

Learning experience (LX) design and digital language learning games: Analysing Duolingo's learning experience design with the LETUS design framework

Bachelor's thesis
Millastiina Kaipainen

University of Jyväskylä
Department of Language and Communication Studies

English
June 2020

JYVÄSKYLÄN YLIOPISTO

Tiedekunta – Faculty Humanistis-yhteiskuntatieteellinen tiedekunta	Laitos – Department Kieli- ja viestintätieteiden laitos
Tekijä – Author Millastiina Kaipainen	
Työn nimi – Title Learning experience (LX) design and digital language learning games: Analysing Duolingo’s learning experience design with the LETUS design framework	
Oppiaine – Subject Englannin kieli	Työn laji – Level Kandidaatintutkielma
Aika – Month and year Heinäkuu 2020	Sivumäärä – Number of pages
Tiivistelmä – Abstract <p>Tämä tutkielma keskittyy Duolingon käyttäjälähtöiseen oppimismuotoiluun (<i>eng.</i> LX design) ja pohtii kerätyn tiedon pohjalta Duolingon käyttöä osana suomalaista kielikoulutusta. Ilmiötä analysoitiin käyttämällä kvalitatiivista sisältöanalyysiä ja LETUS-viitekehystä. Analyysin kohteeksi valittiin Duolingon ruotsinkielen kurssi englanninkielisille käyttäjille, sillä tutkimuksen teon hetkellä ei ollut tarjolla kielikursseja suomenkielisille käyttäjille.</p> <p>Tutkielmani teoreettinen viitekehys keskittyy ensin määrittelemään LX design termin ja antaa sen jälkeen katsauksen Kenttälä, Rousi ja Kankaanrannan (2018) LETUS-viitekehukseen (Learning Experience Technology Usability design framework). LETUS-viitekehys valikoitui tutkimukseni viitekehukseksi, sillä se pyrkii ottamaan huomioon oppimisen kompleksisuuden ja moninaiset kontekstit. LETUS-viitekehyksessä keskitytään muun muassa pohtimaan LX designia oppimisen, teknologian ja sisällön kautta kontekstualisoimalla ne käsittämään mikro-, meso- ja makrotasot.</p> <p>Tutkimukseni keskittyi erityisesti pohtimaan oppimista yksilön näkökulmasta mikrotasolla sekä Duolingon sisältöä mikrotasolla. Muutama konteksti jouduttiin jättämään sivuun, sillä ne olisivat vaatineet kattavampaa ja laajempaa tutkimusta esimerkiksi käyttäjäkyselyn muodossa. Analyysini kuitenkin osoitti, että Duolingo on ottanut huomioon monet LETUS-viitekehysten mainitsemat elementit erityisesti teknologian ja immersion osalta. Tästä huolimatta muutamia kehityskohteita havaittiin, joista suurimmat ongelmat liittyivät yksilöiden huomioimiseen ja sisältöön.</p>	
Asiasanat – Keywords LX design, LETUS design framework, digital language learning games, käyttäjälähtöinen oppimismuotoilu, LETUS-viitekehys, digitaaliset oppimispelit	
Säilytyspaikka – Depository JYX	
Muita tietoja – Additional information	

Table of Contents

1	INTRODUCTION	5
2	THEORETHICAL FRAMEWORK	5
2.1	Learning experience (LX) design	6
2.1.1	Learning	6
2.1.2	Experience.....	7
2.1.3	Design	7
2.2	LETUS-Framework	8
3	PRESENT STUDY	11
4	ANALYSIS OF DUOLINGO.....	13
4.1	Learning.....	13
4.1.1	Individual features on micro level.....	13
4.1.2	Social features on micro level.....	17
4.1.3	Individual features on macro level.....	18
4.1.4	Social features on macro level	20
4.2	Technology	21
4.2.1	Environmental features on micro level	21
4.3	Content.....	23
4.3.1	Content features on micro level	23
5	ANALYSING DUOLINGO’S SUITABILITY IN THE CONTEXT OF FINNISH SCHOOL SYSTEM.....	27
5.1	Individual features on micro level	27
5.2	Content features on micro.....	28
6	CONCLUSION.....	31
	BIBLIOGRAPHY.....	32
	APPENDIX.....	35

TABLE OF FIGURES

<i>Table 1. The LETUS-framework by Kenttälä et al. (2018)</i>	9
<i>Table 2. Duolingo's gamifying elements</i>	19
<i>Table 3. Duolingo's affordances</i>	22
<i>Table 4. The word categories and the grammar structures in the Swedish course for English speakers</i>	23

1 INTRODUCTION

Web-based applications such as language learning games have become more prominent in language classrooms. However, many of these applications are not intended for language learning (Reinhardt, 2018) which is a complex mixture of features and participants that must be covered in the design and application of language learning materials.

One way to study this complexity is through learning experience design and the Learning Experience Technology Usability (LETUS) design framework (Kenttälä et al., 2018). These aim to design learning products that consider all perspectives and acknowledge learners' needs and contexts, and help them reach their learning goals. Incorporating design thinking into learning technology brings contextual, pedagogical and content perspective into learning material development, thus helping teachers, and other stakeholders, to create and analyse language learning technology (Garreta-Domingo et al., 2018).

This study's focus is analysing the learning experience design of one learning application, Duolingo, and its suitability for the Finnish school system based on how closely it follows the LETUS framework. The study will first explain terms related to the field and then concentrates on Duolingo, its contents, technology, and how it accommodates different learners.

2 THEORETICAL FRAMEWORK

2.1 Learning experience (LX) design

Learning Experience (LX) derives from the field of information technology and user experience (UX). In order to understand LX, it is also important to understand UX. According to the International Organization for Standardization (ISO) UX means a ‘person’s perceptions and responses resulting from the use and/or anticipated use of a product, system or service’. Moreover, UX includes all the user’s experiences (e.g. physical, emotional, behavioural) that take place before, during and after the use of a product. UX is a combination of brand image, user’s individual features as well as presentation and interactive qualities of the interface (ISO, 2018). The main aim of UX, and in that way also LX, is to understand what makes a good experience and employ these principles into the design of a user interface in order to create learning experience (Raybourn, 2016). In essence, LX design seeks to combine learning, human-technology interaction and design thinking in a learner-centred way. In the following sections the terms *learning*, *experience* and *design* will be explained.

2.1.1 Learning

The learner and learner-centredness is in the heart of LX (Raybourn, 2016). A learner-centred approach in design means that learning should emphasize students and their learning rather than teachers and teaching. The main focus should not be on the materials and methods teachers will use, or the way lessons should be instructed. Instead, teacher’s aim should be on what materials and methods they should use so that the individual students would accomplish the set goals (Wiggins & McTighe as cited by Blin & Jalkanen, 2014). Students attain different levels of success in language learning development, and many researchers have argued that this is

due to different contexts and individual differences in cognitive abilities (Faretta-Stutenberg & Morgan-Short, 2018). Hence, it is crucial to study learning and teaching from a student's point of view and try to avoid the one-size-fits-all approach. However, as educators are in the significant role of choosing the pedagogy, methods, and learning materials for their students, they should not be neglected in the design process. Ultimately, their views of technology have a major impact on technology usage in the classrooms (Kenttälä, et al., 2018).

2.1.2 Experience

Another important aspect of LX design is experience. In LX design, learning is considered to be shaped by students' past experiences, impressions, and memories, which are also used as building blocks for future learning experiences and goals (Kenttälä et al., 2017); people learn from past experiences and those experiences influence the future experiences (Dewey, 1938/1997, as cited by Kenttälä et al., 2017). On the other hand, experiences are very subjective, and people will react differently depending on context (Kraft, 2012). Undoubtedly, experiences are in the core of LX design, but the subjectivity of experiences might set difficulties in the design process. Essentially, learning designers must incorporate elements which enhance the successful learning experiences of individuals and which mitigate the negative feelings.

2.1.3 Design

Design in the learning context means that the learning designers try to understand where the learners are in their learning path, and what tools they will need in order to reach the desired goals set by the instructors, educators and designers in the given context (Luchs et al., 2016). The design process requires both creative practice and critical thinking. According to Luchs et

al. (2016), one way to look at the creative process is to first identify the problem by discovering and defining it and then solve it by creating a prototype (or prototypes) and evaluating it. After evaluation, the designer can continue the process from the beginning by identifying, discovering and defining.

2.2 LETUS Framework

The LETUS framework (Kenttälä, et al., 2018) is one way to examine learning experience design of learning software products. It consists of three aspects: learning, technology and content. Each of these are studied through contextualisation, in other words micro, meso and macro levels. Micro means classroom or learning environmental factors such as age level, subject, emotional and social environment, skills and competences, affordances, authenticity. Meso level means learning environments outside the classroom, e.g. online courses, teacher training, experience-based knowledge, informal learning and non-educational contexts, and collaboration outside the classroom. Macro level consists of societal factors that affect teachers and learners. These factors can include curricula, theory and research knowledge, teaching practises and pedagogy, adapting models to context, cultural economic context and infrastructure (Kenttälä et al., 2018).

The aspect of learning can be realised on two levels, individual and social, and these levels consist of the factors that teachers use to help learners in their learning processes. The individual level consists of micro level individual factors such as age level, strategies, expectations, beliefs, ICT skills; meso level is experience-based knowledge; and macro level is teaching practices and pedagogy (see Table 1). On the other hand, learning can also be studied via its social context. Micro level factors of learning include collaboration and

knowledge transfer, communication and interaction, and emotional and social environments; meso level means collaboration outside the classroom (e.g. mentors); and macro level is cultural and economic contexts, school values and expectations as well as curricula (Kenttälä et al., 2018).

Table 1. The LETUS framework by Kenttälä et al. (2018)

LETUS Design framework aspect	Context type	Micro	Meso	Macro
Learning	Individual	ICT skills Learner related Beliefs Tacit knowledge Age level Teacher (classroom) strategies Competencies Expectations (satisfaction)	Experience based knowledge	Teaching practices and pedagogy
	Social	Collaboration and knowledge transfer Communication and interaction Emotional and social environment	Collaboration outside classroom (e.g. mentors)	Cultural and economic context School values and expectations Curricula
Technology	Environmental	Physical environment Constraints (e.g. availability of technology) Affordances (technology and contextual) Immersion and flow	Online courses Informal learning and non-educational contexts (e.g. video games)	Infrastructure
Content	Content	Content area Structure and organisation of content Authenticity Activity type specific Subject / discipline	Teacher training	Theory and research knowledge Models and frameworks Adapting models to context

The technology aspect is viewed through environmental factors and it addresses the basic requirements for a usable software product. Micro level includes physical environments, constraints (availability), affordances and immersion, and flow. Meso level includes online courses, informal learning, and non-educational contexts such as video games and online communities, whereas the macro level includes infrastructure of technology (Kenttälä et al., 2018).

The aspect of content consists of micro level content area, structure and organisation of content, authenticity, activity type specific and subject/discipline. Meso level consists of teacher training and macro level theory and research, knowledge, models and framework and adapting models to context. These factors consider the practical usability issues and the experience of learning (Kenttälä et al., 2018).

3 PRESENT STUDY

The aim of the study is to explore the language learning game Duolingo's LX design and its suitability for the Finnish education system. In this thesis I will answer the following questions:

1. What kind of LETUS elements have been used or incorporated in Duolingo?
2. Based on the previous question, is Duolingo suitable for the school context, more specifically foreign language learning education in Finland?

The first question aims to trace the elements that language learning games and applications include, and which focus on helping the students to study more efficiently. As Finnish not available at the given moment, I looked at the Swedish language course for English speaking learners. However, it must be stated that a few of the factors could not be analysed satisfactorily because they would have required a questionnaire, more complicated cognitive research, or they would have gone over the scope of the study. These include a few individual learning aspects at the micro level (e.g. personality, cultural background); the meso level's experience-based knowledge; the entire meso level of the social learning aspect; the macro level's cultural and economic context; meso and macro levels of both technology and content. The data was analysed by using qualitative content analysis. This method was chosen because it provides a systematic standpoint to draw conclusions from the phenomena (Downe-Wambolt, 1992 as cited by Bengtsson, 2016), LX design. With this in mind, I answered the second question and considered the usage of Duolingo in language classroom in Finnish school system.

I hypothesize that as Duolingo is one of the most famous and a leading language learning application in the world, it puts a great emphasis on issues regarding usability, user experience, and learning. When it comes to the second question, however, I expect to discover that it is not suitable for Finnish school system's foreign language education as such and would need

adaptations in order to fit. The main reason for this is that it does not offer any language courses for speakers of Finnish. Whether there are other critical flaws why Duolingo is not suitable for Finnish school system will be discovered.

4 ANALYSIS OF DUOLINGO

4.1 Learning

4.1.1 Individual features on micro level

Individual features found on Duolingo's website include ICT-skills, learner's individual characters (e.g. learning style, learning speed), age level, teaching strategies, and competencies.

Firstly, the users are presumed to know how to use a computer. This includes for example the basic usage of browsers and search engines, basic knowledge on how to use email (confirmation of an account is made via email) and how to log in to an account. In a sense, this can also be interpreted as tacit knowledge as many of us have learnt these basics through trial and error rather than through courses and/or official education.

Secondly, a few factors that takes learners' individual characters into account were found, such as learning styles, or learning preferences as 'learning style' can be misleading since it gives the impression of innate characteristics (Reid, 2007). According to Duolingo's webpage (2020) Duolingo 'adapts to your learning style' and that 'exercises are tailored to help you learn and review'. Duolingo collects learner data and uses it to calculate individual learning curves based on the student's time and accuracy ratio (Streeter, 2015). Thereby, Duolingo does not give the option for individual students to choose their preferred learning style(s) but rather has set styles that are recurring according to individual student's performance. However, the factors that are usually related to learning preferences are modality, personality, and social factors. Modality refers to visual, auditory, tactile and kinaesthetic learning; personality type refers to how an individual student engages with the task (e.g. emotionally, adventurously, reflectively, cautiously); and social factors that refer to continuum between collaboration and working alone (Reid, 2007). If Duolingo's website is studied through these factors, it is clear that not that many options are given to individual students. The exercise types appear to be always the same,

text and auditory oriented, whereas tactile, and kinaesthetic modalities appeared to have been disregarded. Moreover, Duolingo's exercise types and methods cater for more inductive, autonomous, or competitive learner, than other learner types.

Regarding age level, there are certain features that might influence who might be using Duolingo. Learners who use Duolingo are required to have an adequate level of ICT-skills, an adequate level of one of the languages Duolingo offers as a language pair and aspiration for online language learning. Firstly, even though Duolingo's user interface is very playful and colourful, the exercise types might be too text-oriented for the younger audience. Furthermore, children who speak a language that is not offered in Duolingo would have to study in other language than their native language. If they are monolingual, that means that they will study languages at school, thus, reach the needed language level later in their life. Finally, also older generations might be out of the target group. Older generations are sometimes regarded as 'digital-immigrants' who might not be comfortable with digital learning technology (Prensky, 2001). However, I would still argue that Duolingo's target audience is quite broad because it is free and rather accessible, thus, gives equal opportunities for all age levels.

Duolingo's teacher strategies, or in other words methods used to help students learn the wanted content, can be divided into categories: 'optional' and 'non-optional'. 'Non-optional' strategies include goal setting, progress tracking, streaks, achievements, and instant feedback – most of which are also gamifying elements. The goal setting and progress tracking mean that the user can decide the amount of time one is willing to spend studying per day. This daily goal spans from a 'casual' five minutes per day to an 'insane' twenty minutes per day. The daily goal can be changed afterwards at any time. By completing topics and lessons within the topics, the user earns experience points (XP) that are shown on a daily goal XP progress chart. With these experience points users also compete against others on the leader board but the leader board can be disabled from the settings. In addition, Duolingo tries to engage its users with streak

and achievement tracking. If the user completes a lesson a day, the user will build their streak. Achievements are unlocked when the user completes a wanted action, for example the user reaches a certain streak level, earns a certain amount of XP, learns some amount of words or follows a number of friends. Of course, these ‘non-optional’ strategies can be ignored by learners, but they will be shown and updated. ‘Optional’ strategies include competing against friends, public leader board, getting daily notifications if one has not completed a lesson as well as compliments and motivational messages. These teacher strategies can be seen as ‘optional’ because the user can disable most of these from one’s settings.

The competitive point of view appears to attract all the attention from other reasons why people are learning a new language. When I created my account, I was asked why I wanted to learn a language (brain training, family and friends, school, culture, travel, job opportunities, other). However, it seems that this has not affected anything, not explicitly at least. This could be a great opportunity to personalize the content for different learning purposes which would make the learning process more relevant and engaging for different learners. Here the design approach would be especially beneficial as many studies have concluded that learning technology and its potential is not fully recognized in the field of education; teachers and material designers appear to replicate existing practices rather than discovering the opportunities of new learning environments (Blin et al., 2014). Indeed, design thinking in learning context could bring the wanted and needed perspective to provide a more comprehensive experience that promotes learning, and that also ‘respond to the demands of the “knowledge society”’(Blin et al., 2014: 148).

Competences also affect learning experience. According to Caena and Punie (2019: 9-10) the personal, social and learning to learn competence that can be defined as ‘the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one’s learning and career.’ Consequently, it can be inferred that

the individuals who have these abilities are likely to perform well in Duolingo. However, intrinsic motivation can be discouraged if the learner does not enjoy the task or the learning experience all together (Reid, 2007). As was stated at the end of the last paragraph, tailored goal and content could be more motivating and engaging for different learners, especially when the learners are studying and using the app in their own spare time. If the content is more aligned with the students learning purposes and consequently more relatable, then in theory the learner would stay more resilient and more engaged with the content. Nevertheless, there are a few features that can be motivating for some of the students. For instance, the built-in features e.g. gamification, reminder notifications and e-mails (sent when the student has not practised and reached one's daily goal), achievements, and feedback.

Learner expectations may also have an impact on learning experience. According to posts on Duolingo's forum about expectations towards Duolingo, many language learners appear to be interested in whether they will become 'fluent' when/if they finish Duolingo. Duolingo's website states that the words and grammar structures it uses correspond to the A2-B1 level on CEFR (Common European Framework for Reference). What is important to note here is that 'fluency' is an extremely hard term to define because it means different things to different people. An A2-B1 level speaker can be considered fluent because one can communicate one's meaning accurately enough to get one's message across, whereas someone else would consider only a near-native level to be fluent. These individual differences might cause intrinsic motivational problems when learner is not performing as well as one wanted or when a learner tries to communicate in the target language without the wanted outcome. As fluency seems to be a frequently asked question, it would probably be best to try to incorporate this knowledge somehow and to some place visible.

4.1.2 Social features on micro level

Social features on the micro level include collaboration and knowledge transfer, communication and interaction, and social environment. All the collaboration, communication and interaction within the virtual classroom happen in Duolingo's forum. Naturally, users have different social and emotional environments that have an effect on their lives, but one context they share is the Duolingo platform. Therefore, I am only considering the social features that Duolingo's forum provides for its users.

The main resource of collaboration, knowledge transfer, communication and interaction that would happen in a regular classroom happen in the discussion forum. The language that the user has chosen as one's primary language will determine what sub-forums the user can subscribe to. As Finnish was not an option, I chose English as my primary language. That choice gives users an opportunity to subscribe to all the language pairs that English has (35 languages) as well as troubleshooting, educators and Duolingo in English. On the forum the users can talk about everything for example relating to learning, their target language, and Duolingo's exercises.

Users are also given the opportunity to impact the things they are learning. After every question, when the feedback is given, there is an option to report the question. Duolingo proceeds to ask the reason for reporting for which they have given a few options: 'my answer should not be accepted', 'the English sentence is unnatural or has an error', 'one or more of the options is a duplicate', 'one or more of the options is offensive', or 'something else went wrong'. Another way is to make a post about the improvement you would like to see on Duolingo's forum. Many of Duolingo's users have done so, and the moderators and contributors on the forum seem to encourage it.

4.1.3 Individual features on macro level

Individual features on the macro level include teaching practises and pedagogy. Teaching practises mean all kinds of teaching strategies that help students to get more involved and engaged in the learning process whereas pedagogy means the theoretical approach to teaching. Cultural and economic factors are excluded.

Teaching practises can be a ‘make-or-break’ factor for individual learning and learning experience. These aspects include questions such as how long students spend studying, the kind of feedback students are given, and is the material the right level of difficulty and otherwise suitable. The time users spend learning their language is first determined when the Duolingo account is created. Language learners must decide the amount of time they want to spend studying their target language. Even though the time must be decided when the account is created, it can be changed later as many times as wanted. This advocates personalisation and gives learners the chance to be in charge of their own learning. Feedback is given after every completed exercise. Unfortunately, like Reid (2007: 15) states ‘feedback is often used as means of grading and correcting’, thus, can be demotivating for some of the learners. However, there are other feedback systems as well, like motivational messages, lingots/achievements, leader boards, a weekly progress report and the learning tree itself. These systems are more positive by nature as they concentrate on achievements and how a learner has improved rather than corrections and errors. In addition, the corrective feedback after each task is justifiable because it is the only way to explicitly state how a learner did and how one could improve. However, what I do find a little trickier is that the learner does not get an explanation on why the sentence the learner has produced is wrong. The learner only gets the correct solution and the possibility to discuss the task with the other learners on Duolingo’s forum.

Duolingo’s pedagogy appears to combine inductive, constructivist, gamified and personalised learning together. Inductive learning approach can be seen from the exercise types and their

layouts. Before the lesson, the user can choose to view the grammar part of the task, but it is not mandatory in order to do the task's lessons or even possible during the lessons. The lessons do not contain explicitly stated grammar: the rules and meanings are inducted from the example sentences and correct answers. Duolingo's pedagogy is also constructivist learning because it leans and builds heavily on prior knowledge. First students learn the basic skills and only then they can move forward to harder vocabulary and grammar structures. Moreover, the learnt content is regularly reflected upon and re-practiced. When it comes to gamification, it is clear that Duolingo aims for gamified approach. I collected all the found elements and listed them by using Reeves and Read's model (see Table 2). This model consists of avatars, three-dimensional environments, narrative contexts, feedback, reputation, marketplaces, competitions, teams, parallel communication systems, and time pressure.

Table 2. Duolingo's gamifying elements

Avatars	Yes: <ul style="list-style-type: none"> • Users can choose a profile picture and a username
Three-dimensional environments	No.
Narrative Context	No.
Feedback	Yes: <ul style="list-style-type: none"> • After each task user will get direct feedback • Motivational messages • Words learned (spaced repetition chart) • XP charts • Leader boards • Weekly reports (via e-mail) • tasks are broken into more manageable units • Possible intrinsic rewards
Reputations, ranks, and levels	Yes: <ul style="list-style-type: none"> • Achievements • Leader board • Content is divided into levels
Marketplaces and economies;	Yes:

	<ul style="list-style-type: none"> • Users earn ‘lingots’ with which they can purchase power-ups and practice time
Competition under rules that are explicit and enforced	Yes: <ul style="list-style-type: none"> • Users compete against each other’s XP (leader board)
Teams	No.
Parallel communication systems that can be easily reconfigured	No, but one can exchange ideas with others on Duolingo’s forum
Time pressure	Yes: <ul style="list-style-type: none"> • Users must reach their daily goal in order to maintain their streak • Users have limited time to earn XP points to stay and advance on leaderboards.

Furthermore, Duolingo pursues personalisation as was discussed in one of the paragraphs in the individual differences on micro level section. This is done by analysing learner data and applying machine learning algorithms that have positive impact on task performance as well as applying spaced-repetition model (Settles et al. 2018; Streeter, 2015). Every language learner is an individual so whether these practises and pedagogies are suitable is highly learner dependent.

4.1.4 Social features on macro level

Social features on the macro level includes school values and expectations, and curricula. The curricula part is discussed further in the content section. Duolingo’s values and expectations are explained on the company website. The company’s mission is to provide ‘personalized education’, and ‘make learning fun and universally accessible’, and the way Duolingo is approaching this is via gamification, real-life communication, implicit learning, personalisation, varied exposure, and continuous improvement (Duolingo, 2020). According to Duolingo’s website (2020), the company analyses the data of millions of learners to ‘create

the most effective educational system possible and tailor it to each student'. Their main point is to create a fun learning environment by gamifying language learning and making it free for all who have access to internet and to some digital device. Duolingo uses 'accessible' to mean 'free of charge' but it has also taken accessibility into consideration in the sense of accommodating people with disabilities such as hearing and visual impairments. This is done for instance by adding an option to exclude tasks that use hearing or speaking.

4.2 Technology

4.2.1 Environmental features on micro level

Technology's micro level includes physical environment, constraints, affordances, immersion, and flow. Even though physical environment in the LETUS framework appears to mainly consider the technological side of learning environment (e.g. device used, internet connections), it should be also mentioned that physical and mental learning environments (e.g. lighting, noise, air quality, thermal comfort, but also feelings) have an impact on students' learning (perusopetuksen opetusuunnitelman perusteet, 2004) , but since learning environments differ from student to student, they are left out of this analysis.

Technology's affordances, meaning the perceived and actual properties of a thing that determine how it could possibly be used (Norman, 2004), have an impact on learning experience, too. According to Bower (2008), e-learning technology affordances can be classified as media, spatial, temporal, navigation, emphasis, synthesis, access-control, and technical affordances as well as usability, aesthetics, and reliability. The spreadsheet below explains affordances I found on Duolingo's website (Table 3).

Table 3. Duolingo's affordances

Media affordance	<ul style="list-style-type: none"> • Text: <ul style="list-style-type: none"> ○ Text is readable, although some colour contrast issues were found. The background and font contrast in few elements were not adequate ○ Text is writeable • Images: <ul style="list-style-type: none"> ○ Viewable • Audio: <ul style="list-style-type: none"> ○ 'Listenable' ○ 'Speakable'. Although I did have some difficulties with the speaking part of the tasks. It did not appear to recognise my voice at all.
Spatial affordance	The elements cannot be moved around or re-sized by the user, but the interface is scalable.
Temporal affordance	Accessible anytime anywhere as long as you have a device and internet connection. Moreover, it makes record of time spent and lingots earned.
Navigation affordance	The interface is 'browsable', and the forum section 'browsable', 'linkable', and searchable.
Emphasis affordance	Important things are emphasized for example with colours, font size, and element size.
Synthesis affordance	The account can be connected with Google account or Facebook account. Links and other external sources can be shared on the forum section
Access-control affordance	User has to have an account.
Technical affordance	Yes, Minimal technologies; internet connection, device that connects to the Internet
Usability	Useable, but not necessarily that accessible, for example colour contrast might cause troubles.
Aesthetics	Aesthetic, e.g. use of white space, coherent colour scheme, familiar design patterns (icons, layout, dropout menus, global navigation bar).
Reliability	system appears to work as intended whenever required.

When it comes to immersion and flow, Duolingo tries to reach it through gamification. Prensky (as cited by Peterson, 2013) states that computer games have qualities that make them engaging (rules, goals and objectives, outcomes and feedback, conflict/competition/challenge, interaction and representation or a story) and cause the sense of flow. In addition, according to Csíkszentmihályi's (1990) theory, flow requires a balance between learner's abilities and the difficulty of tasks. If a beginner learner studies a hard task, it might result in anxiety. If an advanced learner studies an easy task it might result in boredom. If the tasks and learners are

in balance it will, in theory, yield in optimal experience and immersion. Therefore, it is very student-dependent whether Duolingo causes flow or not.

4.3 Content

4.3.1 Content features on micro level

Micro level content means the things students are learning, the way the content is structured and organized on the site, how authentic the learnt language is, and the types of activities that have been employed.

The chart below (Table 4) shows all the word categories as well as the grammar structures that are covered in the Swedish course for English speakers.

Table 4. The word categories and the grammar structures in the Swedish course for English speakers

Words and phrases	Grammar structures
Phrases	Definites
Basics	Plurals
Food	Possessive
Animals	Pronouns
Clothing	Verbs
Colours	Questions
Time	Prepositions
Family	Conjunctions
Jobs	Adjectives
Places	Verb present tense
Objects	Adverbs
People	Determin.
Travel	Verb past tense
Numbers	Verb infinitive
Education	Modal
Geography	Imperative
Feelings	Past part.
Abstract	Active part.
Nature	Future. Perfect
Sports	V. conditionals
Directions	Future
Arts	V past perfect
Medical	Continuous

Politics Communication Spiritual Science Business celebrate	Future perfect passive
--	---------------------------

The content is divided into a learning tree. In the case of Swedish for speakers of English, the tree consists of five levels. To get access to the next level of the tree, the learner needs to master all the topics on the level one is currently at. This is assessed through a level test or completing all the topics on the level. The first levels include basic vocabulary and grammar structures such as family, verbs, colours, clothing and pronouns whereas the last levels include more complex structures and vocabulary e.g. politics, science, medical, arts, conditionals, past participle, future perfect and passive voice.

Even though the lists of word and structure categories are impressive, it must be noted that the words are first learnt in isolation and then in minimal context (one sentence). Let us take the word 'cheese' as an example. In one lesson the word was only covered in two sentences which are repeated if learner do not get it right. In the first task one must mark the correct meaning for the English sentence 'I eat fruit and cheese'. The second time the word appeared, the same sentence was formed to a grammatically correct sentence by dragging the given Swedish words. I wanted to know how many times the word 'cheese' was used. I studied the 'words' section of the site from which one can see the instances that the word appears. According to the words-section the word 'cheese' is used in four sentences: 'the boy and the girl are eating cheese', 'I eat fruit and cheese', 'I eat cheese and eggs' and 'They eat cheese'. The word is given only in context of eating; therefore, it does not give much variation on the usage. What if the learner wants to say: 'Do you have any cheese?' or 'how much is the cheese?' or 'That house smells like cheese'. To know a word the student has to know its meaning, be able to

write and recognize the written form, be able to speak and recognize the spoken word, know its grammatical characteristics (e.g. is it a noun, or a verb and their inflections), collocations, register constraints, frequency and associations. The three first ones can be learnt in isolation, but the rest are acquired by large amount of exposure in diverse contexts (Schmitt, 2010). The lack of context might be tolerable in the case of the word ‘cheese’ but might end up being very troubling when a learnt word has multiple meanings and/or synonyms or when the word is otherwise ambiguous like prepositions and adverbs (e.g. in the sentence *John washed the plates in the sink*. Is John washing all the plates or only the ones that are in the sink?).

Duolingo uses many activity types for learning vocabulary and structures. When I practised Swedish I encountered tasks such as ‘type what you hear in Swedish’, ‘say and record X word in Swedish’, ‘Write English sentences in Swedish’ (and vice versa, from Swedish to English), or ‘drag words to form a grammatically correct Swedish sentence’ and ‘choose the right Swedish alternative/translation for an English sentence or a word’. In addition, the user can able/disable and skip speaking and listening exercises if the user does not want to answer the question or is not able to answer the question. However, the communication side of language appears to be left behind. From communication point of view, language learning can be divided into five categories: reading, listening, speaking, writing, and grammar and structures, of which Duolingo emphasises vocabulary and structure. Of course, a learner can listen, read, repeat, and write the sentences one is learning via Duolingo, but it will not replace a task that emphasises listening, reading, writing, or speaking. Furthermore, if Duolingo’s exercises are studied by using Bloom’s taxonomy (see Appendix 1), it seems that the exercises only stay at the first steps of learning, remembering and understanding. This means that after completion learners can define, name, match, recall, identify, label, and recognize the words, as well as translate and understand grammatical structures, but not necessarily explain learnt objects in their own words in the target language, analyse and evaluate what word or structure to use in a

new context or use the language in a complex situations such as speaking and writing. Therefore, it is fair to say that Duolingo's only learning objective is to help a learner recognise and remember words and phrases and use them in familiar contexts.

The above should also be analysed from the perspective of authenticity. According to Lehtonen et al. (2015), authentic learning is related to situational or contextual learning in which the learning tasks resemble real-life situations. In 'real-life', learners are going to encounter complex situations that require texts for different purposes and communication situations. Therefore, the language learning materials should be as authentic as possible such as newspaper articles or announcements and, furthermore, the learners should also respond authentically to the presented material. Authentic responses help students to build and reflect their understanding of the learnt language and the way it is used (Lehtonen et al., 2015). Duolingo uses everyday words and phrases in the tasks but the tasks do not prepare learners to communicate with the language authentically.

5 ANALYSING DUOLINGO'S SUITABILITY IN THE CONTEXT OF FINNISH SCHOOL SYSTEM

5.1 Individual features on micro level

As was discussed in one of the paragraphs about individual features on micro level, age might be an unavoidable barrier. Even though Duolingo offers various language pairs, Finnish is not one of the languages it provides. Finnish teachers of English and other languages are usually employing both (Finnish and the taught subject e.g. English, Swedish, German, French) during the classes. This creates an obstacle for the usage of Duolingo. The only way to use Duolingo in language classes at the moment is to use a course for speakers of their second language (which is most likely English) to learn a third language (or fourth, fifth). Keeping this in mind, the aimed level of English, for example, at the end of the upper comprehensive school is B1.1 on the CEFR (Opetushallitus, 2014). According to Council of Europe, this means the user 'can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc.' (CEFR, n. d.). The usage of Duolingo would require intermediate or proficient knowledge of words and structures of English. Therefore, from pedagogical point of view it would not be fair to the students to use a platform that teaches a possible third language in their second language.

Different learning content for individual students would also cause difficulties with assessment. One of Duolingo's premises is that the user needs to practice the content to reach the wanted objective, the top of the learning tree. When students first start to use Duolingo, they can choose to take the level test and jump ahead. Consequently, each student would study at their own pace. This could be very motivating for the students as they would have constantly new content and direct feedback. However, in Finland students get a grade after each term and there are certain learning objectives that need to be assessed and that are same for everyone. If Duolingo

is employed regularly and the students learn different content, they cannot be assessed fairly. In conclusion, it would not be just to use Duolingo regularly and then disregard the hard work that the students have done.

5.2 Content features on micro

Even though Duolingo's list of word categories and grammatical structures is impressive, there are still major issues that should be considered. The first major issue is lack of contextualisation. For instance, in one of the tasks the user is asked to write 'yes, please!' in Swedish. The options from which to choose from are 'ja' (=yes), 'morgon' (=morning), 'ursäkta' (=sorry), 'välkommen' (=welcome), 'snälla' (=kind [adj.]), and 'natt' (=night). The correct answer for the task was 'Ja, snälla' instead of 'Ja, tack'. 'Ja, snälla' has slightly different meaning than 'Ja, tack' and would be used in a situation when one is appealing to someone's kindness. Even though both are translated as 'yes, please' they are used in different contexts. In this case 'Ja, tack' would be more natural and closer to 'yes, please' than 'Ja, snälla'.

Relating to the first issue, context, the lack of authenticity is also a major concern. Many of the sentences are impersonal and not relatable. For instance, the sentences 'the crab eats the strawberry', 'the spider does not like the pepper' and 'the ant eats the pepper' are not necessarily the first things that student needs in one's everyday life or for example while travelling. As was mentioned in the paragraph about authenticity, authentic language is learnt through communication (Lehtonen et al., 2015). In Duolingo, the structures and words are learnt through repetition, drilling, which is a behavioural approach to language learning. However, this kind of behavioural repetition is usually used in language learning to drill useful and common language chunks like 'How are you?' or 'I'm sorry' and not grammatical

structures and longer decontextualised sentences. To learn the possible usages of grammar structures and words, they need to be applied and used independently as well as accurately (Tice, 2020). However, there is a change for the better. In one of Duolingo's blog posts it has been stated that the company has launched Spanish and French podcasts to improve listening skills, Duolingo events that gathers students to practice their target language(s), and short interactive stories for English speakers learning Spanish, French, German and Portuguese (Pajak & Tsai, 2019). This is a major improvement which will help students' communicational skills and which I hope will extend towards other language courses as well.

However, the repetitive nature of the lessons and the exercises might lead to boredom or exhaustion. Let us take the category of definites for further investigation. There are all together five levels on the category. On each level there are five lessons which consists of seven or eight exercises that are repeated if the user gives a wrong answer. Because I took the level test, I automatically started on the second level of the category. Within these five lessons on the second level the word 'eat' was used (including inflected forms) sixteen times, 'drink' only twice. On the third level 'eat' was used, again, sixteen times, 'drink' twice. On the fourth level 'eat' occurred fifteen times, 'drink' zero. On the final level, 'eat' was employed fifteen times and 'drink' twice. All together the word 'eat' was used sixty-two times compared to 'drink' which was used only six times. This illustrates the problem well: even though the word 'eat' is very useful and relevant in everyday situations and it needs to be repeated multiple times within a longer period of time in order to be added to the long-term memory. Nevertheless, it gets too much attention to the detriment of other verbs such as 'drink'. Of course, it must be pointed out that there were also other verbs and nouns that added to the content and made it more balanced learning experience. In addition, in the school context there might be a chance to change this. The instructions for Duolingo for schools state that the teachers can control students' exposure to certain words (Duolingo for Schools, 2020). How this is done, and to

what extent, was not stated. In addition, the learners may choose to skip some of the lessons if they feel that they know enough. If they have reached the first level on all of the topics on one section of the tree, they may advance to the next section.

The final issue is the function of the tasks. The main object seems to be to identify, memorize, and repeat words and structures, which leaves the user on the first two levels of learning on Bloom's taxonomy. Although this would not be an issue if Duolingo was only used as a tool to learn new vocabulary and revise grammar structures and the content would be supplied with more extensive speaking, listening, reading, and writing exercises. Nevertheless, it must be stated that Duolingo implicitly acknowledges its supplemental value by listing classroom purposes which are: offering Duolingo as a reward, use it as a game during the lesson, use it as a reinforcement tool, use it as a warm-up, assign as homework, use it as extra credit for students who practice on their own, and during longer breaks and holidays to keep the skills sharp (Duolingo for schools, 2020). It does not state that it is the only thing that is needed for successful language learning. What is also great to notice is that Duolingo strive for constant improvement. On a recent blog post they listed all the upcoming and new changes on the site: it stated for instance that Duolingo will introduce new language exercises for more intermediate language learners. The exercises, including reading, writing and listening exercises, will be more monolingual and will not rely on translation (Pajak & Tsai, 2019). However, these upgrades are made by Duolingo employees and not by Duolingo volunteers who create most of the learning content like in the case of the Swedish course, therefore, it is not likely to be added in any time soon.

6 CONCLUSION

This thesis explored Duolingo's LX design and its suitability for Finnish education system. It found that Duolingo's content is targeted at English speakers and that the usage of Duolingo in Finnish education would be inconvenient and unfair. Furthermore, the lack of contextualisation and the lack of communicational exercises should be combined with speaking, writing, listening, and reading exercises.

Some LETUS-framework aspects were not included in this study due to space restraints. As the megatrend of digitalisation continues, the educational system should do everything to accommodate learning materials to the realities of today's students and teachers in order to enhance the learning experience and make learning more effective and engaging.

BIBLIOGRAPHY

- Bengtsson, M. (2016). *How to plan and perform a qualitative study using content analysis* [online]. doi:[10.1016/j.npls.2016.01.001](https://doi.org/10.1016/j.npls.2016.01.001)
- Blin, F. & Jalkanen, J (2014) *Designing for language learning: agency and languaging in hybrid environments* [online]. APPLS: journal of applied language studies, 8 (1), 147-170. <http://apples.jyu.fi/ArticleFile/download/433>
- Bower, M. (2008) *Affordance analysis – matching learning tasks with learning technologies* [online]. Educational Media International, 45:1, 3-15, doi:[10.1080/09523980701847115](https://doi.org/10.1080/09523980701847115)
- Caena, F., & Punie, Y. (2019). *Developing a european framework for the personal, social and learning to learn key competence (LifEComp)* [online]. <https://op.europa.eu/en/publication-detail/-/publication/99e3b8f2-e8ea-11e9-9c4e-01aa75ed71a1/language-en/format-PDF/source-search>. (4 October, 2019).
- Council of Europe (n. d.), *Common european framework of reference for languages (CEFR): Common reference levels* [online]. <https://www.coe.int/web/common-european-framework-reference-languages/table-1-cefr-3.3-common-reference-levels-global-scale>. (1 March, 2020).
- Csikszentmihalyi, M. (1990) *Flow: the psychology of optimal performance*. New York: Harper & Row.
- Duolingo for schools: guide for leaders in education* (2016 ed.) Duolingo [online]. https://duolingo-data.s3.amazonaws.com/s3/schools/active/Duolingo_for_Schools_Guide.pdf. (27 May, 2020).
- Duolingo official webpage* [online]. <https://duolingo.com/info>. (1 March, 2020).
- Faretta-Stutenberg, M. & Morgan-Short, K. (2017). *The interplay of individual differences and context of learning in behavioral and neurocognitive second language development* [online]. Second Language Research. 026765831668490. doi:[10.1177/0267658316684903](https://doi.org/10.1177/0267658316684903)
- Garreta-Domingo, M., Hernández-Leo, D., & Sloep, P. B. (2018). Education, technology and design: A much needed interdisciplinary collaboration. In Kapros E., & Koutsombogera M. (Eds.), *Designing for the user experience in learning systems. Human–Computer interaction series*. Springer, 17-39.
- The International Organization for Standardization (ISO) ISO 9241-210:2010, 3.2.3

- Kenttälä, V., Rousi, R., & Kankaanranta, M. (2017). Towards the Learning Experience Technology Usability framework. In T. Kidd, & L. R. Morris (Eds.), *Handbook of Research on Instructional Systems and Educational Technology*. IGI global.
- Kenttälä, V., Rousi, R., & Kankaanranta, M. (2018). Learning Experience Technology Usability Design framework. In T. Bastianes (Ed.), *EdMedia 2018: Proceedings of the World Conference on Educational Media and Technology*. Association for the Advancement of Computing in Education (AACE), 414-423.
- Kraft, C. (2012). User experience and why it matters. *User experience innovation: User centred design that works*. Berkeley, CA: Apress.
- Lehtonen, T., Lakkala, M., Eloranta, J., & Rasila, M. (2015). *Tila haltuun! Suositukset virtuaalisen suomen opiskelun toteuttamiseen*. In Lappalainen Y., Poikolainen M. and Trapp H.(Eds.), *Pedagoginen perusta kielenoppimisessa* Turku, Turun yliopiston Brahea-keskus. 20-37.
https://helda.helsinki.fi/bitstream/handle/10138/156221/Pedagoginen_perusta_kielenoppimisessa.pdf?sequence=1
- Norman, D. (2004). *Affordances and design* [online].
https://www.researchgate.net/publication/265618710_Affordances_and_Design. (1 March, 2020)
- Opetushallitus. (2014). *Kehittyvä kielitaito eri kielissä ja oppimäärissä* [online].
https://www.oph.fi/sites/default/files/documents/kehittyva_kielitaito_eri_kielissa_0.pdf. (27 May, 2020)
- Pajak, B., & Tsai, K. (2019). *How we've improved the duolingo learning experience this year (and a sneak peek toward 2020!)*[blog post]. Retrieved from
<https://blog.duolingo.com/how-weve-improved-the-duolingo-learning-experience-this-year-and-a-sneak-peek-toward-2020/>
- Perusopetuksen opetussuunnitelman perusteet* (2004) Finnish National Board of Education [online] https://www.oph.fi/sites/default/files/documents/perusopetuksen-opetussuunnitelman-perusteet_2004.pdf. (1 June, 2020)
- Peterson, M. (2013). *Computer games and language learning* (First edition ed.). New York, NY: Palgrave Macmillan.
- Prensky, M. (2001). Digital natives, digital immigrants [online].
<https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>. (27 May, 2020).
- Raybourn, E. (2016) *A metaphor for Immersive Environments: Learning experience Design Challenges and opportunities* [online]

<https://pdfs.semanticscholar.org/6f2f/3fd3cb1e44aa2c8ecd798b303a6a66f83b.pdf>. (28 May, 2020)

Reeves, B., & Read, J. L. (2009). *Total engagement: Using games and virtual worlds to change the way people work and businesses compete*. Boston, Mass.: Harvard Business Press.

Reid, G. (2007). *Motivating learners in the classroom: Ideas and strategies*. London: Paul Chapman.

Reinhardt, J. (2018). *Gameful second and foreign language teaching and learning: Theory, research, and practice*. Cham: Palgrave Macmillan.

Settles, B., Brust, C., Gustafson, E., Hagiwara, M., & Madnani, N. (2018). *Second language acquisition modeling* [online]. <https://research.duolingo.com/papers/settles.slam18.pdf>. (1 March, 2020).

Schmitt, N. (2010). Key issues in teaching and learning vocabulary. In R. Chacón Beltrán, C. Abello-Contesse & M. d. M. Torreblanca-López (Eds.), *Insights into non-native vocabulary teaching and learning*. Bristol, Buffalo: Multilingual Matters, 28.

Streeter, M. (2015). *Mixture modeling of individual learning curves* [online] <https://research.duolingo.com/papers/streeter.edm15.pdf>. (1 March, 2020).

Tice, T. *Drilling 1*. [Blog post] Retrieved from <https://www.teachingenglish.org.uk/article/drilling-1>. (11 May, 2020).

APPENDIX

Appendix 1. Bloom's taxonomy by the Vanderbilt University Centre of Learning

Bloom's Taxonomy

