sessions (Appendix 21.)

Regarding activities, a majority of teachers did not use games in the class. One of the reasons was that games were time-consuming and required a lot of energy from students whereas the lecturing time is limited. However, few teachers utilized Kahoot for quizzes, Quizlet flashcard applications or websites such as Kieli.net. The two favoured activities were discussions between the teacher and students along with simple games. When asked about whether competitiveness should be implemented in activities in class, there were two contradictory opinions from teachers. Half of the teachers agreed with the statement that there should be competitiveness because teachers could observe the active and passive students. On the other hand, the rest of the teachers claimed that there should be no competitiveness in the activities because students should concentrate on traditional study planning. To monitor students' performance, 60% teachers carried out continuous assessments through different assignments during the learning process. A high number of teachers also measured if students are progressing based on the goals set by students and on the tests results. It is especially remarkable that all teachers did

not use any tools or software to monitor students' performance, whereas students' performance should be monitored so teachers can provide the most effective support. However, few teachers made use of continuous assessment method based on assignment results. With respect to knowledge review in the classroom, three quarters of the teachers reviewed knowledge by asking students questions or reviewing homework. In addition, the next lesson planning was frequently related to the previous lesson knowledge (Appendix 21.)

Problems in language teaching were elaborated by five teachers, emphasizing on the inflexibility of online platforms and teaching methods, the deficiency of students' motivation, the need for larger materials sources with natural and authentic sources, along with inspiration for students to speak confidently. Other than difficulties in platform management and suitable methods, encouraging students to be more motivated in language learning and conversing was another challenge. Additionally, few teachers indicated that there is a lack of natural conversation recording or videos as well as lack of development in materials. Occasionally, the lack of teaching immersion in target language and lack of common languages represented problems in teaching.

Therefore, several ways to tackle the issues were constantly using the new words in class as well as consistently giving assignments and exercises. Utilizing games was an interesting approach, however, a majority of language teachers did not use gamified applications for teaching. Most teachers relied on textbooks for the most credible resources. Although using applications for language teaching was not common, few teachers utilized Kahoot for quizzes, Quizlet flashcard applications or fascinating websites such as Kieli.net. It is interesting to note that most teachers did not teach with language applications due to various reasons such as the lack of features, materials and the labour-intensity of the application. Additionally, the majority of teachers agreed that competitiveness helped boost students' motivation for learning, especially for certain groups of students. Quizlet and Kahoot were the applications which provided the competitive values for teachers. Not only did teachers implement the Quizlet flashcard application but they also encouraged students to create their own sets of flashcards (Appendix 21.)

4.3.2. Empathy mapping

Empathy mapping (EM) is a method for customers' insights obtaining enhancement during the first phase of design thinking process. With EM, qualitative data collected from the

research field studies, interviews and surveys are illustrated vividly in different segments, forming a standard and completed measurement to empathetically create a user persona. With the abundant information gathered from the research, empathy method is greatly crucial in interpreting meanings of the data. After that, the overall portrait of the user persona can be deducted from the customer EM. One of the most important reasons for founding an user EM is due to the efficiency, applicability and feasibility in demonstrating the customer segment attitudes to the stakeholders, developers and business-related decision makers as it is the central source containing vividly depicted insights from potential customers without bias or assumptions (Gibbons 2018.)

Based on the interview and survey results, an EM for students in Appendix 12 is established with information aggregated from multiple interviewees. Competitive language learning students are empathized with in-depth information regarding five senses. Most importantly, their pains are magnified by the lack of motivation, lack of communication with advanced speakers (Appendix 7), difficulties in revising grammar and memorizing words (Appendix 19). Potential customers also dream to be able to communicate more frequently, boost interaction with teachers and receive support from teachers (Appendix 10). Having various anxieties and needs, the user persona hopes to find solutions for the pains and a way to satisfy their gains.

The target customer who is empathized thoroughly is innovative language teachers. Teachers' EM presented in Appendix 13 shares complementary characteristics, actions, and senses with the students' one. The interview results from Appendix 21 highlight difficulties in the teaching process for teachers respecting methods for inspiring students to communicate, motivating inactive and quiet students, supporting students, as well as more potential tools for assessing students and activities for online lecturing. With the anxieties in mind, teachers aim to access more methods for helping students become active in class, facilitating more interaction and classroom dynamics (Appendix 21), providing useful contents (Appendix 10) to strengthen students' knowledge absorption, and acquiring more authentic materials.

4.4. Define phase

After gathering users' needs and wants, the defining step is where designers come to the statement conclusion of users' problems (Chasanidou et al. 2015). Various methods utilized for defining problems involve articulating user personas, problem statements and user scenarios.

4.4.1. User personas

User persona is the representation of the products/services customer group with reality-like characteristics with whom the design teams can interact and engage to make design decisions. The method is influential in identifying customers' pains and gains (Chasanidou et al. 2015). The user personas are the potential user groups of the application whose information are generated from the user profiles findings combined with EM.

With the establishment of an EM, a deeper insight is incorporated into the student persona. The portrait of the student known as "Nick James" reflects a competitive language learner who is goal-oriented, hard-working and technology-savvy (Appendix 14). The major needs to use and buy the Challenge Me product deducted from Appendix 12 surround motivation, learning efficiency with teachers' support and interaction, peer learners influence, consistent language practice and opportunities for improved self-study as self-study is one of the key preferred learning activities for students (Appendix 9).

From the observation of teachers' EM, a teacher persona namely "Hanna Kisonen" in Appendix 15 is formed, representing innovative language teachers who are willing to utilize useful tools in teaching methods. When lecturing, she prioritizes engagement with students along with gamified activities for students and aims to improve lesson quality with various innovative methods. Hanna's rationales for using and purchasing the product mainly to solve problems presented in Appendix 13 such as motivation deficiency among students, support and interaction provision for students, time efficiency for lessons and materials facilitation and creative online activities conduct.

4.4.2. Problem statements

Problem statements are developed to form an in-depth understanding of the users' pains. There are several methods to form a problem statement. The method implemented for constructing problem statements in this research is using the 4 Ws "*Our (who) has the problem that (what) when (where). Our solution should deliver (why).*" (Devos 2018.)

Our student has the problem that he lacks learning motivation along with interaction with teachers and peers. Our solution should deliver a way for him to feel more motivated and supported by teachers, so he can enhance his learning progress.

Our teacher has the problem that she struggles to motivate and support her students in class and at home. Our solution should deliver a way for her to inspire and assist the students, so she can provide more values to the students.

4.4.3. User scenarios

User scenarios are delivered with crucial information from empathy mapping and value proposition mapping, as they focus on the pains and gains of each persona. The use of user scenarios is mainly to visualize users' involvement with the offering product or services regarding the use contexts, needs and wants, pains and motivations (Interaction Design Foundation 2020b.) The factors constructing a good scenario comprise of user description, motivation and situation of product seeking, user's goals, and task, if possible, user's spending and income data can be recorded (Justinmind 2020). The elaborated scenario is rather complex, illustrating more details regarding the user's background, pains, gains, motivation, and the course of action which leads to the finding of the product (Usability.gov 2020.) In the Challenge Me application design, an elaborated scenario is applied to fully comprehend potential users.

Student

Nick James is 24 years old. He is an International Business student studying in Haaga-Helia UAS. Nick enrolls in various classes, additionally, he plays guitar and dances every weekend. He has a very busy schedule throughout the week. At school, one of the compulsory classes Nick must enroll in is Finnish. Nick finds it increasingly challenging to study Finnish because there is a large amount of knowledge that needs to be absorbed while he does not have enough time to practice. Besides, the language grammar rules are complicated, the vocabulary is long with various compound words and the lessons are dull due to the lack of interaction among teachers and students. Nick's motivation for practicing Finnish gradually decreases because of the mentioned reasons, which worsen his learning progress and activeness in class. Therefore, he is looking for a solution which delivers a means to improve his learning motivation and interactivity with teachers and peers.

Nick is competitive and goal-oriented who prefers to compete with peers in language learning. Hence, he wants a convenient tool which allows teachers and students to interact better during and after class. Furthermore, Nick wants to acquire motivation to practice and revise the language regularly. Thus, he needs a tool for revising the

language grammar and vocabulary with gamified features so he can maintain the learning motivation. During one Finnish lesson, Nick's teacher organizes a live language challenge where he can join and overcome challenges with his classmates. With Nick's competitiveness, he is eager to participate and win the challenges. After the game, Nick feels more refreshed and becomes more motivated and enthusiastic in learning. He also subconsciously gathers crucial knowledge from the activity. Nick is curious about the application, so he finds out more information about the Challenge Me application. He discovers more interesting challenges in different levels along with learning progress updates within the platform. With the materials available, Nick is able to practice Finnish when he has free time for self-study sessions.

Teacher

Hanna Kisonen is 39 years old. She is a creative, innovative, and student-oriented Finnish teacher. Currently she is working in Haaga-Helia UAS. During her career, Hanna has always sought different innovative methods using variable tools. In her opinion, game-based learning is one of the effective education methods for students. Furthermore, she is interested in supporting and engaging with students.

Usually Hanna teaches Finnish onsite at the university classroom. However, due to the Coronavirus situation, she needs to adapt to the circumstance and implement most lessons online with the students. Since online teaching has become more common, Hanna also manages to implement certain tools and teaching methods to suit the situation. However, there are still problems arose from online lessons such as students are not as active as onsite learning. Engaging level in an online classroom is not optimized because she cannot feasibly facilitate interaction among teacher and students. There are students who rarely contribute to class discussions hence, she wants a solution for providing more inspiration, encouragement, and rewards to the inactive students.

Additionally, due to the size of the classroom, sometimes, Hanna cannot provide support and assistance to suit the needs of all students. Hanna wants a convenient tool to easily gather students' opinions and questions so she could aid the students and improve their learning process. For measuring students' performance, Hanna usually facilitates tests based on the university system standard. However, she prefers to be regularly updated with progress from students so she can offer support and adjust lessons planning based on their needs. Regarding materials for teaching, Hanna mainly utilizes textbooks, but she also gathers extra authentic materials including videos, articles, natural recordings, etc. for

the students. This activity takes up an amount of time and effort, which she wishes that there is a centralized authentic material for her to access.

Hanna heard from her colleges that there is a language learning tool called the Challenge Me application which suits her current needs and wants. She accesses the tool and rapidly creates interesting challenges for students based on the authentic material library. Hanna implements a live language challenge during her online lessons and receives positive feedback from the students. In addition, she can keep track of her students' performance and offer support via discussions and rewards.

4.5. Ideation phase

Ideation stage refers to investigating and challenging assumptions about users' solutions along with brainstorming various ideas (Chasanidou et al. 2015). With the customer insights in mind, solutions from ideation sessions are untangled with methods such as assumptions challenging and design hypothesis (Design kit 2020; 18F Methods 2020). Moreover, value proposition canvas is efficient to generate possible solutions.

4.5.1. Design hypothesis

Design hypothesis is the formulation of assumptious statements without specific evidence aiming at giving explanation to certain events. At the start of the project, designers tend to acquire a variety of hypotheses to initiate the design thinking phases. Therefore, it is extremely crucial that presentation, investigation, and elaboration of design hypotheses are carried out systematically to validate the statements and make design decisions accordingly (Justinmind 2018.) Design hypotheses are recommended to be tested during the user research phase such as interviews, surveys, or usability testing because the team will easily comprehend proper issues for testing and appropriate navigation for testing results (Interaction Design Foundation 2016). Design hypothesis statement is a method for delivering assumptions in a verifiable format coordinated by elements including assumptions, hypotheses, outcomes, personas, and features (Gothelf & Seiden 2013, 18). The process continues with questions and assumptions prioritization since there are a lot of assumptions whereas the project time is constraint. As the higher risk the assumptions induce, the higher necessity for the validation and the greater the results are contributed (Gothelf at al. 2013, 22).

The prioritization step reveals the most essential questions of turning assumptions into hypotheses which can be challenged with measurable outcome. In this phase, the team will brainstorm on how to answer the declared questions and frame them into proper hypotheses consisting of inquiry and solution (Lai 2018.) Gothelf et al. (2013, 22) constructed a meaningful format for framing the design hypothesis: *“We believe [this statement is true]. We will know we’re [right/wrong] when we see the following feedback from the market: [qualitative feedback] and/or [quantitative feedback] and/or [key performance indicator change].”* In many cases, the main hypothesis contains too large objectives to be tested during one experiment. Hence, the design team can deconstruct the main hypothesis into sub-hypotheses containing improved or innovative features in a framework: *“We believe that [doing this/building this feature/creating this experience] for [these people/personas] will achieve [this outcome]. We will know this is true when we see [this market feedback, quantitative measure, or qualitative insight].”* The statement contains two crucial parts of necessary features and customers’ gains from the releasing of specific features. The customer feedback will be aggregated to help determine the advantages of the features based on declared market metric or insights (Gothelf et al. 2013, 23.)

Main hypothesis

We believe that designing a language learning platform utilizing gamified features and cloze test will provide satisfactory benefits for teachers and tackle crucial language practice problems from students. We will know we are right when we see an increase in motivation and interaction from students during and after the lessons, as well as a boost in teachers’ satisfaction and utilization for lessons planning.

Sub hypothesis

We believe that integrating gamification in a language learning application for the students will grasp their attention and boost their motivation. We will know this is true when we see confirmed responses and positive attitudes towards gamification from students.

We believe that implementing a variety of language exercises including cloze test for the students will promote consistent practice and interests. We will know this is true when students’ habits reflect an interest for tackling exercises and students’ responses present satisfaction towards application learning structure.

We believe that building a knowledge review feature for the students will improve students' learning progress and strengthen their memory muscle. We will know this is true when students approve the essence of reviewing prior learning and express a desire for reviewing knowledge by completing assignments.

We believe that by presenting a tool for teachers to facilitate teaching materials and exercises, teachers will acquire freedom in creating content while students will receive credible materials from teachers. We will know this is true when teachers demonstrate a need for materials development while students prefer trusted content from teachers.

We believe that through the facilitated challenges, teachers will save time on measuring students' performance and feasibly offer support for students. We will know this is true when teachers are interested in students' performance assessment with time efficacy and support delivery while students acquire assistance from teachers.

We believe that by establishing live game features for students and teachers to participate, both parties will enjoy an interactive, motivated, and engaging learning environment, especially the effects are enhanced in online learning platforms. We will know this is true when we see the needs and wants for interactive sessions and enhanced engaging experiences between students and teachers.

4.5.2. Value proposition mapping

The efficient mapping method for ideation phase is the Value Proposition Map (VPM), a tool which help ensure that a product or service is positioned around what the customer values and needs. The VPM was initially developed by Dr Alexander Osterwalder, Pigneur, Bernarda & Smith (2014) as a framework to ensure that there is a fit between the product and market. The VPM consists of two sides: the sphere of customers' understanding and the aspect of products or services offering. In the right-hand side, customer jobs are defined as distinctive tasks, problems, or desires which customers need to encounter, solve, or satisfy. After comprehending customers' behaviour, explaining desired gains is a powerful stage to analyse customers' dreams, benefits and wants and incorporate these elements into the products or services offering (Kinch 2017.)

Regarding the VPM for "Competitive language learning students", the most essential problems need to be tackled are centralized in the pain area such as acquiring learning motivation, increasing interaction with teacher, receiving support from teacher and

revising grammar and vocabulary consistently, which are deducted from EM for students in Appendix 12. With respect to these prioritized challenges, critical features are formed to facilitate solutions including gamified elements, leaderboard and ranking system, classroom live challenges with a variety of exercises and materials including effective cloze test as well as discussion functions (Appendix 16).

Within the VPM in Appendix 13 for the customer segment of “Innovative language teachers”, elements in gain, pain and customer jobs sections are analysed in conjunction with the product offerings. It is critical that the teachers’ pains including motivating students, activities for online teaching, supporting students and measuring students; performance identified from teachers’ EM are solved with the ease of Challenge Me application features. However, inspiration for students to speak more frequently remains an insoluble challenge out of the scope and functionality of the application. Regarding other aspects, the application demonstrates useful and beneficial features such as reward system, gamified activity, discussion areas and automatic statistical assessment (Appendix 17.)

After filling in the VPM, the main goal of the mapping process facilitation is to determine the fit between the product and the customers. There are three kinds of fit which are delivered by Dr Alexander Osterwalder, Pigneur, Bernarda & Smith (2014, 48), including problem-solution fit, product-market fit, and business model fit. The product-market fit occurrence is organized when there is measurable output that the business products or services are gaining benefits and relieving pains for the customer segments (Osterwalder et al. 2014, 49). Challenge Me application has achieved a product-market fit, indicating that potential customers with imminent desires are understood and channelled with suitable and appropriate product value proposition.

4.6. Prototype phase

The solution space of the design thinking process starts with the implementation phase containing wireframing, building design patterns library, rapid prototyping, pilot products, live prototyping and building partnerships (Design kit 2020; 18F Methods 2020). Based on the scenario of students and teachers, crucial features are designed for their purposes. Prototyping is an important step to deliver the program concept to the end users, hence, the users can rapidly give feedback on the prototype and help form the design iteration loop. Regarding the tools, high-fidelity prototyping is developed using Figma prototyping software introduced in Figure 1.

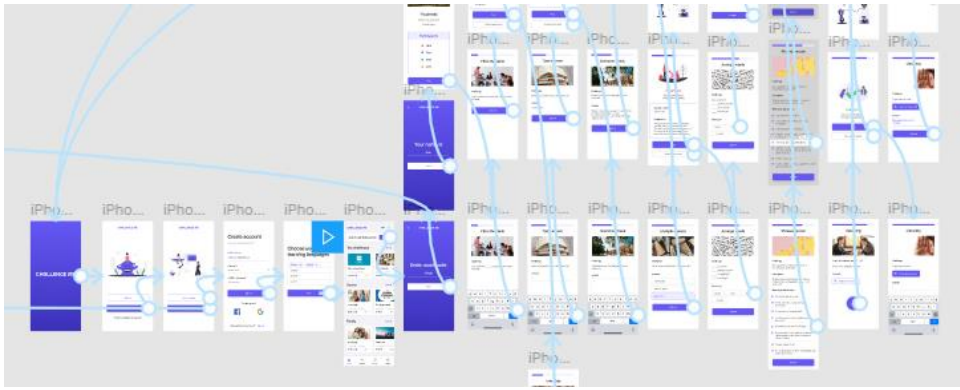


Figure 1. Figma prototype

Student

Most students need to achieve improved learning motivation and interactivity with teachers and peers (Appendix 19). To tackle the student's problems, Challenge Me application features must encompass a variety of exciting challenges including cloze test question type, gamified features including leaderboard, points, levels system, progress, and review functions. In Figure 2, the user flow of students is clearly laid out with emphasis on the solid coloured blocks as these are the crucial features which aim to solve the student's pains and serve as student's gain creators.

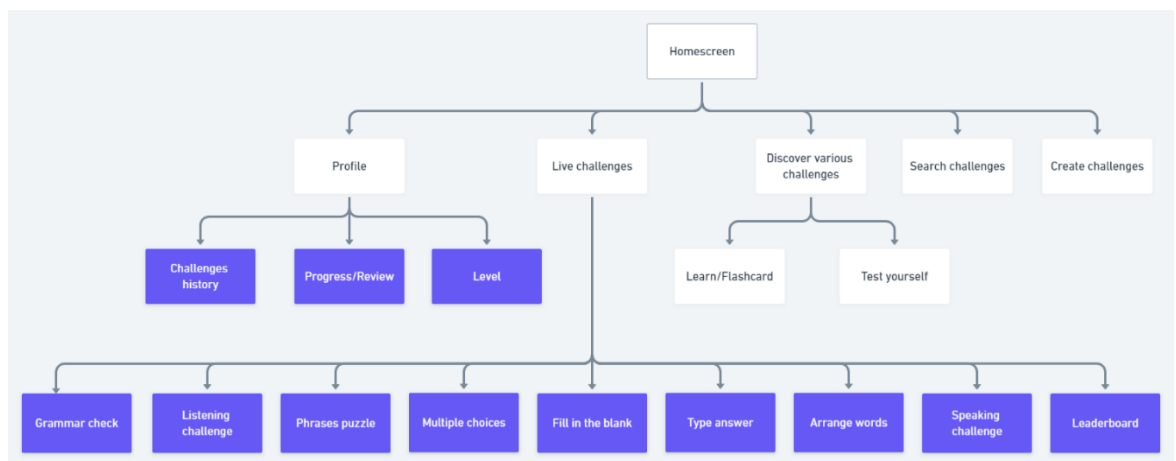


Figure 2. Students' user flow

Within the homescreen laid out in Figure 3, a number of different challenges from multiple content creators are presented to the students, allowing them to browse in different categories to choose the most suitable language challenge. The illustrated challenges in homescreen mainly aim at students who prefer to challenge themselves at home or for self-studying. It is emphasized in student's needs that they prefer interaction with teachers

and fellow learners (Appendix 16). In consequence, joining a live challenge created and organized by a teacher is crucial for students to participate in the class dynamics and contribute to the lesson interaction. In addition, live challenge features encompass gamified elements such as main challenges and quests, leaderboards, competition, points, peers ranking, rewards system, personal progress, review charts, and social elements. The mentioned gamified compartments are tremendously essential in applying the positive impacts of gamification in language education (Flores 2015, 39.)

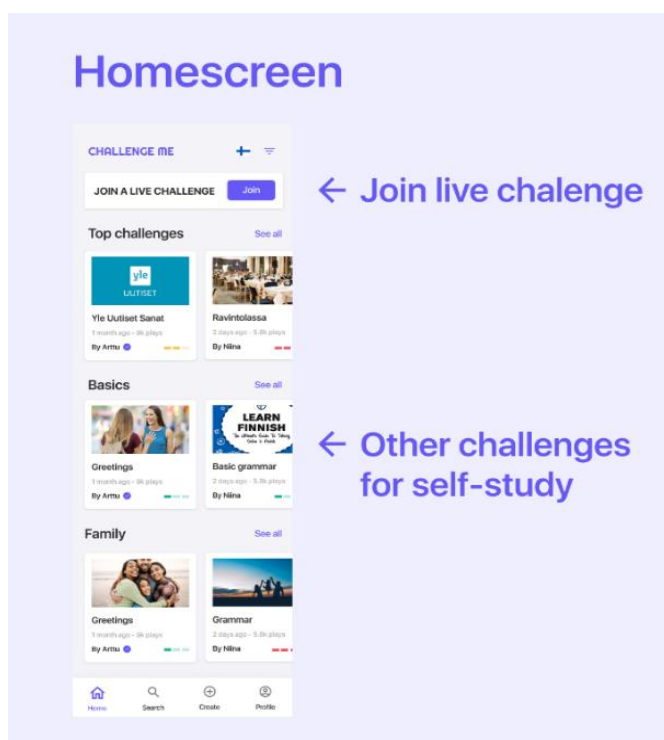


Figure 3. Students' homescreen

After accessing the homescreen of the application and joining a live challenge, students start competing with classmates by completing the language challenges. There are various types of questions designed for language learners including "Fill in the blank", "Multiple choices", "Arrange words", "Phrases puzzle", etc. The diversity of questions structures allows students to learn not only vocabulary but also grammar rules, which is hardly presented in competitors' applications. A majority of the challenges are created based on "cloze test" principles where a specific word in the sentence is deleted rationally, to help improve the effectiveness of the learning process (Ross 2017). Moreover, different types of challenges assist students in exploring the vocabulary in different contexts instead of in isolation. It is essential to understand the words meaning and grammar structure in different contexts and sentences as the practice boosts the memorability of

language learning as Webb (2008, 240) indicated that comprehending the linguistic contexts enhances vocabulary acknowledgement.

The Figure 4 demonstrated the operation and process of the live challenges as students proceed in different questions. The student starts with “Fill in the blank” question where he ponders what to type in the blank space for the question. More importantly, “Fill in the blank” challenge is a type of cloze test for language learning, which is acknowledged for efficient testing of grammar skills by Guangling (2006, 19). Additionally, the research points out that understanding words in contexts rather than in isolation is extremely necessary (Kuimova 2018).

With the correct answer, the student is on top of the leaderboard. After each answer, students will immediately observe the results displayed as correct or incorrect answers with explanations, as well as their scores, position in the leaderboard compared with peer learners. The prompt results and scores belong to gamified features and serve as factors boosting the competitiveness in students during the live challenge, helping them reach the target motivation, energy, and excitement for learning. The immediate results in comparison with fellow learners are considered as effective elements for the student to feel more encouraged (Flores 2015, 38.)

Within the leaderboard, the student’s classmates are illustrated as opponents with different points, delivering a social appearance as a characteristic of gamification. The social elements reflecting through live competition in class assist students in improved learning progress, sharing activities and peer empathy (Fogg 2002, 89). Additionally, the language challenges are divided into multiple types of sub-challenges, requiring students to overcome each question one-by-one. The segregation of educational questions requires the student to put more effort and receive better rewards. By surpassing the questions to move forward during the learning process, the student acquires a motivated attitude while naturally sharpens his knowledge (Flores 2015, 43.)

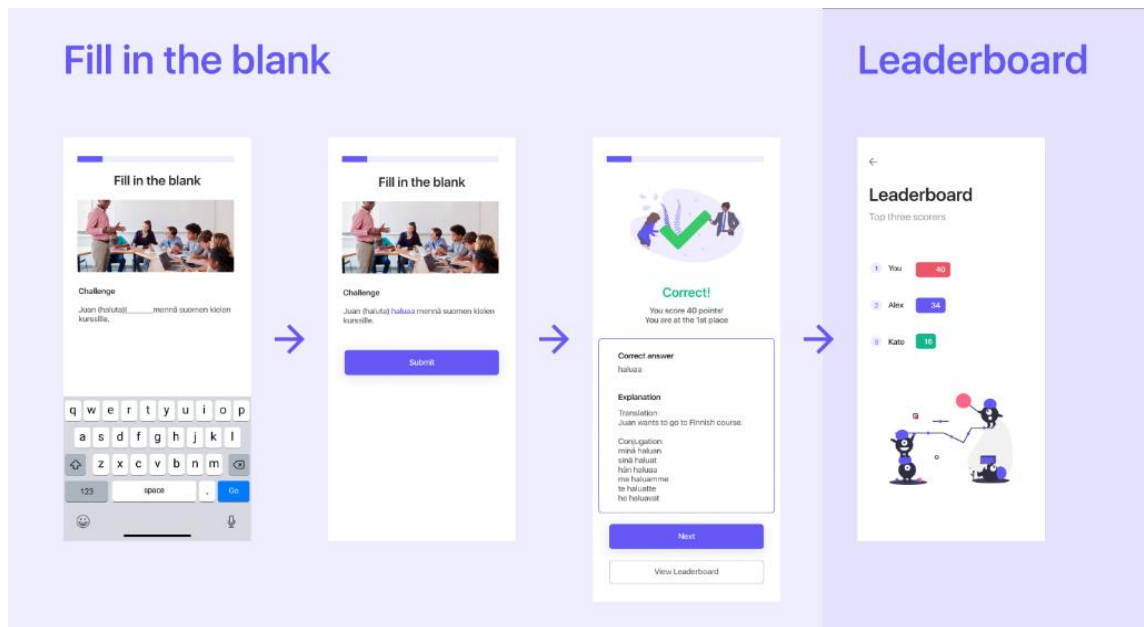


Figure 4. “Fill in the blank” challenge

“Arrange words” in Figure 5 is another type of challenge where different word need to be placed in the correct positions. The particular challenge is also one of the cloze test types known as multiple choices cloze test, referring to the effectiveness of revising grammatical knowledge (Hadley & Naaykens 1997, 113). The question allows learners to brainstorm and determine the suitability of vocabulary in accordance with the context. The student produces the correct answer, which helps him to retrieve the top leader position and win the competition. The effects of defeating opponents in gamification boost student’s motivation and satisfaction (Florczyk 2012.) Not only the motivation aspect is immensely improved, but the student is more likely to increase participation in classes and retention towards the application as Osipov et al. (2014, 12) announced that regular return of users called retention cycle would be promoted. Hence, the student tends to return to the platform for practice in a frequent period, allowing his skills to be drilled and mastered based on the quality and the quantity of the language challenges (Osipov et al. 2015, 72).

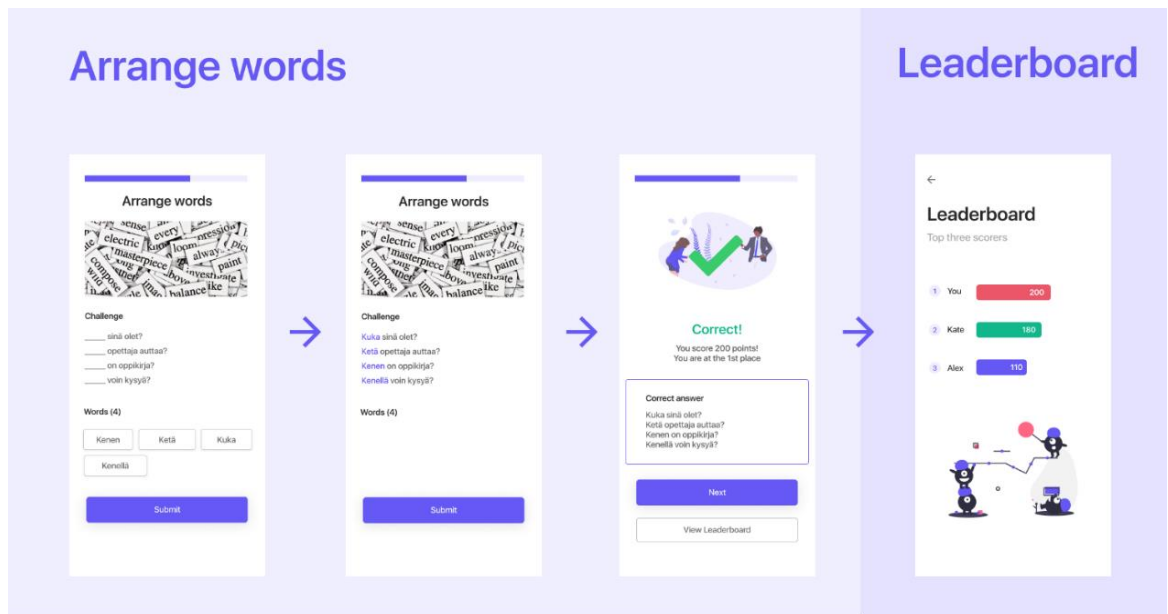


Figure 5. "Arrange words" challenge

After finishing the challenges in the classroom, students can log in their account as Figure 6 has shown and observe their profile page for current learning charts, reviewing incorrect answers and frequent mistakes, discovering completed challenges in challenge history. Since the students have highlighted the needs for identifying learning progress and conducting regular language practice via knowledge review (Appendix 19), reviewing features is critical. By presenting progress of learning based on practicing history, the student understands the learning areas which need improvement, the level which he has reached and the motivation to enhance his current progress. The mentioned elements known as personal progress and review charts were stated by Flores (2015, 39) as the crucial elements of gamification principles.

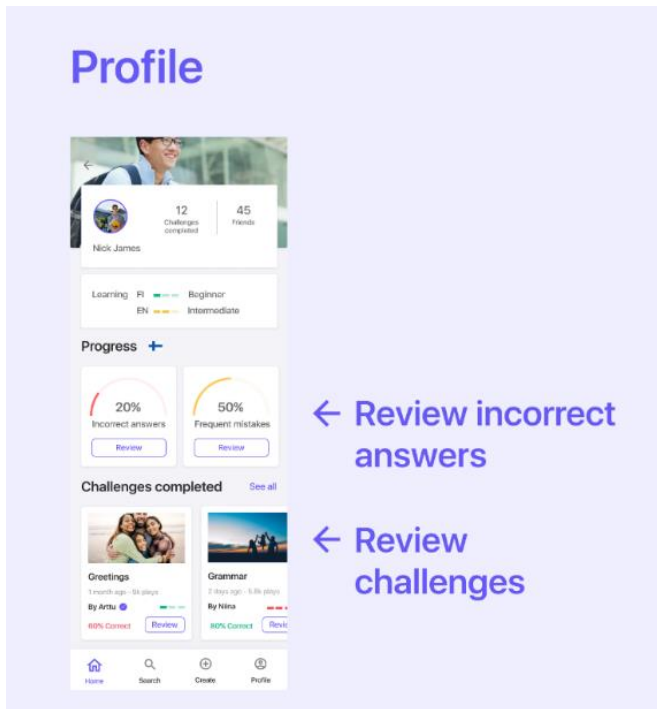


Figure 6. Student's profile

Teacher

Teacher's user flow shown in Figure 7 is a visualization of application information architecture for teachers' interface. Teachers encountered challenges in methods for motivating and supporting students, as well as activities suitable for online teaching (Appendix 21). Hence, the core features concern freedom and ease in creating language challenges based on available and credible materials library, offering support for students based on their discussions and their reported performance. In the user flow chart, the highlighted blocks emphasize the essential features which must be designed within the interface for the teacher.

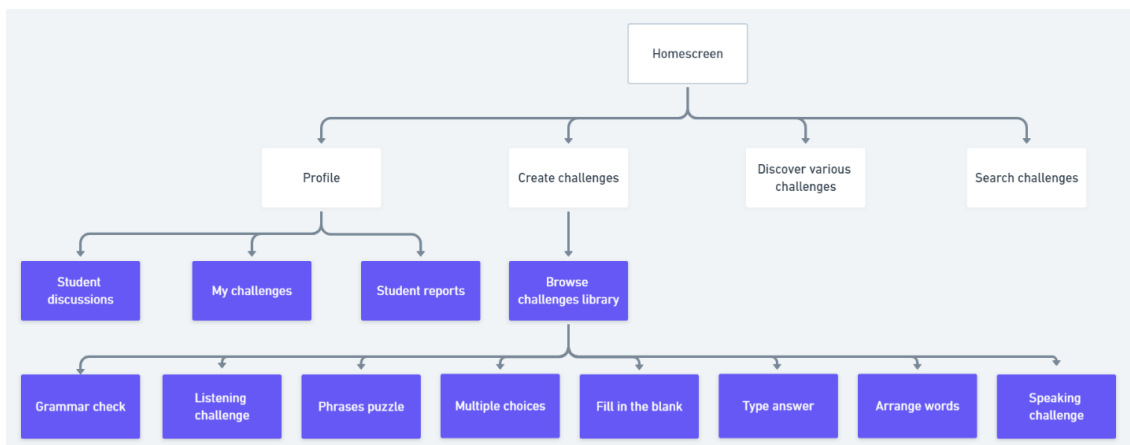


Figure 7. Teachers' user flow

As the teacher mainly uses laptop devices to create lessons' planning, it is essential that teachers' interface for creating language challenges is implemented on the large screen size. Consequently, the teacher's interface design is carried out in laptop size. From the homescreen, the teacher presses the "Create" button to start customizing the language challenges. A challenge contains descriptive elements such as cover picture, title, descriptions, categories, language, difficulty, and visibility so teachers can customize freely (Figure 8.)

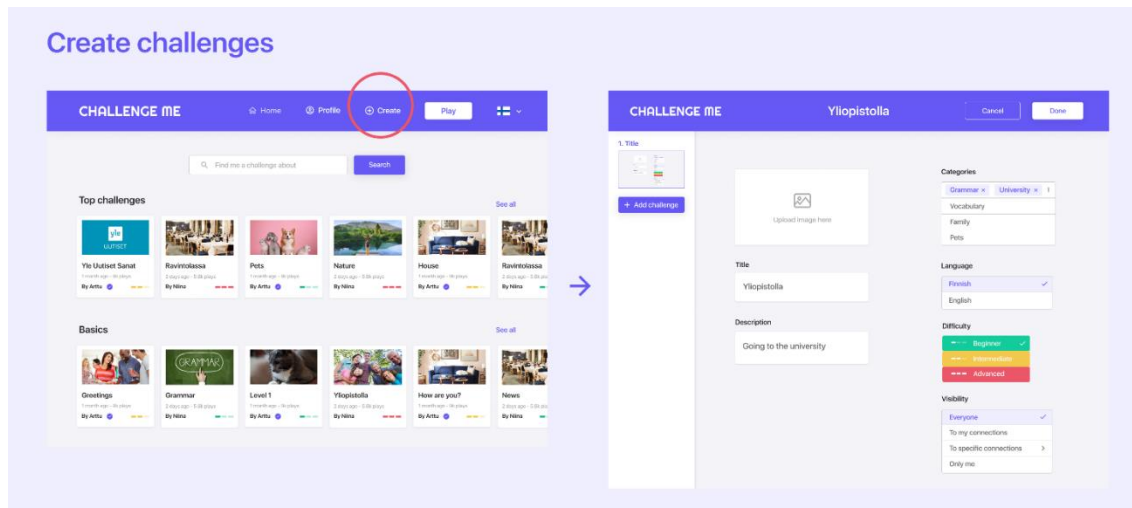


Figure 8. Create a challenge

The needs for authentic and natural materials were specified in the interview results (Appendix 21). Hence, teachers can access the challenges library by clicking "Search challenges" for centralized and flexible teaching materials as observed in Figure 9. Additionally, the search challenges feature helps the teacher compile materials more rapidly, timesaving and efficiently than manually creating exercises as competitors' applications are more labour-intensive in this aspect. Besides, according to the survey results, the teacher wants to provide useful contents for students because students trust teachers whose contents are meaningful and creative (Appendix 10). To channel this purpose, the freedom of challenges creation and the variety of choices for establishing challenges are also one of the highlights in the application.

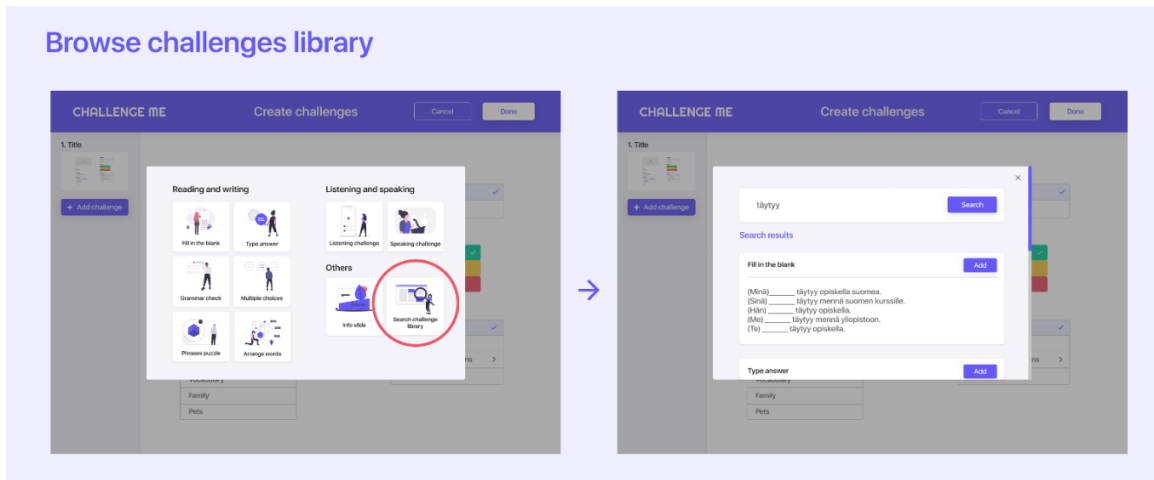


Figure 9. Browse challenge library

After successfully compiling the challenges from credible sources or from customized materials, the teacher can press “Done” to publish the challenges as described from Figure 10 process. Students can access the challenge as a live game in class or as homework assignment depending on the teacher’s provided guidance. Additionally, challenges can be visible to certain groups of students or to public networks including non-students. As a majority of students are interested in creative content created by teachers (Appendix 8), potential students from the application network will be attracted by the fascinating challenges and teachers will gain more student base.

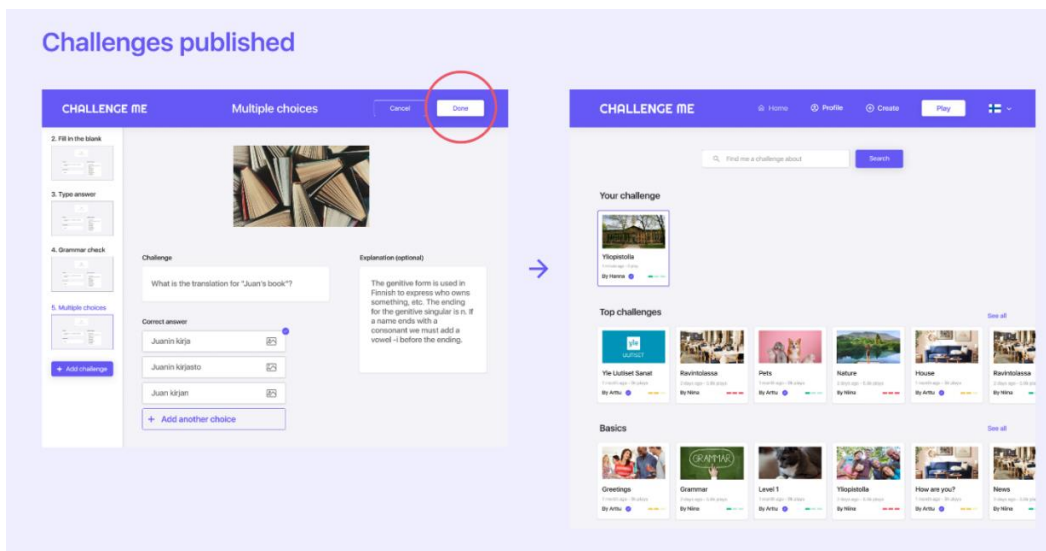


Figure 10. Publish challenge

Facilitating interaction and discussions in the classroom is highly important to all teachers (Appendix 21). To address this purpose, under each challenge in the application, there is a discussion section for students to discuss among each other as well as seek for rapid

answers from teachers. As students comment under the challenges, notifications are immediately delivered to the teacher's profile where the teacher can comprehend and tackle students' problems (Figure 11). The discussions benefit not only the teachers as they can gather students' opinions and inquiries but also the seemingly quiet students who do not usually speak or contribute to class. The social elements from gamification utilization can be observed vividly through discussion features (Osipov et al. 2015, 71).

The interview results indicated that more than a half of teachers utilize continuous assessments and tests to track students' progress which consumes a large amount of time. It is crucial that a convenient tool is developed for achieving time efficiency (Appendix 21). Hence, there should be a convenient tool for the teacher to track students' progress regularly and rapidly. In the proposed digital solution, the teacher can access the visualization of student performance percentage as well as detailed report on each student performance under the profile section. The data is generated automatically from the implemented challenges performance results such as number of correct and incorrect answers, the number of frequent mistakes, how students specifically perform in each question (Figure 11.) Based on the information, teachers can feasibly adjust lessons planning to improve students' performance. The control and supervision appended by teachers during gamified sessions are one of the most vital elements, guaranteeing a motivated, proactive and reliable learning environment for students (Florczyk 2012).

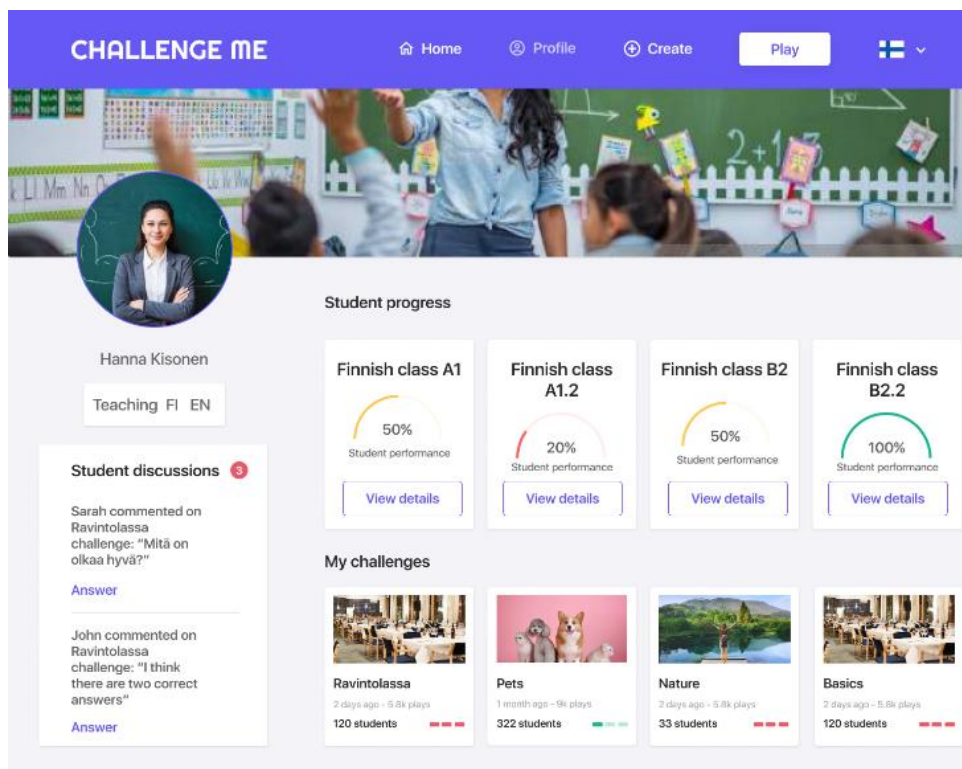


Figure 11. Teacher's profile

4.7. Test phase

The testing results based on presented prototypes are achieved in the last phase, forming an effective iteration loop to implement early customer feedback. Based on the market responses, critical variables such as development and market issues are revealed (Christian 2018, 5.)

During the usability testing phase, the goal is defined for students as joining a live game and competing with friends. The task-based user scenario for usability testing is conducted. Firstly, the user signs up as a student. In the Finnish lesson scenario, the teacher organizes a live game on Challenge Me for warm up activity and reviewing knowledge from previous lessons. The user is tasked to join a live language game with classmates, overcome the challenges, and compete with other classmates. The usability testing was conducted with 9 potential users including teachers and students.

After the usability testing, results and feedback were gathered and prioritized based on Affinity Mapping method in Appendix 22 to initiate the iteration process. From the testing observation and post-testing interview results, important notes on confusion places, missing and unnecessary features are presented. Based on the statistics, 78% of users (7/9 users) think the application is up to their expectation while 68% of users (6/9 users) are likely to use the application once it is finished. The positive findings indicate the potential opportunities for the success of the digital solution.

Even though many testing users were interested in features such as gamification, leaderboards and the variety of exercises, there was multiple confusion and negative feedback from the users. Nearly all users were confused by the limitation of Figma prototyping software since they did not know several screens could be moved up or down. Next, the "View Leaderboard" button seemed to be less visible as most users did not notice the button, reflecting constraints in understanding the purpose of gamification implemented. Hence, the leaderboard button should be more visible, preferably instantly displayed after each question. Furthermore, the point system operation was unclear to a third of the users (Appendix 22.)

Regarding the missing features, teachers' major feedback includes acquiring a teacher profile to promote courses and to link the challenges with education provider's websites.

Next, the thesis author should consider implementing multilingual support such as built-in google translate where users can click the words for translation, so users can understand words' meanings along with explanation translations. More features such as creating word flashcards and utilizing words for exercises should be designed as many users confirm that they prefer to build up their own vocabulary library. Other than deficient features, there are also unnecessary functions within the current prototype. One of the surplus features is grammar check as it is not suitable to put in the game. Next, the report should not be public because of legal and privacy issues. Finally, most users did not read or partially read the explanations when the user chooses the correct answer (Appendix 22.)

5. Discussion

This chapter of the thesis analyses and discusses the design hypothesis, the research findings related to cloze test and gamification along with key outcomes. Additionally, the final design is implemented with the design thinking process. The final results of the project regarding high-fidelity prototyping is evaluated based on the alignment between theoretical objectives and empirical data. Furthermore, future recommendations related to the Challenge Me application and commissioning party are revealed.

5.1. Hypotheses validation

Hypotheses which are defined before the research is implemented is discussed in this section. The findings from the interview and surveys can be elaborated and verified to indicate the potential of Challenge Me app solution.

Main hypothesis validation

As stated in the sub-chapter 4.5.1 of design hypothesis, the language learning application is proved to be efficient if an advancement in motivation, interaction, and satisfaction from students and teachers is obtained. After the implemented usability testing, Appendix 22 shows that 78% of users including students and teachers agreed that the application is up to or exceeding their expectation, indicating great opportunities for the application to satisfy a large number of potential users. Additionally, 67% testing participants are likely to use the application once it is finished, suggesting that a majority of users' needs and wants are tackled using the developed digital solution. The positive research responses approve the essence and potential of the Challenge Me application.

Sub hypothesis validation

Positive influence of gamification in language learning is validated if students' motivation and constructive attitudes are collected from the research. Based on Appendix 7 and Appendix 19, interviewees and survey participants clearly stated that one of their biggest problems for learning language is the motivation deficiency. Hence, solving the right problems with proper technique such as gamification is extremely vital. As Appendix 19 indicated, most interviewees preferred competing with their friends or with themselves since competitiveness brings about a boosted motivation level during the language learning process. Only a few students interviewed were not interested in competition. Half

of the students interviewed shared common interest with a language learning application known as Duolingo as the application competitive features including ranking system and progress tracking are critically valued (Appendix 19.) Additionally, the results in Appendix 22 vividly emphasize that leaderboard features were most preferable. Hence, the positive effects of gamification in language education are immense. Not only did students advocate the impact of gamification, but half of teachers also confirmed that competitive features in gamified applications are useful for learning because through the competitiveness exposed, teachers can observe students' participation and performance. Nevertheless, many teachers did not use games in class because of the time consumption and lack of values while few teachers apply Quizlet and Kahoot in their lessons (Appendix 21). Therefore, the integration of the gamification system in language education depends on specific groups of teachers and their teaching approaches.

In the Challenge Me application, a variety of language exercises consisting of cloze procedure and other skill tests are designed to increase practicing frequency and efficiency. Research results gathered from interviews, surveys, and usability testing phases show that students frequently complete exercises from textbooks. The outcome is clarified in Appendix 8, where a large number of survey respondents confirmed that completing homework and acquiring grammatical knowledge from advanced speakers were one of the most influential activities. When discussing grammar and vocabulary learning methods, students were indulgent in practicing with textbooks and completing exercises from reliable books. Tackling exercises assists students in words memorization in different contexts and word meaning speculation (Appendix 19.) Most of the exercise types from textbooks involve gap filling practice, also known as cloze test method which is proved to be highly effective in language absorption. Furthermore, testing users presented satisfaction towards application learning structure concerning the variety of exercises (Appendix 22). Thus, the cloze test measurement is effectively utilized in the application, promoting a productive and meaningful language learning method.

Whether review features enhance students' learning progress is another hypothesis. During the interview process, the importance of knowledge review and revision is advocated by the majority of interviewees. Most students explained that their teachers would recap previous knowledge at the beginning of the lessons, review answers for homework and generate more exercises and questions based on previous knowledge (Appendix 19.) Students' learning progress is supported with regular review sessions with exercises and queries distribution as it helps strengthen the memorizing ability. The

knowledge review feature in Challenge Me application is established to satisfy the mentioned purposes.

Challenge Me application presents an interface for teachers to freely create content, materials, challenges, exercises, and gain access to various credible materials. This hypothesis is approved by the needs of trustworthy materials as students enjoyed useful contents composed and delivered by teachers (Figure 2 & 4). Not only are the desires of students are addressed with the reliable materials and content, but teachers' problems related to the lack of natural conversation recordings, videos and reliable materials development are also tackled (Appendix 21). The teachers' interface serves as a centralized materials library where teachers can freely browse trustworthy content and exercises, supplying the natural recordings and credible materials such as textbooks for teachers. However, one adverse factor collected from teachers' feedback reveals that teachers did not frequently create their own grammar and vocabulary assignments. Few teachers would modify certain exercises to suit their lessons (Appendix 21.) Hence, the need for creating useful content and exercises varies among different teachers.

Another hypothesis is that through the completed challenges by students, teachers can save time on measuring the performance and offer support for the students. The evidence supporting this hypothesis validation includes the needs for support from students and the desires for students' performance tracking from teachers. 80% of students clearly stated that support during studies was one of the most important qualities in trusting teachers, referring to the desires of receiving assistance and guidance from the teachers (Appendix 10). From the teachers' perspectives, more than half of them did not utilize any tools or software for performance tracking, while the lesser half conducted continuous assessments through assignments and tests implementation (Appendix 21). However, the traditional measuring methods of gathering test results and continuous assessment take up time and effort. Thus, the application automatically generated data for assessment and review chart features are extremely useful since the performance measurement is instantly presented.

Live game feature is believed to assist students and teachers in immersion of an interactive, motivated, and engaging learning environment. The hypothesis is confirmed since nearly all teachers follow the interactive teaching methods where students' engagement via inquiries, conversations, and activities is emphasized (Appendix 21). Additionally, students generally expect interactive sessions between teachers and students such as fun learning games, queries, and conversation (Appendix 19).

The needs and wants for interactive sessions along with engaging experiences from students and teachers are vividly elaborated through the user research, advocating the essence of live game features.

5.2. Cloze test efficiency implementation

Based on the analysed quantitative and qualitative data, design hypothesis validation and key output mentioned related to cloze procedure, the cloze test efficiency application sub-chapter facilitates meaningful and relevant answers to the first research questions.

RQ 1: How is cloze test efficiency applied in the application?

Cloze test measures such as gap-filling exercises is a commonly known method for assessing language proficiency. The efficiency of cloze test is demonstrated clearly from the user research results and literature review. Literature review clarified that multiple-choice cloze test and rational cloze procedure are productive methods for revising grammatical and lexical structure (Hadley & Naaykens 1997, 112-113). Multiple contexts in the cloze procedure supports memorizing vocabulary better than learning words in isolation (Kuimova 2018). Users confirm that their habits for practicing language encompass tackling textbooks exercises including gap-filling assignments as the structure is effective, helping them memorize vocabulary and grammar in different contexts (Appendix 19). The efficiency of cloze test is adapted into the Challenge Me application via the design establishment of “Fill in the blank” (Figure 4) and “Arrange words” challenges (Figure 5).

5.3. Gamification utilization in language application

The integration of gamification in language education is investigated through detailed research as gamification approach is a modern technological method with immense influence in various industries. The combined findings based on literature review, qualitative interviews, and digital solutions proposed mainly serve to tackle the second research question.

RQ 2: How to utilize gamification to improve the application?

It is noteworthy to mention that the motivational pains among students is confirmed to be immense as user research recorded. As students show massive interest in competition

with themselves and with peers, gamification method is the proper technique to address the pain points for students (Appendix 19). However, there are contradictory perspectives among teachers as only specific teachers agree that competitiveness in gamification improves language teaching (Appendix 21). Gamified features are appropriate to implement in the Challenge Me application based on the demand of a majority of students and specific groups of teachers. Findings from the literature review suggests that core gamified elements are important to adapt into a language learning environment including main challenges and quests, segregation of questions, immediate results, leaderboards, competition, points, peers ranking, rewards system, personal progress, review charts and social elements (Flores 2015, 39). These essential factors are implemented as the major establishment in the application, which the live challenge feature entirely encompasses (Figure 3). Specifically, for e-learning platform development, gamification influence of statistical analysis revealed in progress and review charts is extremely vital for teachers to adjust teaching approaches (Flores 2015, 40). Based on the findings, both student and teacher's interface are integrated with progress review containing useful statistics. While students enjoy reviewing incorrect answers and frequent mistakes (Figure 6), teachers acquire detailed and useful automatic generated statistical analysis on students' performance, helping them adjust the lesson planning (Figure 11). Especially, with the teachers' acknowledgement and supervision of students' performance, the gamified e-learning environment is enhanced with more proactive and motivated students (Florczyk 2012). The gamified features integration eventually boosts students' motivation, satisfaction, and retention (Osipov et al. 2014, 12). Additionally, instant feedback revealing the answers immediately after question completion acts as a beneficial quality from gamification methodology, encouraging students to be more aware of their own and peer's performance (Flores 2015, 38). In Figure 4, students will immediately observe the results displayed as correct or incorrect answers with explanations, their scores, and ranking in the leaderboard compared with peer learners. Not only instant feedback is incorporated, the social elements with fellow learners and teachers revealed through the leaderboard (Figure 4) and discussion box (Figure 11), promoting learning advancement, information sharing and empathy (Fogg 2002, 89). All in all, the Challenge Me application feature values are aligned with gamification principles.

5.4. Identified users' needs and proposed solutions

It is necessary to identify users' needs and desires as well as facilitate correlated digital solutions for the precise navigation of application design. The user research containing qualitative and quantitative data acts as the concrete foundation to specify the user needs.

Especially, the design thinking philosophy is an extremely crucial method for designing a meaningful digital solution, providing additional values to customers on the market. The third research question is elaborated with answers derived from the beneficial findings.

RQ 3: What are the users' needs and how the application tackles them?

Students' needs and wants are centralized in substantial pains such as difficulties in acquiring learning motivation, increasing interaction with teachers, receiving support from teachers, and consistently revising grammar and vocabulary (Appendix 12). Therefore, the digital solution emphasizes on formulation of gamified elements, leaderboard and ranking system for boosted motivation; live challenges for enhanced teacher interaction (Figure 4 & Figure 5); discussion and performance measurement features for acquiring support from teachers (Figure 6); and finally, a variety of reliable exercises including cloze test for language revision (Figure 4 & Figure 5).

According to the teachers' responses, they strive to motivate and support students, seek for online teaching activities and inspire students to speak more frequently. Additionally, teachers' gains involve timesaving in students' performance measurement and access to trustworthy content, materials, and exercises library (Appendix 21.) The solutions for mentioned issues are observed in the application features such as reward system and gamified activity for improved students' motivation and participation. In addition, discussion channel for feasible support, performance measurement based on automatic generated data (Figure 11), and reliable content library (Figure 9) are constructed. However, the dream for encouraging students to communicate regularly is not tackled utilizing the Challenge Me application.

5.5. Product applicability, relevance, and necessity

The outcome of high-fidelity prototyping has achieved testing results from the commissioning company, language teachers, and students. Commissioning company benefits from the design of Challenge Me application as it proposes an opportunity for the development of a meaningful language teaching tool. The commissioning company is a private Finnish lessons provider. The company representative is Roosa Kuusisto. The company services include providing high quality classes in Finnish language and primary school subjects both online and in person. The high-fidelity prototyping of Challenge Me application was reported to be up to the commissioning party's expectations during the usability testing results. Consequently, the application adequately solves her major

encountered problems in language teaching. Several feedback from the commissioning party includes implementation of multilingual translation built-in features for delivering knowledge in various languages and establishment of posting features on teachers' profile for feasible connection with potential students. Furthermore, private students from the commissioning party expressed enthusiasm and excitement with the Challenge Me application concept and prototype, revealing the compelling aspects the application will introduce in the future development. The research findings and design results provide Teacher Roosa Tmi with beneficial knowledge related to the application of cloze test procedure and gamification philosophy in language e-learning field as well as areas of improvement for the prototyping.

The thesis author has achieved the targets and objectives of the thesis to collect new and useful information for cloze test methods, gamification effects, along with design thinking methodologies for Challenge Me application. Besides, the thesis author was able to answer the research questions and provide concrete findings related to target users' desires and pains to back up the answers. Not only are users' pains and gains are declared in the thesis objectives findings, but essential data also analysed from the biggest competitive players in language education including Duolingo, Kahoot, and Quizlet are collected and concluded. Hence, competitive edges for the Challenge Me application are vividly derived. The key results from competitor analysis induce unique value proposition for the Challenge Me application, magnifying potential market entry opportunities for the product. As a result, the application satisfies target customers, encompasses scientifically proven methodologies, and positively differentiates from relevant competitors. Based on the solid framework created by literature review and user research along with competitive advantages identified from competitors analysis, navigation for the Challenge Me application solution was figured out with productive interface and user experience design, promoting additional values to the current language education e-learning industry. The thesis project was completed within the determined deadline and the thesis author was able to deliver a final report.

5.6. Recommendations

The Challenge Me application development will follow the high-fidelity prototyping to finally launch the product in the market for early feedback collection from real users. Additionally, further development process of the Challenge Me application must enclose the feedback from usability testing to formulate design iteration loop and more usability responses should be sought if needed. Specific feedback needs to be incorporated in the future

development phase concern changes in leaderboard visibility, points system clarification, along with implementation of new features such as posting ability on teacher's profile, multilingual support for words and sentences translation, saving words in a vocabulary library, and review words based on cloze procedure. Future application development team working on the application should take into consideration the detailed feedback. Not only iterated feedback is significant, but the elaboration, maintenance, and update of the design system containing colour palettes, fonts, spacing, icons, illustrations, etc. are extremely crucial for successful application development. Especially, when the future implemented application achieves a larger number of users, obstacles will pile up if the iterated feedback are not carried out or collected in advance and the design system is neglected.

Another recommendation for the commissioning party is the future use cases for the Challenge Me application when it is built with coding stacks and launched in the market. As the commissioning party shows massive interest in the project and intends to acquire positive influences utilizing the future application, Teacher Roosa Tmi will be one of the first users when the product is ready for the market. Examples of use cases scenarios for Teacher Roosa Tmi consists of inside and outside classroom challenges facilitation. With in-class live game from the Challenge Me application, the commissioning party is able to capture students' attention, increase students' success rates, improve students' excitement with gamified elements, enhance motivation, boost students' participation and retention, introduce fresh topic and content-rich subjects. Flexibility in practice is shown in the application by outside classroom practice and review where students can complete challenges as homework. Especially, as the commissioning party agreed that game-based learning and competitiveness are the core qualities in her teaching method, the Challenge Me application serves as an efficient tool for her to manage and plan the lessons. The tool contributes as an interactive variation from traditional online teaching session as the commissioning party demonstrated a pain in teaching methods during online classes. It is notable that the commissioning party conduct continuous assessments with students based on their completed assignments, which cause an abundant waste of time and effort in measuring students' performance. Thus, the usability of the application targets time efficacy with auto-generated statistical data analysis from students' performance for Teacher Roosa Tmi.

5.7. Reflection on personal learning

Regarding personal learning, this thesis project has been a fascinating and intriguing journey to the author. The project originates as an entrepreneurial concept for improving current language learning application while bringing compelling factors to both students and teachers. Hence, the recognition of new knowledge related to language learning, gamification combined with user experience design skills for digital products attained from university specialization fruitfully form the thesis topic and conduct. The author has gained practical knowledge of cloze test, gamification effects for language learning, and design thinking philosophy application. The integration of new concepts, skills, philosophy, and knowledge becomes a solid foundation for the development of the entrepreneurial business idea. Promising opportunities are prompted for the Challenge Me application to transform into real product in the market.

Moreover, during the implementation of thesis research, the thesis author encountered with an enthusiastic, motivated, helpful, entrepreneurial, and skilled language teacher who works as a private trader in the field of language education known as Teacher Roosa Tmi. The private teacher presents immense understanding and interest in the project, demonstrating her professional assistance with expertise knowledge during the user research and usability testing phase for the design establishment of the product. As the product aims to solve the commissioning party's pains and gains as well as potential users' needs and wants, it is crucial that expertise knowledge from Teacher Roosa Tmi are adapted into the process. Therefore, the thesis author has asked the commissioning party to commission the thesis as both parties foresee the additional values the project brings about in the future for mutual benefits. Additionally, since Teacher Roosa Tmi shows great enthusiasm and support to the project, the company is one of the most prominent users after the launch of the product on the market. Hence, the thesis author can feasibly promote and develop the product with concrete first user. The thesis process has created opportunities for the thesis author not only to comprehend the knowledge and construct the necessary prototype but also to form a trustworthy relationship with an education expert.

6. Summary

Newly discovered knowledge on cloze test efficiency, gamification effects, target users' needs and wants along with design thinking methodologies for Challenge Me application are tackled during the thesis implementation. Essence of the cloze test indicated the productive language practice method with emphasis on context learning and vocabulary memorization enhancement. Next, gamification is proven to be an effective integration with online language education, suggesting that gamified elements boost students' motivation and interaction while saving time for teachers in performance measurement. Students significantly enjoy the instant feedback from the gamified features as it provides gratification for correct responses, triggers competition and motivation during studies. Moreover, interesting user research findings from the teachers and students support key research questions and the development of a language learning digital solution. The high-fidelity prototyping of the Challenge Me application was confirmed to meet all the requirements from the commissioning party and in consequence, solve her major confronted problems in language teaching.

The thesis author spent total 300 hours on the project with timespan of five months from June to November 2020. Though there were multiple threats to the project such as failure in meeting deadline and commissioning stoppage. Nevertheless, the project was fruitfully implemented as the methods for elimination of perceived threats were strictly followed. The preconditions for the success of the project are carefully planned out, including the project plan, the availability and confirmation of people involved in the project, the agreement between commissioning company and the thesis author, and the hours reserved for the thesis implementation. With the success of the project, the writer of the thesis has achieved a high-fidelity prototyping of the digital product which can be tested and gathered early feedback from the users to conduct iteration. The design served as a foundation of final development of product which will be conducted after the thesis is finalized.

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Appendices

Appendix 1. Survey questions for students

1. What are your biggest challenges when learning a new language?
2. Which activities help you learn a new language consistently?
3. What are the language learning methods which you prefer?
4. What factors help you trust a teacher?
5. What type of learning activities with teachers do you prefer?

Appendix 2. Interview questions for students

Warm up questions

1. How old are you?
2. What is your current job?
3. Can you tell me about your hobbies?
4. What languages are you studying?

Language learning background

1. Tell me about how you usually study language. In class and self-study?
2. How do you study language vocabulary and grammar?
3. What kind of language learning materials do you use?
4. When learning in the classroom, what materials/assignments do you expect the language teacher to provide?
5. What activities do you expect in a language learning class?
Do you play games in language learning class?
6. When doing self-study, what are the three activities you like the most?
7. Do you like to do grammar exercises/vocabulary exercises?
8. Does the teacher review knowledge from the previous lesson?
What methods does your teacher use to review knowledge?
Do you think it is efficient?

Define Problems

1. What challenges have you encountered when learning language grammar and vocabulary?
2. Have you created any workarounds to help you in general? Tell me more.
3. Have you tried any apps or products or websites to solve the problems?

Gamification & Motivation

1. Have you tried any language learning application with gamified features?
2. Can you tell about the last time you used the app?
3. Do you think gamification helps you in learning motivation? Why?
4. Do you like to compete with friends/yourself when learning language? Why?

Benchmark with competitors

1. What are some of the apps and websites you use the most for language learning?
2. What do you like & dislike most about those language learning apps/websites?
3. Does your language teacher use applications/software when teaching? If yes, can you name them?

Appendix 3. Interview questions for teachers

Warm up questions

1. How old are you?
2. What is your current job?
3. Can you tell me about your hobbies?
4. What languages are you teaching?

Language teaching background

1. Tell me about how you usually teach language.
2. How do you teach language vocabulary and grammar?
3. What kinds of language learning materials do you provide for students?
4. What activities do you have in a language learning class? Do you play language games with students in class? Are the games competitive? Do your students enjoy it?
5. What types of assignments do you give to students?
6. Do you provide your own grammar exercises/vocab exercises? Based on what materials?
7. Do you provide different types of assignments for students? Why?
8. How do you measure students' performance? What tools do you use to monitor students' performance?
9. Do you review knowledge from previous lessons? What methods do you use to review students' knowledge?

Define Problems

1. What challenges have you encountered when teaching language in general?
2. How about problems specifically for grammar and vocabulary?
3. How do you currently tackle those problems?
4. Have you created any workarounds to help you?
5. Have you tried any apps or products or software to solve the problems?

Gamification & Competition

1. Have you tried teaching with any language learning application with gamified features?
2. Do you think gamification helps students in learning motivation? Why?

Benchmark with competitors

1. Do you use applications/software/websites when teaching? If yes, can you name them?
2. What do you like & dislike most about those language learning apps/websites?
3. Can you describe the last time you use the software in the class?

Appendix 4. Post-test interview

1. How do you feel when using the prototype?
2. Where is the most frustrating part?
3. How does it measure up to your expectations?
4. What do you like & dislike most about the app?
5. What features do you think are missing?
6. Does anything seem out of place or unnecessary?
7. If you had a magic wand, what would you change about the app?
8. How likely or unlikely would you be to use this product once it's finished?
9. From 1 to 10, how would you rate the app?

Appendix 5. Prototyping links

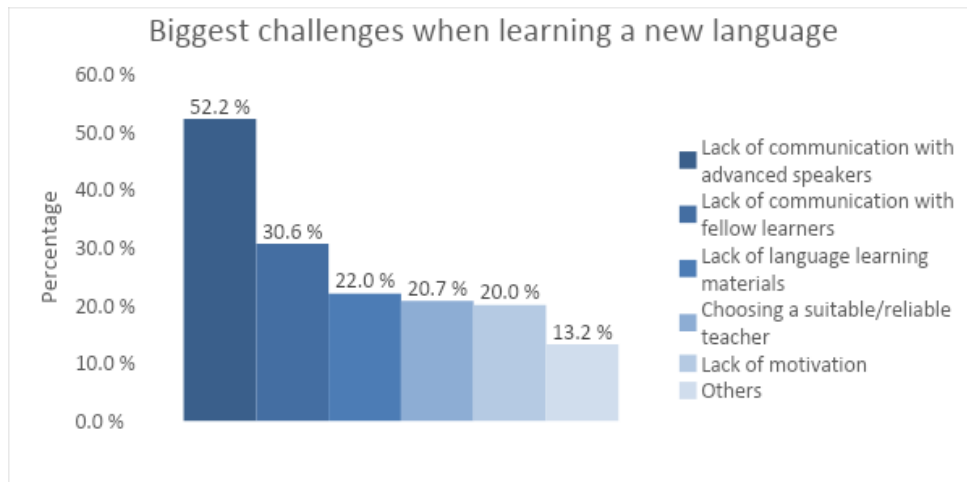
Student's interface

<https://www.figma.com/proto/RBi7FUnSsg8JROGkSCVbyR/ChallengeMe?node-id=21%3A1048&scaling=scale-down>

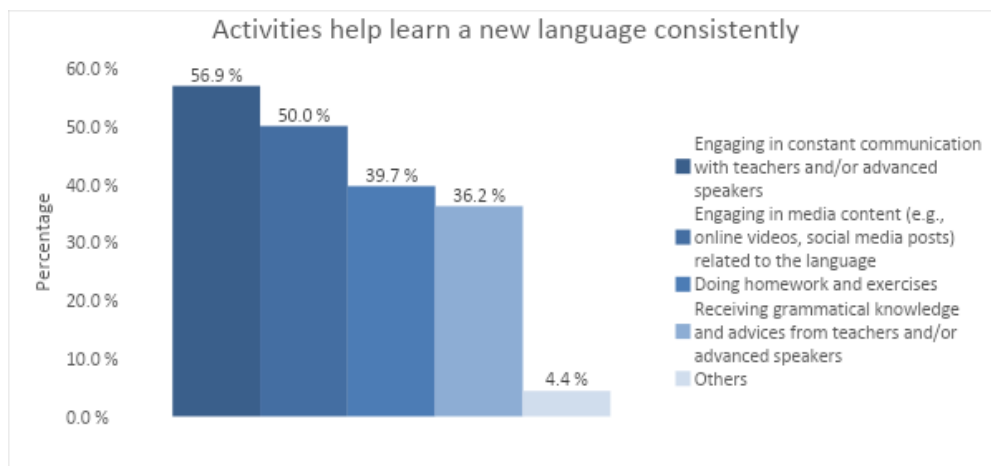
Teacher's interface

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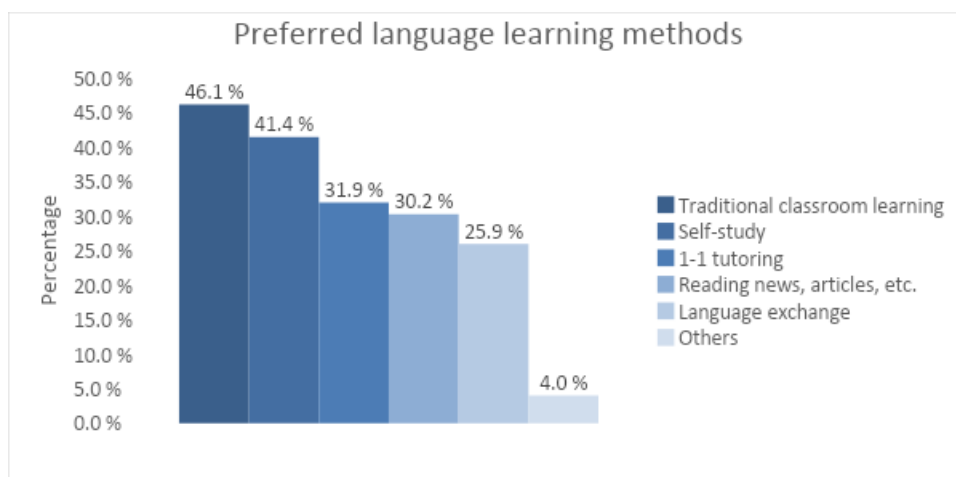
Appendix 7. Biggest challenges in language learning



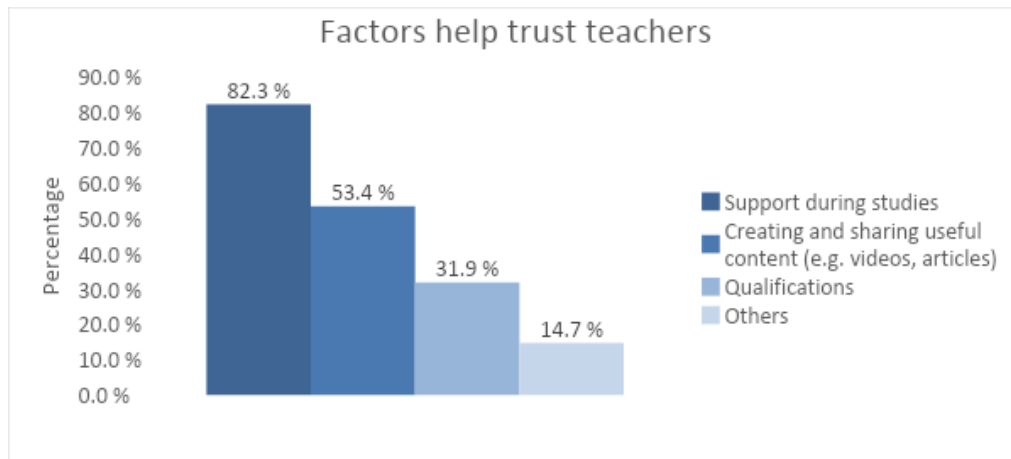
Appendix 8. Activities help consistent language learning



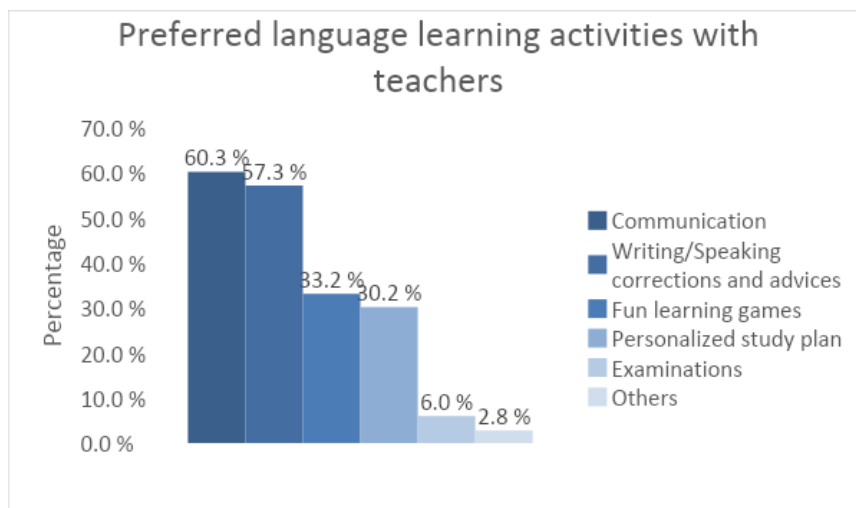
Appendix 9. Preferred language learning methods



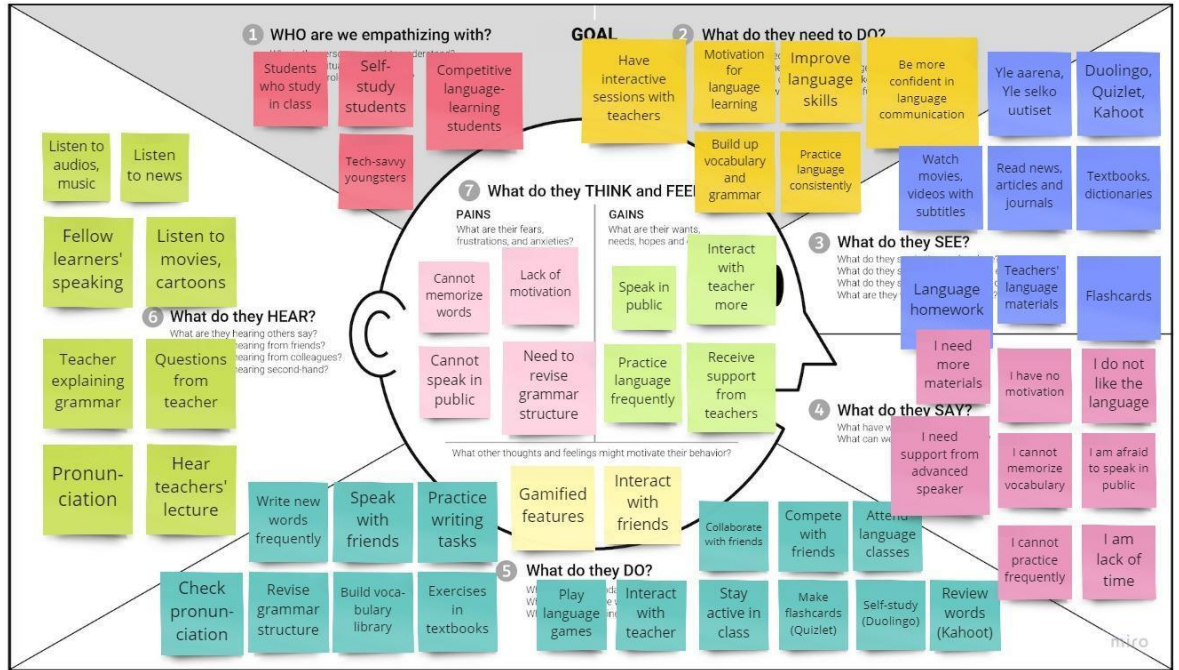
Appendix 10. Factors help trust teachers



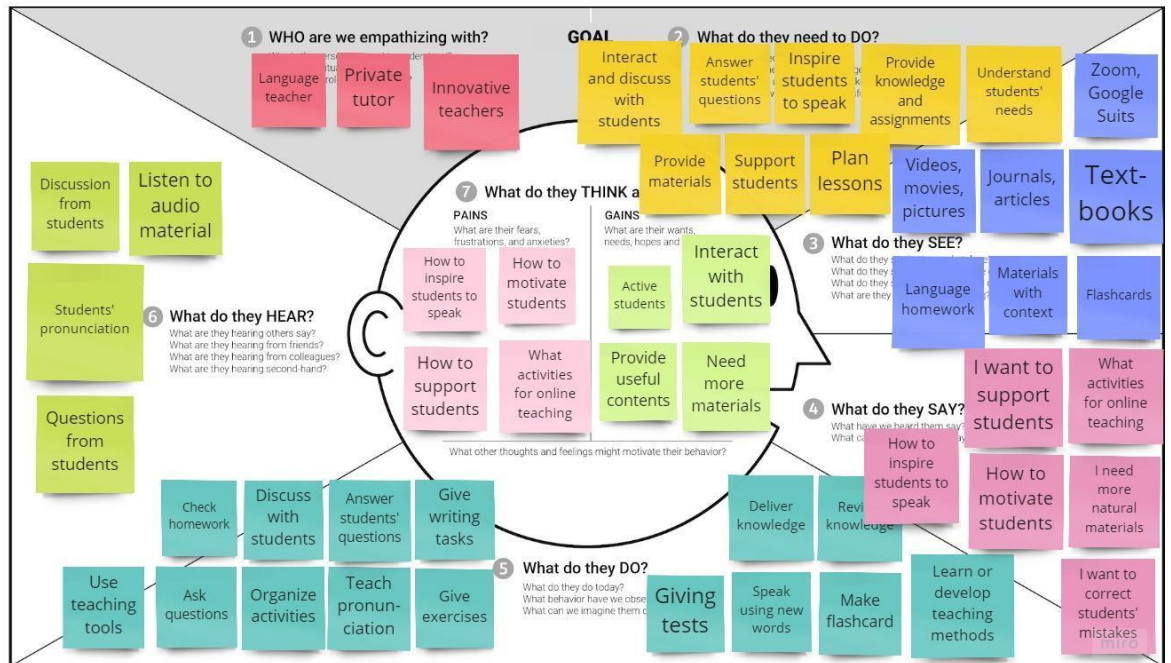
Appendix 11. Preferred activities with language teachers



Appendix 12. Students' empathy map




Appendix 13. Teachers' empathy map



Appendix 14. Student Persona

Persona: Competitive language learning student



Nick James

Who am i ...
 Man
 24 years old
 Studying in a Finnish class
 Competitive in learning
 Has busy schedule

3 reasons to use your product/services
 1) Need a language learning tool which is motivated and fun
 2) Want to compete with friends and interact with teachers when learning language
 3) Want to revise vocabulary and grammar

3 reasons to buy your product/services
 1) Provide learning motivation
 2) Improve learning efficiency with teachers' support
 3) Save money by self-study materials in the application

My interests
 Watching movies
 Reading news
 Playing games
 Better career

My personality
 Goal-oriented
 Competitive
 Logical
 Hard-working

My skills
 Reading
 Writing
 Speaking
 Listening


My dreams
 Memorize words
 Speak confidently
 Fluent in language
 Get a job

My relationships with technology
 Advanced internet user
 Familiar with language learning app

miro

Appendix 15. Teacher Persona

Persona: Innovative language teacher



Hanna Kisonen

Who am i ...
 Woman
 39 years old
 Finnish teacher
 Innovative teaching methods
 Onsite and online teaching

3 reasons to use your product/services
 1) Need a language teaching tool which is motivated and fun
 2) Need an innovative tool for online teaching
 3) Want to support and help students

3 reasons to buy your product/services
 1) Provide learning motivation for students
 2) Improve lesson quality and efficiency
 3) Save time with exercises and material library

My interests
 Game-based teaching
 Support students
 Engaging with students
 Improved quality

My personality
 Creative
 Student-oriented
 Innovative
 Active

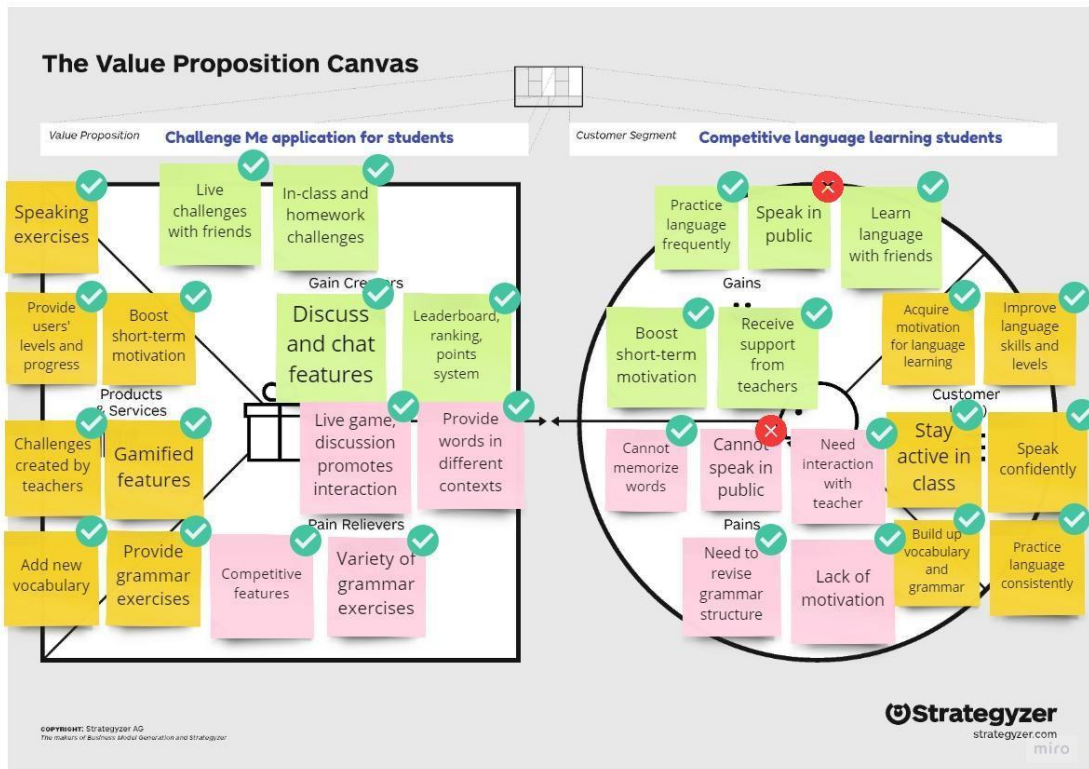
My skills
 Language teaching
 Grammar explaining
 Creative content creation
 Answering students' questions

My dreams
 Efficient lesson
 Interactive lesson
 Active students
 Students practice frequently

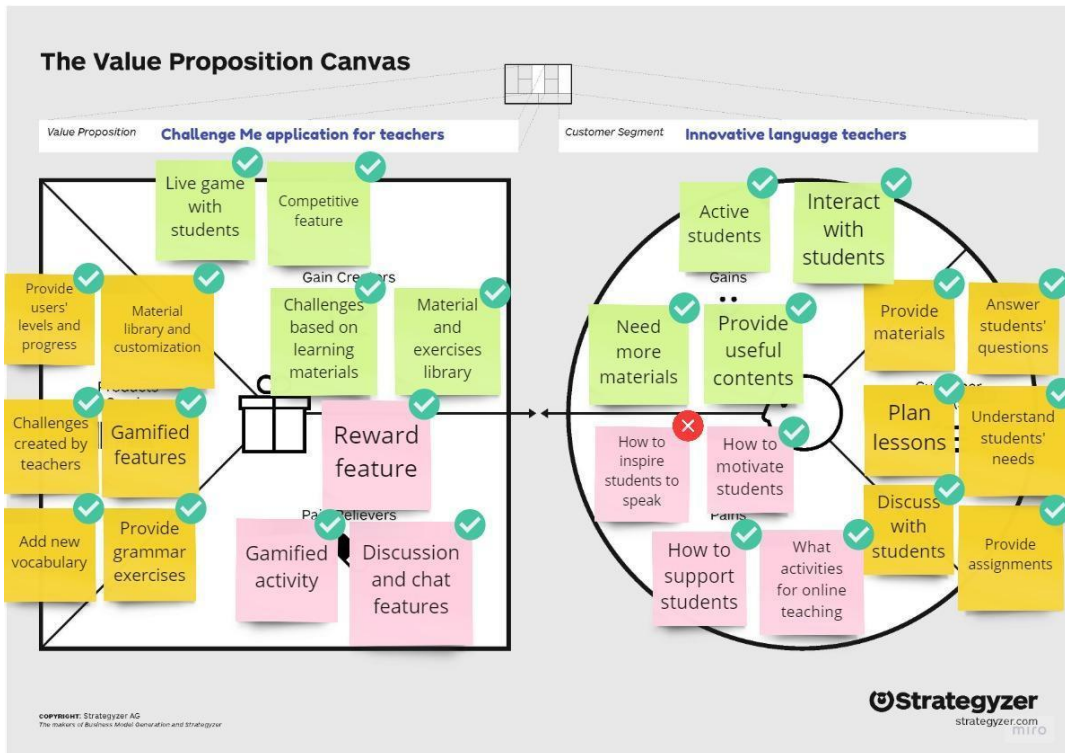
My relationships with technology
 Advanced internet user
 Familiar with language teaching app

miro

Appendix 16. Students' value proposition map



Appendix 17. Teachers' value proposition map



Appendix 18. Student profiles

User no.	Name	Age	Job	Study languages	Hobbies
1	Ngan	25	Student	English, Finnish	Painting, coloring
2	Janne	24	IT Student	German, English	Playing tennis
3	Ngoc	23	Student	Japanese, English	Flowers, dancing
4	Lily	23	Manager	Finnish, Korean	Drawing, playing piano
5	Giao	23	IT Student	English, Finnish	Reading books
6	Mei	28	IT Student	English, Finnish	Painting

Appendix 19. Students' interview results

Themes	Responses
Regular methods for language learning	<ul style="list-style-type: none"> ● Learn with textbooks and complete exercises (4 votes) ● Build own library with frequently seen words (4 votes) ● Join lessons and complete exercises (3 votes) ● Communicate with colleagues and friends (3 votes) ● Listen to music, watch movies, media content (2 votes) ● Write new words and paragraphs repetitively (2 votes) ● Make flashcards (2 votes)
Language learning materials and expectations	<ul style="list-style-type: none"> ● Diverse textbooks and exercises (4 votes) ● Videos, movies, news and music (4 votes) ● Language application such as Quizlet, Duolingo (3 votes) ● Speaking correction from teachers (2 votes) ● Online learning materials, games
Expected activities with teachers	<ul style="list-style-type: none"> ● Interactive sessions where teachers give questions and seek answers from students (4 votes) ● Games such as Kahoot for reviewing words (2 votes) ● Does not like to play games (2 votes) ● Discussion with fellow learners (2 votes)
Self-study activities	<ul style="list-style-type: none"> ● Watch movies and immerse in entertainment (3 votes) ● Do grammar exercises in the textbooks (3 votes) ● Build his/her own vocabulary library (2 votes) ● Practice writing new words (2 votes) ● Communicate with spouse and friends (2 votes) ● Read newspaper and articles (2 votes)
Knowledge review	<ul style="list-style-type: none"> ● Knowledge review is extremely important (5 votes) ● Teacher recaps previous knowledge (3 votes) ● Teacher reviews answers for the homework (3 votes) ● Teacher gives relevant exercises (2 votes) ● Teacher asks relevant questions (2 votes)
Language learning problems	<ul style="list-style-type: none"> ● Lack of motivation (4 votes) ● Difficulties in memorizing grammar and vocabulary (4 votes) ● Afraid to speak in public because of mistakes (3 votes)

	<ul style="list-style-type: none"> ● Teacher's online materials are unorganized and tedious ● Compound words and pronunciation challenges
Tackling the problems	<ul style="list-style-type: none"> ● Revise knowledge in conversations and exercises (4 votes) ● Note down the vocabulary (4 votes) ● Frequently communicate friends (3 votes) ● Repetitively write down new words (2 votes) ● Guess the word meaning ● Check pronunciation from the dictionary
Competitors' tools and applications	<ul style="list-style-type: none"> ● Duolingo (3 votes) <ul style="list-style-type: none"> ○ Disadvantages: random, unstructured, and unpractical knowledge ○ Advantages: competitive feature, progress and ranking system ● Yle language school, Yle Selkouutiset (3 votes) ● Duolingo (3 votes) ● Quizlet. One of the disadvantages of Quizlet is the inability to help learners understand language grammar (2 votes) ● Rosetta Stones ● Quizlet flashcards, dictionary ● Socrative, Kahoot
Teacher's software	<ul style="list-style-type: none"> ● Teachers do not use applications for teaching (3 votes) ● Zoom video conferencing, Google Classroom
Gamification in learning motivation	<ul style="list-style-type: none"> ● The learner prefers competing with her/himself more than with friends (3 votes) ● The learner prefers to compete with friends (3 votes) ● Provides competitiveness and motivation (2 votes) ● The learner prefers discussing with friends (2 votes) ● The learner do not prefer competition (2 votes)

Appendix 20. Teacher profiles

User	Name	Age	Job	Teach	Student group	Hobbies
1	Roosa	27	Private teacher	Finnish, Swedish	Youngsters and adults	Dance lessons, running
2	Julie	28	Language teacher	English, Vietnamese	University/high school students	Badminton, swimming, reading
3	Meri	39	Public teacher	English	3rd and 6th grade	Technology, languages
4	Chi	24	Private teacher	English	University students	Reading books
5	Mari	34	Language teacher	Finnish	Adults	Triathlete

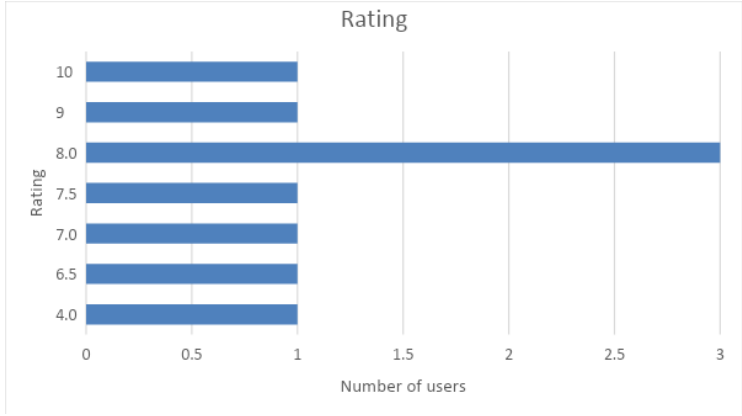
Appendix 21. Teachers' interview results

Themes	Responses
Language teaching methods	<ul style="list-style-type: none"> • Present grammar knowledge with context then the grammar rules are taught with related assignments (5 votes) • Interactive methods related to students' engagement (4 votes) • Lessons frequently involve speaking sessions (4 votes) • Online teaching (3 votes) • Provide grammar exercises from textbooks (3 votes) • Explain and conduct the lesson in the target language (2 votes) • Visualize the language utilizing pictures, drawings (2 votes) • Create sets of flashcards such as using Quizlet (2 votes) • Relate the study plan to social issues or hobbies
Teaching materials and assignments	<ul style="list-style-type: none"> • Textbooks provided by the students or trusted sources (4 votes) • Online materials and authentic materials such as videos, natural recording of conversation, etc. (3 votes) • Written assignments with grammar and vocabulary (3 votes) • The teacher does not create own assignments (3 votes) • Online credible grammatical and vocabulary exercises (2 votes) • Skills exercises to help students express their ideas (2 votes) • Games such as bingo, crosswords, and letters puzzle • The teacher modifies authentic content to create more personalized solution
Activities	<p><i>Activities</i></p> <ul style="list-style-type: none"> • Teacher does not use game in the class (3 votes) • Discussions between the teacher and students (3 votes) • Teacher uses simple gamified activities for learning vocabulary (3 votes) • Activities such as role-play, drama, concrete objects, board games etc. (2 votes)
Competitiveness	<ul style="list-style-type: none"> • There should be competitiveness. However, teachers need to adjust the activities based on student group (3 votes) • There is no competitiveness in the activities (2 votes)

Students' performance	<ul style="list-style-type: none"> • No tools or software to monitor students' performance (3 votes) • Continuous assessments through assignments (3 votes) • Test results depending on student groups (3 votes) • Measure based on students' initial goals (2 votes) • Give feedback on students' activeness (2 votes)
Knowledge review	<ul style="list-style-type: none"> • Ask students relevant questions (3 votes) • Lesson plan is related to previous lesson (3 votes) • Review homework (2 votes)
Problems in teaching	<ul style="list-style-type: none"> • Online class platform is an obstacle due to the limitations in teaching methods and technical problems (3 votes) • Students are not motivated (2 votes) • Lack of natural conversation recording (2 votes) • Cannot use the target language to explain (2 votes) • Need to encourage students to use vocabulary (2 votes) • Lack of development in materials
Tackling problems	<ul style="list-style-type: none"> • Constantly use new words so the students can mimic (3 votes) • Give students more exercises (2 vote) • Using games or repeating grammar structure
Teaching applications	<ul style="list-style-type: none"> • Do not teach with applications (3 votes) • Google Suits for homework assessment and students' review (3 votes) • Kahoot, Quizlet for vocabulary with pictures and recording • Kieli.net for observing the verb changes • Word Dive, Word Wall
Gamified applications	<ul style="list-style-type: none"> • Competitive features are useful for students' learning (4 votes) • Do not teach with gamified applications (3 votes) • Create Quizlet flashcard sets • Word Wall or Kahoot are labour-intensive for teachers • Gamification only helps the young and beginner students

Appendix 22. Usability testing results

Themes	Findings
Most confusing parts	<ul style="list-style-type: none"> ● Confuse at the tasks due to Figma prototyping limitation (6 votes) ● Do not see or click the “View Leaderboard” button, prefer to see the leaderboard without clicking or it should be more visible with more statistics (5 votes) ● Do not comprehend how the points system operate (3 votes) ● The purpose of the content in the home screen (2 votes) ● Grammar check challenge does not give any guidelines for writing ● The design of info slide looks similar with the challenges
Expectation measures	<ul style="list-style-type: none"> ● Up to or exceed her expectations (7 votes) ● Not up to her expectations (2 votes)
Likes	<ul style="list-style-type: none"> ● Clean, straightforward, intuitive, and clear design, easy to use (8 votes) ● Variety of exercises (4 vote) ● Grammar explanations (3 votes) ● Do not need to use many applications for one task (2 votes) ● Leaderboard (2 votes) ● Teacher has more freedom to create different challenges
Dislikes	<ul style="list-style-type: none"> ● Nothing so far (2 votes) ● The application is labour-intensive for teachers ● Do not like the randomness in the lesson structure ● Do not like competing with others and only wants to see her progress
Missing features	<p><i>General</i></p> <ul style="list-style-type: none"> ● Multilingual supporting such as built-in google translate (2 votes) ● More functions such as flashcards, crossword, and alphabets puzzle (2 votes) ● See students’ progress and level and choose user’s level based on the ability

	<p><i>Sign up and Profile</i></p> <ul style="list-style-type: none"> ● Prefer to have a teacher profile for promotion (2 votes) ● Can join the application as a teacher and as a student <p><i>Challenges</i></p> <ul style="list-style-type: none"> ● Review wrong questions regularly (2 votes) ● Add pictures to the conversation in phrases puzzle challenge ● Students should be able to join the challenge in one-player mode ● Students should be able to compete with themselves ● History of challenges which user has participated in ● Invite friends to join the challenges ● If the assignment is submitted for grading, then there should be indication ● The challenge descriptions and topic should look more distinguishable 																
Unnecessarily features	<ul style="list-style-type: none"> ● Grammar check is not suitable to put in the game (3 votes) ● The report should not be public because of legal and privacy issues (2 votes) ● Do not read or partially read the explanations if the answers are correct (2 votes) 																
Likelihood to use the finished app	<ul style="list-style-type: none"> ● Likely to use the app (6 votes) ● Unlikely to use the app (2 votes) ● Likely to use if the more functionalities are added 																
Rating	 <table border="1"> <caption>Rating Data</caption> <thead> <tr> <th>Rating</th> <th>Number of users</th> </tr> </thead> <tbody> <tr> <td>4.0</td> <td>1</td> </tr> <tr> <td>6.5</td> <td>1</td> </tr> <tr> <td>7.0</td> <td>1</td> </tr> <tr> <td>7.5</td> <td>1</td> </tr> <tr> <td>8.0</td> <td>3</td> </tr> <tr> <td>9</td> <td>1</td> </tr> <tr> <td>10</td> <td>1</td> </tr> </tbody> </table>	Rating	Number of users	4.0	1	6.5	1	7.0	1	7.5	1	8.0	3	9	1	10	1
Rating	Number of users																
4.0	1																
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