

# The Affordances of Duolingo for Mobile-Assisted Language Learning

*A sociocultural and ecological perspective*

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## 1. Introduction

The role of information technology has been growing rapidly in the field of education. As this change progresses, there is an increasing demand for studies in learning theory and relationship between the use of computer devices. Mobile technology such as tablets, laptop computers and smartphones enable learning in and out of the traditional classroom setting, bridging the gap between formal and informal learning. Online resources have brought almost universal access to learning, allowing autonomous learning on a global scale. Researchers are now looking into video games in search for an increase in learner motivation and learning effectiveness through immersive environments.

Some believe that gamified language learning applications such as Duolingo have the potential of making second language learning as enjoyable as playing a video game. With over 100 million users (June 2015), the system has quickly become one of the most popular ways of learning languages online (Lardinois, 2015). Its aim is to provide free and enjoyable language education globally. Originally the company was intended to be funded by the web translations users produced as an exercise for language learning. Later on, the company began providing a digital language certification program, *Test Center*, which is intended to serve as an alternative to the Test of English as a Foreign Language (TOEFL) and other language proficiency tests (Lardinois, 2014). The fundamental idea of Duolingo is to bring equality to language learning in societies where the cost of education is too high for groups with low income. I believe that Duolingo's way of approaching language learning makes it an interesting subject for educational and linguistic research.

This pro gradu thesis studies the Android smartphone version of Duolingo. The aim is *to explore different language learning affordances in Duolingo from the viewpoint of the sociocultural theory and its ecological perspective*. Special attention will be paid to affordances in gamification, language learning activities, and aspects of peer-to-peer interaction. In other words, the intention is to examine how the various affordances align with the aforementioned theories of language learning. Education-related studies in computer-assisted language learning, mobile technologies and gamification are used to support these theories for a more comprehensive analysis. The phenomenographical method allows for the description of similarities and differences between the application and the two widely-accepted language learning theories.

In the following section, I will introduce the theoretical background of the study. It contains the theories and research that are central to the analysis. Subsection 2.1. will be a presentation of the sociocultural theory and the ecological perspective, including definitions for some of the key concepts used in this study, such as ‘affordance’ and ‘scaffolding’. Subsection 2.2. concerns mobile-assisted language learning (MALL), and is followed by a look at computer-assisted language learning (CALL) and learner autonomy. Gamification is a topic that is at the core of Duolingo’s design, and it will be defined in subsection 2.3. Video games will also be considered here as they contribute to the analysis of gamification elements. The subject of the analysis will be introduced in the third section, together with the description of the methodology and the problem areas of the study. In the fourth section, the language learning affordances of Duolingo will be studied. The analysis of language learning affordances begins with a focus on gamification elements, followed by an analysis of the different activities which the application provides for different users. The analysis ends in subsection 4.3., where the affordances for social interaction are explored. Section five discusses the major findings of the analysis, their significance, and prospects for future studies in mobile-assisted language learning. Finally, the results of the analysis will be drawn together in the sixth section.

## 2. Theoretical framework

In this section, I will present the theoretical framework and basis which will be used in the analysis of the language learning affordances of Duolingo. The sociocultural theory and its ecological perspective will provide the foundation for theoretical analysis. Studying the smartphone version of Duolingo demands some inquiry into research concerning language learning with mobile devices. The field, also referred to as Mobile-assisted language learning (MALL), provides unique opportunities by allowing flexibility in terms of time and location. Autonomy is another important perspective for this study, the primary design of Duolingo being a single-user experience. As a gamified language learning application, the subject uses game elements for motivating learners, which is why it is necessary to define gamification and said game elements.

The first subsection introduces the two main theories used in this study: the sociocultural theory and the ecological perspective. In the second subsection, recent research in the field of mobile technology and language learning are examined. The third subsection looks at a number of different affordances and constraints set by computer-assisted language learning (CALL) in the context of autonomous learning. Gamification and video games in language learning are the topic of the fourth and final subsection, which aims to better understand which game features are useful for educative purposes.

### 2.1. The sociocultural theory of language learning and the ecological view

This subsection will be an overview of the *sociocultural theory* and its *ecological view*. The sociocultural theory (henceforth SCT) originates from the work of Vygotsky, and the ecological perspective was created by van Lier from this basis. The SCT and the ecological perspective share similar concepts and ideas, and their terminology will be used interchangeably in this study. For bringing into perspective the relationship between the two ideas, van Lier states that “ecology is a fruitful way to understand and build on the legacy that Vygotsky [...] left for us” (Lantolf et al., 2000, p. 245). Starting out with the SCT, I will introduce specific concepts from both theories in this subsection. These concepts are essential for understanding the perspective of the analysis, but they also provide a brief introduction to how these theories view language learning.

The *zone of proximal development* (ZPD) is a metaphorical concept of the SCT created by Vygotsky. It represents the difference between what a person can achieve alone and what can be achieved with support from another person or cultural artefacts (Lantolf et al., 2000, pp. 16–17). Inside the ZPD, development is the result of communicative imitation and interaction between the two agents. In the case of people, this interaction is often considered to occur between an expert (a more knowledgeable other) and a novice. However, some researchers are requesting for more studies on the scope of the ZPD for gathering more data on the development between two or more peers in a similar situation. Imitation is considered vital in the sociocultural learning theory and the concept of ZPD: it is an elaborative effort where the learner is communicating and not simply producing a copy of what the expert has said, acting as a mere repeater (p. 17–18). Such a learner who is developing self-regulation through the assistance of a more capable other is referred by Vygotsky as a *mediated learner*. This process is also known as sociocultural mediation (Oxford, 2015).

While the ZPD represents the distance between what can be achieved alone and after receiving assistance, Abdullah, Hussin, Asra & Zakaria (2013) define *scaffolding* as a metaphor referring to the assistance given by a more knowledgeable other (MKO) to the learner. The learner only needs to be given the minimum amount of assistance, so that the task can thereafter be completed autonomously. The scaffolding (support) is removed as soon as the learner is able to work independently on the task, and the process can be cycled as the learner progresses. Scaffolding is referred to as ‘directive’ when the learning goals, content and strategies are designed by an instructor. However, directive scaffolding has been criticised as being teacher-centred. ‘Supportive’ scaffolding customises instructions to the needs of the learner, taking into account their abilities and interests (Abdullah et al., 2013). Studies in which scaffolding is viewed as corrective feedback have been excluded from this study, as that view does not support the nature of the SCT or the ecological view.

Another essential aspect of the SCT is the *activity theory*. Activity is motivated by a biological or culturally constructed need, and it is carried out under particular spatial and temporal conditions (p. 8). Learning a language represents an activity which is motivated by a culturally constructed need: for example, having an education for future employment. In a cross-cultural study by Wertch, Minick and Arns (1984 via Lantolf et al., 2000), the researchers compared rural Brazilian mothers and their children with school teachers and their students. Each adult and child dyad was given the task to copy a

puzzle depicting a barnyard scene. Finding that adults in the two groups approached the problem differently, researchers suggest that they had different motives and goals for the activities. The rural mothers seemed to be seeking an error-free performance and efficiency, giving direct piece-by-piece instructions for the child building the puzzle. The teachers were aiming for the development of autonomy and learning by allowing independent work and the making of errors. The different motives and goals of the groups lead the researchers to believe that the children were participating in different activities altogether (p. 9–11). This example shows how the same activity can have a different goal, and shows the complex nature of studying activities. It could be argued that an activity is more than the sum of its parts, and it can be used in ways which can benefit or constrain learning, regardless of how the activity was designed to work.

Moving on, I will next discuss the *ecological perspective* of the SCT. The ecological perspective (also ‘view’) is described as not being a theory or a method in itself, but as a way of thinking about language as a tool and a meaning-making activity. According to van Lier (2004b, p. 86),

*An ecological perspective is at its core a world view, a way of being and acting in the world that has an impact on how we conduct our lives, how we relate to others and to the environment, and of course also, how we conceive of teaching and learning.*

Ecological linguistics studies the relations of thought and action instead of objects such as words and sentences (van Lier, 2000). A concept that is central to that view is *affordance*. Van Lier (2004a) describes affordance as a relationship between the learner and the environment, which signals an opportunity or an inhibition of action. Acting upon an affordance enables further linguistic action. (pp. 4–5, 95) For example, a chair offers the affordance of sitting, which is an *immediate affordance*. Pointing a finger to the chair and asking a person to sit down are also affordances: they are examples of *mediated affordances*, which supplement the aforementioned immediate affordance of sitting. In the SCT, the ZPD is sometimes viewed as the collaborative construction of opportunities (affordances) that enable the development of mental abilities (Lantolf et al., 2000, p. 17).

The ecological perspective views language teaching as assisted language use, in which the ‘skill-getting’ and ‘skill-using’ are in a dynamic interplay with each other. The context of language use is preferably a meaningful activity, such as a project-based workshop, where learning has a purpose that

supports a goal. Learners should have a motivation for accomplishing their goals, and teachers and peers are there to offer their assistance in finding the tools for doing so. One possible scenario for this could be a computer-based presentation: when learners are recording an introduction to the presentation, they may want to practice their delivery repeatedly to have it done correctly. The practise serves a purpose in a meaningful context, unlike the repetitive practice of grammar for the sole purpose of thriving in a test program, for example. (van Lier, 2004a, p. 223–224)

The ecological perspective views language learning as an *emergence* rather than a linear acquisition. It is the combination of simple elements which form a higher-order system: “[i]n language, grammar emerges from lexis, symbols emerge from tools, [and] learning emerges from participation. Language proficiency emerges from all these transformations.” (2004a, p. 5) The emergentist perspective suggests that grammar is not a prerequisite of communication, but rather a by-product. Van Lier theorises on teaching grammar explicitly by focusing the learners’ attention to what is being said and how it is said, while exploring possibilities of how to say that thing more efficiently. Explanations and drilling are not favourable in his considering (pp. 89–90).

In his article about perception, voice, identity and democracy of language learning, van Lier (2004b) stresses the importance of communication and interaction in language development. He argues that learners are able to develop an identity and voice in the second language (L2) when they partake in collaborative dialogue, whereas the communication in many language classes is limited only to information transmission (p. 83). The perception of both direct and indirect information leads to effective interpretations, and therefore separating linguistic information (often referred to as ‘input’) to books and exercises may hinder linguistic growth. Learning to perceive signifies more than increasing phonological and morphological awareness; the context of an activity and the multisensory information that relates to it are also included. (pp. 87–90)

Tomlinson (in Bolitho et al., 2003) defines Language Awareness (*awareness* in this study) as a mental attribute that develops when language learners pay motivated attention to language in use. This enables them to slowly build an understanding of how languages work. The term also refers to the pedagogical approach that is meant to help learners build such an understanding by allowing them to discover language by means of enquiry. According to van Lier (2004a), awareness is a perceptual experience of language. This is different from using language in transparent ways, as infants do until the age of four



or five years when the idea is typically pitched to them. However, in second language learning, awareness is present from the very beginning, because learners focus on the L2 as an “object-to-be-learned”, and its utterances are therefore viewed as objects rather than as actions (p. 99).

Van Lier (2004a) divides awareness into four levels. First, there is the affordance: a relationship between an organism, e.g. an infant, and some quality or property in its environment, such as the voice of its mother, which the baby is able to feel but might not respond to. The second level adds reactivity by means of focusing attention intentionally. The individual becomes aware of a learning opportunity by noticing the gap between the current language knowledge and language in the environment. The third level of awareness involves active control, which includes language play and manipulation (incl. stories, puns, etc.), and an academic analytical control, which comes particularly from school. This allows the individual to technically manipulate the linguistic code and analyse its structures and functions. The fourth and final level of language awareness is a critical perspective: aspects such as the use and abuse of power, deception, moral use, as well as the social and political language. According to van Lier, all of these levels play a part in the learning process, and the educational environment should offer varying activities and opportunities to make use of them. (pp. 100–102)

It can be seen how an awareness of analytical form is included in the perspective of van Lier. Tomlinson (in Bolitho et al., 2003) considers the Language Awareness approach as a reaction against such traditional teaching of metalinguistic rules, terminology and form, in other words a “top-down transmission of language knowledge”. Instead, awareness is built gradually by learners themselves, paying conscious attention to instances of language while staying positively curious to realise how it is used. Critical Language Awareness (C.L.A.) focuses on developing awareness of how language represents the world and the how it builds power relations, and it seems to agree mostly with the critical perspective discussed by van Lier (2004a, pp. 101–102).

## 2.2. Language learning and mobile technology

Mobile technology has advantages over computer and traditional technologies with its portability and ubiquitous access to learning materials. As such, researchers are exploring its potential in both

institutional as well as autonomous learning. In this subsection, mobile technology is explored from the perspective of language learning.

Sharples, Taylor and Vavoula (2007), who base their theory on the work of Gordon Pask, view learning in general as communication and sharing an understanding between systems. These systems can be people or interactive systems, such as computers. Their theory of mobile learning (henceforth m-learning) is also based on this idea, but the researchers recognise that relating people and computers as interactive systems does not sufficiently take into account “the unique moral and social worth of human learners in their interaction with technology”. (226–227, 231)

M-learning refers to learning and teaching that uses devices such as mobile phones, media players, PDAs, smartphones and tablet computers. These portable devices can potentially be used informally, contextually and spontaneously in any place at any time (Duman, Orhon, & Gedik, 2015). Mobile platforms enable learning outside the conventional setting, which is usually a school or a workplace. People are thus able to gain information, share knowledge and learn wherever they have a need (Sharples et al., 2007). Kukulska-Hulme (2013) defines mobile-assisted language learning (MALL) as “the use of mobile technologies in language learning, especially in situations where device portability offers specific advantages”. These advantages lie in increasing opportunities of language practise, having flexibility in time and location, and adapting to personal habits, motivations and preferences. MALL also allows for learning in a variety of settings, which may cause distraction, in the case of noise and other stimuli, or they might become an enriching opportunity for situated learning.

Kukulska-Hulme (2010) advises educators into adopting a learner-centred approach by listening to the needs of the learners and allowing them to act as “active collaborators” in the teaching and learning process. It seems that language learning is becoming more social and less fixed to a place: learners are using online social spaces informally for learning and mutual support. MALL enables learners by providing ubiquitous access to learning opportunities.

*Language learning is increasingly an everyday activity integrated with life, as travel becomes more commonplace and use of the Internet means that everyone will stumble upon opportunities to read and connect in other languages. (Kukulska-Hulme, 2010)*

Kukulska-Hulme (2010) underlines that due to the fact that the use of personal devices is usually learned informally, taught by friends, colleagues and family, there are countless ways to use them to support learning. It is difficult to uncover the thought processes and motivations behind learner activity and how much a specific activity represents a competency, skill, attribute or expertise. In other words, it seems relatively unclear what is considered efficient in the world of mobile learning. Kukulska-Hulme argues that reporting learner activity is not comprehensive enough, and that there is a call for more comprehensive studies. Duman, Orthon & Gedik (2015) came to a similar conclusion in their review of MALL studies released between 2000 and 2012. According to their report, the cognitive processes of learners, changes in their learning processes and patterns as well as pedagogical frameworks have not been examined. The major topics in MALL research were teaching vocabulary and the usability of the MALL environment. The least favoured topics were the writing process and grammar acquisition.

Applying MALL to formal school education has certain challenges. Koivisto (2013) used nexus analysis to study the effects of bringing mobile devices in the Finnish lower secondary school EFL classroom. Focusing on social actions and their historical trajectories, his results suggest that the subjects (13-year-old students) preferred playing games to using mobile technologies in project work, and that connecting their free-time activities on mobile devices with formal learning at school caused a certain resistance. Koivisto presumes that this reaction originates from the students' expectations of the teacher being in charge.

### 2.3. Computer-assisted language learning and learner autonomy

The affordances of *computer-assisted language learning* (CALL) for learner autonomy will be explored in this subsection. The apparent design of Duolingo is that it is intended as a single-user experience, which is why autonomous language learning will be considered before the qualities of CALL in advancing learner autonomy are looked at. Both CALL and MALL provide such affordances: between the two, there are both shared features as well as differences in how each technology is used for learning. The main difference is portability: mobile devices provide opportunities for learning during the small breaks in everyday life, whereas personal computers are often fixed to a specific place,

offering larger screen sizes and faster performance over their mobile counterparts. However, with the advancement of mobile technology, the gap between mobile devices and desktop computers has narrowed to a point where the performance of smartphones and tablet devices can be regarded as being sufficient for language learning purposes. Laptop computers, which are mobile devices, have the capabilities of running desktop computer applications, and their screens sizes can be considered as being able to deliver an experience that is relatively close to a desktop monitor. The framework of CALL affordances for autonomy created by Reinders & Hubbard (2013) is especially useful in the analysis of Duolingo's affordances.

In the context of language learning, autonomy does not equate with learning by oneself. Benson (2012) highlights the distinction between three specific aspects inside autonomy: *personal autonomy*, which leads to *learner autonomy* (autonomy in learning), which is followed by *language learning autonomy*. In order to be autonomous in language learning, the learner must first develop some level of autonomy in life and learning. Benson argues that learners should autonomous learners should be able to make decisions about the content of their learning. This allows them to customise their learning according to their language needs, shaping their identity as a user of a foreign language.

Oxford (2015) explores the traits of language learner autonomy from a psychological and sociocultural perspective. These traits include emotional intelligence, responsibility, pursuit of freedom, intrinsic motivation, and social relationships. Receiving assistance from a more capable person can also help learners in becoming autonomous, e.g. through scaffolding (see section 2.1). Self-regulation is a foundation for autonomous learning: it includes managing and having positive beliefs about the value of learning and one's own capabilities. Emotional management, such as being proud of one's efforts, is equally important. The self-regulated learner is also skilled in managing learning strategies, such as setting learning goals, managing time and monitoring performance.

Reinders & Hubbard (2013) studied the potential of CALL in advancing learner autonomy. Introducing a framework of CALL advantages for learner autonomy, Reinders & Hubbard used the categorisation of CALL advantages created by Reinders and White (2010). These advantages are categorized into two groups: organisational and pedagogical (Table 1 (from Reinders & Hubbard, 2013, p. 363)). They were considered with learner autonomy in mind, each item representing the affordances and constraints in the process of advancing learner independence. The advantages that represent the organisational group

are more practical in nature, whereas the pedagogical advantages are more directly connected with learning itself. In this subsection, I will introduce these affordances based on the study of Reinders & Hubbard (2013). They will be used as part of the framework for relating the language learning affordances of Duolingo to the SCT and the ecological perspective.

**Table 1. The potential advantages of CALL in learner autonomy**

Organisational advantages	Access
	Storage and retrieval of learning behaviour records and outcomes
	Sharing and recycling of materials
	Cost efficiency
Pedagogical advantages	Authenticity
	Interaction
	Situated learning
	Multimedia
	New types of activities
	Non-linearity
	Feedback
	Monitoring and recording of learning behaviour and progress
	Control
Empowerment	

(Reinders & Hubbard, 2013, p. 363)

On the organisational side of learning, CALL allows both teachers and learners to access resources and learning records with ease. They are also able to create, share and update materials. Reinders and Hubbard (2013) consider this last point especially valuable for developing learner autonomy as it gives the learner control that is unseen in traditional environments. CALL can provide cost efficiency through reproducible digital formats and a greater learner autonomy resulting from less dependence on teachers.

These affordances may also constrain learner autonomy in some ways: according to Reinders & Hubbard, learners can become overwhelmed with processing large amounts of data. The mobile learning experience might be degraded as the result of screen size limitations and the distracting everyday environments (Reinders & Hubbard, 2013; Stockwell, 2013). Also, storing and retrieving

learning materials and records require that the data is sufficiently organised; this can be a laborious effort demanding technical skills. Teachers and learners also need to be trained in retrieving and interpreting learning records in order to make use of this information. Recycling and sharing materials may also constrain creative language production via constant reuse and combination of existing materials. The demand for free materials often comes with constraints such as distracting advertising, a lack of systematicity and limitations in quality control. The costs of technology in the form of hardware, infrastructure, maintenance and training can also be constraining factors for learner autonomy. (Reinders & Hubbard, 2013, pp. 362–364, 366–368)

The pedagogical affordances of CALL for learner autonomy include *authenticity*, in form of real-world materials on the internet, *interaction* through social networks, and *situational learning*, where learning occurs outside the classroom in socioculturally meaningful contexts. As everyday and business communication is becoming increasingly digitised, Reinders & Hubbard suggest that learners should have the ability to seek out such authentic environments. Pedagogically convenient environments, e.g. activities connected to print textbooks that are transferred online, should not be overused (p. 369). In his article on mobile-assisted language learning (MALL), Stockwell (2013) writes: “Simply adapting PC-based activities for mobile devices is unlikely to link to significant mobile usage due to their inherent psychological and physical limitations” (p. 213).

Learners can also benefit from *new types of activities*, e.g. drag-and-drop exercises, *multimedia*, and *non-linear hypermedia*. The latter allows dynamic access to support tools and background information (Reinders & Hubbard, 2013). CALL can also provide instant and personalised *feedback* with text, sounds and visuals, which, when combined with *records* of learning behaviour and progress, has the potential to enable learners in making more informed decisions on their own learning. Having access to materials when and where the learner needs them and choosing a suitable level of support (for example, an option for using a glossary) is empowering to learners: they have a degree of control on their learning process. (pp. 364–366)

These pedagogical advantages may also represent certain constraints for learner autonomy. Reinders & Hubbard point out problems with authenticity in, for example, online chats and discussion boards due to anonymity and different cultural practices. The interaction in computer-mediated communication can sometimes be limited in range, e.g. when posting to fan sites; this can lead to learners only using

their comfortable range, which is not ideal for their learning progress. Hypermedia may be distracting due to its non-linear format, which can interrupt cohesion in texts. The quality of linear media such as text and video can also be inconsistent. Learners often lack the skills of using computerised data as a tool for their own development, and the data or the data is, unreliable, inadequate or of limited value. As for the control and empowerment advantages of CALL, learners first need to have the strategic knowledge of how to use technology for learning: for example, how to select the right program options for their particular development needs. (ibid., pp. 368–371)

In their conclusion, Reinders & Hubbard propose four points of development for overcoming these constraints and achieving the potential benefits for learner autonomy (2013, pp. 371–373). First, the learner must be trained into autonomous learning. Teachers and developers must begin by finding optimal ways of using of technology for language learning, and these ways must then be communicated to the learner. Reinders & Hubbard argue that learners who are not instructed in the use of technology have a tendency of using it inefficiently in language learning. Second, autonomous learners need to have access to a selection of materials and tasks which provide a suitable challenge for them in order to avoid frustration and inefficiency. Third, learners have the potential to support each others' learning, e.g. via scaffolding. Reinders & Hubbard lean on research promoting peer interaction in an autonomous learning setting, and suggest the use of online social networking and community building as a platform for such co-operation. Finally, they call for more technological initiatives for advancing learner autonomy, within CALL or other disciplines. These initiatives should involve enhancing the metacognitive development of the learner, for example. Support is also needed for the specific cognitive, social and affective strategies the learners need to have in these technological environments.

#### 2.4. Video games and gamification

This subsection will have its focus on the educative benefits of video games and gamification. The subject of this study, Duolingo is not a video game, but a learning application. However, it uses gamification as a motivational system, which in turn is based on game elements. Studies of video games in education support the analysis of these elements and while also making a distinction between

gamification and video games. The theory is compiled in order to support the analysis of language learning affordances in the gamification of Duolingo.

Beginning with video games, they seem to have a positive effect on language learning. A recent study with Thai EFL learners by Reinders and Wattana (2015) shows that the use of digital game-based language learning with *Ragnarok Online*, a massively multiplayer online role playing game (MMORPG), seems to lower communication anxiety, increase motivation, production and willingness to communicate in English. This effect is attributed to the focus on fluency instead of accuracy in the use of English in the game, which increased most of the interviewed subjects' perceived communicative competence in the target language. The task-driven cooperative gameplay also seemed to increase motivation to communicate with other players to allow them to succeed in the game.

It seems reasonable to presume that there exists a certain variance between different game genres and language learning. Commercial, off-the-shelf (COTS) games such as the MMORPGs *Ragnarok Online* and *World of Warcraft* may immerse the player into their worlds, serving as learning environments which can also sometimes be modified by educators (Reinders & Wattana, 2015). Originally, language learning was not the focus of these games, as they were made as commercial interactive entertainment. The term game-informed learning could be associated with these games, however. The players are interacting socially not only during the game, but also before and after on social networks, online forums, commentating on posted media or writing texts (Godwin-Jones, 2014, pp. 12). In contrast, educational game-like applications are made with the very intention that the player is learning while playing. Godwin-Jones (2014) argues that educational games are often easier to tailor to specific learning needs and curricula, but they commonly lack the appeal of COTS games and the “game flow” is sometimes interrupted by the all too evident pedagogical intent. Games which have been developed with the intention of being more than entertainment are also referred to as *serious games*, which have been commonly used in educative, military and business applications (Deterding, Dixon, Khaled, & Nacke, 2011).

Kapp (2012) defines *gamification* as a process that uses “game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems”. It can be seen as a motivational system which elicits specific kind of behaviour (Exton & Murray, 2014). Gamification can make ordinary content more engaging by applying “game elements – such as the freedom to fail,



interest curve, storytelling, and feedback – in learning programs” (Kapp, 2012). Deterding, Dixon, Khaled & Nacke (2011) define the term even more broadly as “the use of game design elements in non-game contexts”. Therefore, gamified applications are neither fully-fledged games, nor are they to be related with play or playfulness, where the activity is expressive, improvisational and more free-form. Different uses in different social contexts make it difficult to determine whether an application is a game in itself or simply contains game elements. Depending on the focus, perceptions and enactments of the user, gamified applications can offer affordances for game interpretations as well (Deterding et al., 2011). One example this are leaderboards, which can be seen as being derived content instead of being directly connected to game content.

Exton and Murray (2014) created a taxonomical system for game elements used for motivation. They can be seen as motivational affordances for the learner of a gamified system. The system consists of 16 game elements:

- achievements
- avatars
- badges
- boss fights
- collections
- combat
- content-unlocking
- discussion forums
- gifting
- leaderboards
- levels
- points
- quests
- social graphs
- teams
- virtual goods

Each of these attribute to one or more of the following elements of motivation: competence, autonomy and relatedness (connectedness). *Competence* is defined as the ability to put an effort into mastering a challenge that is optimal for development (Zhang 2008, via *ibid.*). *Autonomy* is described as “a volition that can accompany any act”, and *relatedness* refers to the social aspect, the feeling of connectedness with others. These three components originate from the Self-Determination Theory by Ryan and Deci (2000, via *ibid.*), which requires that all of them are fulfilled so that an individual can experience intrinsic motivation.

Abrams and Walsh (2014) studied the progress of adolescents using a gamified vocabulary web page, the Vocabulary.com Challenge, for learning new words. They report that the public acknowledgement of progress through achieving status levels (also related to badges or achievements) by training vocabulary encouraged the students to use the web pages voluntarily also outside the classroom. As the

students progressed through the vocabulary exercises, the web page awarded them with status levels such as “Hot Shot”, “Savant” or “Guru”. These rewards allow the students to see their own progress, but it also seems to stimulate competition by allowing students to compare their status levels. The group competing could be interpreted as a game interpretation created by the social context (Deterding et al., 2011). The gamified form of study engaged the students to playing for suspended periods of time. Due to being able to control their vocabulary outside the classroom, having access to all the materials and having awareness of their own progress, the students became agents of their own learning (pp. 51, 53–55).

In this study, Duolingo is regarded as a gamified application for learning, not as a game used for entertainment purposes. The Duolingo webpage states that the lessons use gamification, and the company advertises their lessons as being addicting and having a game feel (Duolingo, 2013). Gamified language learning applications use game elements to motivate learners in language learning activities, such as completing exercises or interacting with other users. Interaction can be either part of the design or part of the users’ interpretation in their social context.

## 2.5. Theory summary

The theoretical framework I have presented in this section is a tool for the analysis. It provides a perspective into studying the affordances of language learning in Duolingo. This subsection summarises the main ideas behind that perspective, containing the theory of language learning and the research of technology, autonomy and gamification that supports the analysis.

The sociocultural theory (SCT) and its ecological view are central to how language learning is perceived in this study. These perspectives encourage social interaction and assistance given by a more knowledgeable other (MKO) or a peer (Lantolf et al., 2000). The MKO supports the learner by providing assistance, scaffolding, which enables the achievement of something which the learner is unable to achieve alone. The zone of proximal development (ZPD) is used to describe the distance between what can be achieved alone and with assistance. According to the activity theory of the SCT,

the same task can represent different activities for different learners, depending on their motives and goals.

The ecological perspective views language as relations between thought and action (van Lier, 2000). The learner and the environment are in constant interaction, which creates affordances for language use (van Lier, 2004a). Affordances represent opportunities or inhibitions of action, and they can be immediate or mediated with signs, i.e. language in its different forms. Ideally, language learning in the ecological view interplays constantly between skill-getting and skill-using. Activity should be meaningful to ensure that learners stay motivated and accomplish their goals. Grammar emerges as a by-product of communication rather than through drilling and explanations. This collaborative dialogue allows learners to develop an identity and a voice in the L2 (van Lier, 2004b).

Awareness, also referred to as language awareness, is viewed as a perceptual way of using language. It can be developed, for example, by paying attention to the environment or by building metalinguistic knowledge (van Lier, 2004a). Tomlinson (in Bolitho et al., 2003) disagrees with the latter point: instead, he views awareness as a gradually constructed personal knowledge of how languages work. Critical language awareness involves language with its political and social use, the use and abuse of power, and the way in which language represents the world.

Learning with mobile devices (m-learning) can occur in a multitude of environments in addition to offering possibilities for informal, contextual and spontaneous learning. (Duman et al., 2015; Sharples et al., 2007) Mobile-assisted language learning (MALL) provides ubiquitous access to learning opportunities (Kukulska-Hulme, 2010). As a result, learning is becoming more integrated with everyday life. MALL has also highlighted the social aspect of language learning by mutual support in online social spaces. It seems that research in MALL has not yet shown what is considered as efficient in mobile language learning (Duman et al., 2015; Kukulska-Hulme, 2010).

Personal autonomy, autonomy in learning, and autonomy in language learning can be seen as interconnected concepts (Benson, 2012). For example, becoming autonomous in learning requires a certain level of autonomy in personal life. The assistance of a more capable person, i.e. scaffolding, can cultivate autonomy (Oxford, 2015). Self-regulated learners manage their time, emotions and learning strategies, set learning goals and monitor their own performance. Computer-assisted language learning

(CALL), of which MALL is an extension, offers a number of potential advantages for promoting learner autonomy (Reinders & Hubbard, 2013). Among these are authenticity, new exercise types, hypermedia, feedback, records, and the creation and sharing of materials. CALL can also empower learners by giving them control over their learning, which may become a problem in case they lack strategic knowledge of how to use that control. Materials and tasks should provide suitable challenges for learners in order to maintain motivation and efficiency in learning.

Research has shown some positive advantages in the educative use of video games, including a lower communication anxiety and an increased motivation to communicate (Reinders & Wattana, 2015). Educative games are seen to lack the appeal and quality of commercial, off-the-shelf (COTS) games that are designed to be entertaining (Godwin-Jones, 2014). In gamification, game design elements are harnessed for use in non-game contexts (Deterding et al., 2011). Gamification can also be seen as a way of increasing engagement (Kapp, 2012), or as a motivational system that cultivates specific kind of behaviour (Exton & Murray, 2014). The use of game elements motivates learners by providing a challenge, a sense of social connectedness, or by attributing to their autonomy (ibid.). Awarding users with status levels for completing tasks in a vocabulary learning application is an example of a game element implemented as a motivational reward (Abrams & Walsh, 2014). The perceptions and enactments of users make game interpretations possible also within a gamified application (Deterding et al., 2011).

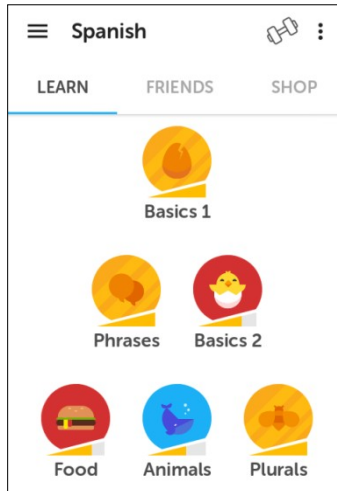
### 3. Data and methodology

In this section, I will introduce Duolingo for Android smartphones as the subject of this study. This will include the general design of the application and a learning effectiveness study specific to Duolingo. I will then present phenomenography as the research method. Describing how it is used in the analysis, I will also address the strengths and weaknesses of the method, ending with the problem areas in examining a changing mobile application such as Duolingo.

#### 3.1. Duolingo: overview

Duolingo was created by Luis von Ahn, and Severin Hacker. Launched for general public in 2012 and it has no price or subscription fees: the company wishes that the product will remain free to use for everybody. It is a gamified language learning application (software) for personal computers and smartphones and tablets with Android and iOS operating systems. All of these versions have the same base functions with some variance in their user interfaces. As of November 3<sup>rd</sup> 2014, 85% of Duolingo's usage comes from mobile devices (Gannes, 2014). The focus of this study will be on the smartphones with the Android operating system. In my examples I will be using Spanish beginner lessons for English speakers. I have chosen the Android platform over the iOS equivalent due to personal preference as well as convenience.

The core of language learning in Duolingo is its lessons. They are divided into small sets which are called *skills* and are laid out in a top-down formation referred to as the *skill tree* (figure 1). Different skills include, for example: clothing, questions, present 1–3 (verb forms), basics 1–2, possession, phrases, and conjunctions.



**Figure 1. The skill tree. Completed skills have orange strength bars.**

Each of these skills contains anywhere from one up to ten short lessons, which commonly have 20 exercises, including:

- translating words and sentences from both languages
- repeating sentences from audio cues by speaking into the microphone of the device
- transcribing or translating spoken language from audio cues
- multiple-choice quiz questions with sentences, words, missing words in a sentence or word-picture cards
- matching word-translation pairs

After completing a required number of exercises, the user eventually learns the skill, for example, household items. Skills are learned in the order of the skill tree. In order to progress to the next branch, the user has to learn the skills that come before it: sometimes the user must learn up to three skills to unlock a next set of skills. The order in which the lessons are performed is entirely optional, but the order in which the skills can be unlocked is consequential and unalterable. Each skill has a strength bar (figure 1), which is full upon skill completion, but depletes over time to represent “words fading from memory”. To refill the bar, skills must be revised by completing strengthening exercises that are either skill-specific or a selection of assignments intended for practising multiple skills simultaneously.

Vesselinov & Grego (2012) tested the effectiveness of studying Spanish with Duolingo. The 88 subjects were native speakers of English from the USA, not of Hispanic origin, not advanced users of

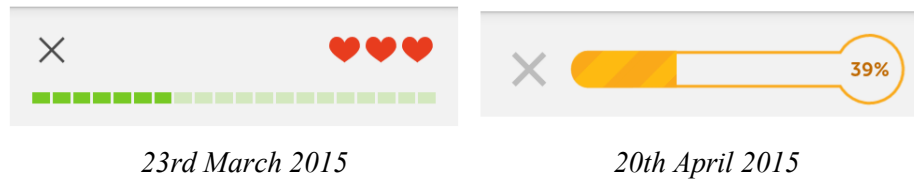
Spanish and over 18 years of age. They partook in a college placement Spanish language test (WebCAPE) at the beginning of the study and repeated the test at the end of the study having studied for two months with using Duolingo. Based on the results on the effectiveness of study, Vesselinov and Grego estimate that a person with no knowledge of Spanish needs around 34 hours of study with Duolingo on average to cover the material for the first college semester. Two factors seemed to influence the progress of the participants in the effectiveness study: motivation and the initial level of knowledge Spanish. Subjects who reported travel as their motivation progressed most, where as subjects studying for school or out of personal interest showed less improvement. Spanish beginners advanced the most, while the more advanced subject had the smallest improvement.

### 3.2. Methodology and problem areas

This study aims *to explore different language learning affordances in Duolingo from the viewpoint of the sociocultural theory and its ecological perspective*. The analysis contains a series of observations which I have made using the application between March and November 2015. Phenomenography will be used in describing the different aspects of Duolingo, which are then discussed in relation to the SCT and the ecological perspective. This approach is based on the idea that, as a tool for language learning, Duolingo is built around a learning theory of some description. This theory may or may not be concurrent with these modern theories. Examining Duolingo from this perspective allows a comparison between these theories and the application itself.

The methodology in this study is unusual in the field of phenomenography in the sense an interview is not carried out. Instead, I will be examining my own user experience of the application. It is therefore inevitable that the observation and selection of examples is biased. In phenomenography, description is mediated through human experience and understanding, and according to its principles, the world and its reality cannot be described without the description passing through a filter of some kind (Niikko, 2003). The method enables the researcher to collect data while also having access to theory: this accessibility allows for a more careful assessment of the application's functions and finding research on new and unexpected observations. In the analysis, screenshots of Duolingo and excerpts from user comments in the exercises will be used as examples.

Studying a digital application such as Duolingo can be challenging due to constant changes made in the user interface. Updates on design occur frequently: they may result in a simple changing of an icon, or an entire user mechanic may be swapped into something completely different. This is the case with Duolingo: as seen in figure 1, the progress bar was changed from a line of green bars (left) to an orange percentage metre, also known as the ‘strength bar’ (right). The change took place somewhere between the end of March and 20th of April, and it altered the gamification mechanics of Duolingo.



**Figure 2. Changes in the design of the progress bar.**

The new design of the bar excludes the heart symbols, which represented the ‘lives’ of the user in the old design<sup>1</sup>. Wrong answers no longer cause the loss of a ‘life’: instead the progress meter drops, causing a slight prolongation of the exercise, but the exercise can no longer be failed as was the case with the old design. This change influences the gamification of Duolingo. The more recent version of Duolingo represents a different kind of activity for the users, which affects game interpretations, for example. I will address the differences between the two versions in the following section, which contains the analysis of the language learning affordances in Duolingo.

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<sup>1</sup> In May 2015, the old version of the progress bar was still used in the ‘take a shortcut’ feature meant for learners who wish to access later parts of the skill tree by proving their knowledge.



#### **4. Duolingo: language learning affordances**

This section contains the analysis, the aim of which is *to explore different language learning affordances in Duolingo from the viewpoint of the sociocultural theory and its ecological perspective*. Special attention will be paid to affordances in gamification, language learning activities, and aspects of peer-to-peer interaction. The first subsection will focus on the gamification elements. Among these are sounds, points, levels and streaks, all of which are designed to affect the motivation of the learner. In the second subsection, I will discuss affordances related to the activities themselves: the focus is on the controllable features of the exercises, where users have options for modifying their learning experience. The social affordances offered by the way of competition, peer and expert support, and communities of practise are examined in the final subsection.

##### **4.1. Gamification and motivational affordances**

In this subsection, I will examine different gamification elements in Duolingo, focusing on their affordances for motivation. First, I will introduce Exton & Murray's (2014) taxonomical framework of gamification elements that will be used as part of the analysis. I will then consider the how these elements, including 'lives', experience points, levels etc., form affordances for motivation. Following is a look at the possibilities for game interpretations outside the application (metagame) that Duolingo affords. The ensuing paragraphs will examine error correction, the effect of gamification on the exercises, the streak mechanic and the virtual currency known as 'lingots'. The language revision exercises, labelled as 'strengthening', will be discussed after this. Finally, I will draw together these findings and compare them to other perspectives.

Exton & Murray (2014) used their taxonomical framework for separating and evaluating those game features of the Duolingo web page that increase motivation. Their analysis concludes that Duolingo is highly gamified, with emphases on promoting competence and social interaction. Their taxonomy and findings will support the analysis of gamification here, but first, it must be noted that the user experience of the web page is different from that of Duolingo for Android smartphones. The smaller screen size of the smart phone means that only the essential features are included in the latter. The

limitations seem to be mostly on the game elements which relate to social interaction. For example, users can give other users ‘lingots’, virtual currency in Duolingo, for helpful comments or other merits on the web page, but not on the smartphone. Users who share their progress with each other can communicate privately on the web page as well. The base function of Duolingo still remains similar in both versions, and because many of the game elements are similar, the analysis of Exton & Murray will provide a valuable point of reference for the analysis.

In Duolingo, the gamification of language learning becomes apparent in its system for reward and punishment. For each correct answer, the learner receives different types of rewards: a pleasant sound, a green textbox notification, an added green block in the progress bar of the current lesson (figures 2 & 3). At the end of a successful lesson (each containing approximately 20 assignments), a fanfare sound is played and the program shows the reward and progress screen. This view shows the gained experience points (XP), with one added bonus experience for each remaining heart, a graph indicating the experience accumulation for each day for the past week, and the Duolingo owl character, announcing the user the amount of experience points needed to meet the daily goal (figure 4).



Figure 3. A successful assignment.

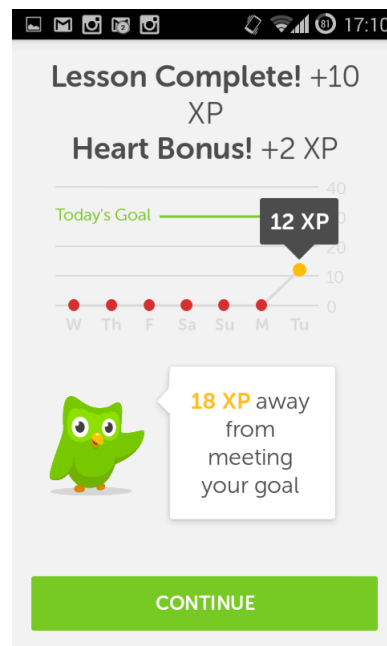
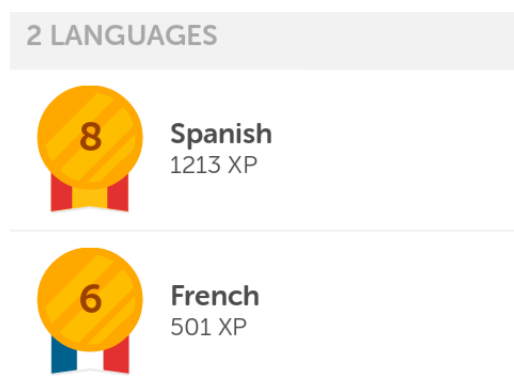


Figure 4. Progress screen.

The sound, the green blocks, that can also be seen as points, and experience points (XP) are game elements designed to motivate the learner to continue practising on a daily basis. Experience points

represent two kinds of rewards. First, users have control over their own daily goal, and they can set it between 10–50 XP per day according to their preference. By reaching consecutive daily goals, the user earns in-game currency, lingots, which will be discussed in detail later in this section. Second, experience builds up and increases the user’s ‘level’ in each language, which is comparable to the status levels vocabulary game in the study of Abrams & Walsh (2014), and which may serve the user as a motivator in the form of public recognition. According to the Exton & Murray (2014), Duolingo’s point system motivates users by giving them a sense of competence, and the possibility to earn lingots by levelling targets their level of interest.

The level system can be seen as having at least two functions from the design point of view: it allows users to view their progression while serving also as a reward that increases motivation by giving them a sense of competence. Users can view the level as a form of feedback of their learning process. For example, if a user has gained level eight in Spanish and six in French (figure 5), the user has a measure of the distance in knowledge between the two languages.



**Figure 5. Levels and experience points (XP) in two languages.**

It might not be a reliable measure by any means, but it gives the learner a tentative estimation of time spent on practising each language. It indicates how much effort has been put into practising each language. Witnessing one’s own progress in numbers can be a rewarding experience and may be viewed as competence. A high level in one or more languages may increase the user’s sense of social status in the community (Exton & Murray, 2014). It is also possible that the level system encourages users towards a consistent daily practice routine. Having the ability to view other user profiles, peers can compare levels and compete with each other, as was the case with the subjects in the study by

Abrams & Walsh (2014), who were motivated enough to begin practising with a gamified vocabulary exercise outside their classroom on their own volition. This scenario seems probable especially if Duolingo is used as a supportive tool in classroom education, where the use of the application begins simultaneously with other peers, enabling possibilities for working together or competing for the highest level. This is only one example of how users are able to create their own meta-game outside Duolingo. Using Duolingo collectively and in various ways, i.e. outside the context of a single user playing the game “as it was designed”, must also be recognised as an affordance for learning, in the same way as a pencil provides the different possibilities of writing, drawing and playing. Deterding et al. (2011) explains that from the perspective of users, it is difficult to distinguish the meta-game experience from the main game experience. However, it must also be said that the aforementioned affordance for comparing and competing will not be available if the user has no peers using Duolingo, or if the user does not find competition a motivating factor.

In the case of an incorrect answer, the learner is prompted with a red dialogue box indicating an incorrect answer (figures 6 and 7), and a comparatively low-pitched sound effect. One of the three ‘lives’, indicated by the red heart symbols, is also lost as a consequence.



Figure 6. Conjunction correction.



Figure 7. Verb form correction.

The error of the user has resulted in the loss of a single heart in the upper right corner of the display. In actuality, the learner has four lives, as the lesson will be discontinued only if one more error is made after losing all the hearts. However, if the lesson is completed with no hearts remaining, i.e. with the last remaining life, there will be no bonus experience. Passing with full hearts earns the user an additional *lingot*, which is the in-game virtual currency used for purchasing additional skills, power-ups or costumes for the mascot owl. Duolingo is designed to rebuild potential loss of confidence after users make an error by providing easier assignments right after their mistake (Gannes, 2014).

Duolingo has also corrected the answers with immediate feedback. It recognises the incorrect conjunctive and verb form and gives the correct one. The SCT and the ecological perspective do not support the view of corrective feedback as scaffolding, and van Lier (2004a) considers the combination of exercises and drilling as unfavourable (pp.89–90). The feedback can nevertheless be an affordance for learning in some cases. For example, the user may read or write erroneously due to an unfocused state. Figure 6 is an example of an error with relatively basic words, typing ‘and’ instead of ‘or’. This can be caused by reading the Spanish *o* (or) as *y* (and) by accident. The combination of the error-indicating sound, colour and text, as well as the corrective underlining can notify learners, potentially causing them to focus more attention to the exercise.

In section 3, I introduced the design of the progress bar which was replaced between 23rd March and 20th April 2015 (see figure 2). In the later design, incorrect answers no longer cause the loss of a heart. The user is not limited to a certain amount of ‘lives’, instead, the progress percentage decreases by 3 to 6 units. The consequence of making mistakes results in more drilling, whereas in the previous version the number of tasks remained the same. The user will progress despite the error, but the loss of a heart is a reminder that every mistake is a step towards losing the progress that has been gained so far.

The key difference for learning between the old and the new design of the progress bar can be seen in the game-like elements they provide. The old version allows the user to advance despite an error, but the user is made aware that if too many mistakes occur, the exercise must be redone. This gives the user an opportunity for game interpretations where actions are meaningful and final: finishing the last set of tasks with no hearts remaining can be exciting to the point where the user keeps double checking on each answer before submitting them. Hearts can be seen to represent the ‘health’ of the user, a game element borrowed from ‘health games’. These games are classified by Deterding et al. (2011) as ‘full-

fledged games', which may partially explain why this particular mechanic can sometimes make exercises exiting. Finishing a difficult exercise can bring a feeling of accomplishment similar to passing a difficult test in formal education. Also, as the number of tasks is always the same regardless of mistakes, the user is able to manage time usage by estimating the average time spent on a single exercise.

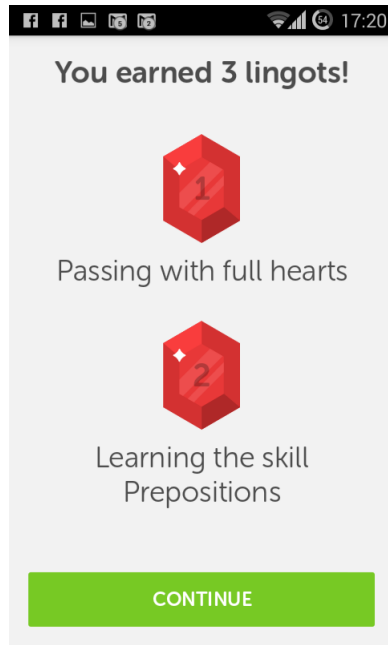
In comparison, the later design of the progress bar could be seen as more flexible: users do not have to repeat the whole exercise after four errors. Instead, they are required to do more exercises. Many users on the comment section consider this flexibility as a positive change. Because there is no risk of losing past progress, mistakes seem to be less of a casualty, and thus making an error seems less of an issue. However, the amount spent on a single exercise must also be considered. The time spent varies depending on how many mistakes are made due to the decrease in the percentage meter. As the number of different exercise types in Duolingo is considerably small some users may find lessons monotonous. Exercises seem to be designed to repeat each word a certain number of times, but if the number of repetitions increases with every mistake, the process can become tedious. When this repetitive drilling continues long enough, it is possible that some users are not eager to continue to the next lesson. In addition to this, users are not able to manage their time as well as in the past due to the variable length of the exercises.

There are benefits to the new progress bar as well. Not being able to fail can result in less anxiety for those users who consider that the health game aspect of the previous version is too stressful or otherwise unenjoyable. Duolingo's creator Luis von Ahn has stated that the new design is more adaptive and helps users master the contents of the exercises better. The program does not make users start over, instead practice continues until they have mastered "the concepts in the lesson" (von Ahn, 2014). From the ecological perspective, the new progress bar design offers more affordances per lesson than the old one.

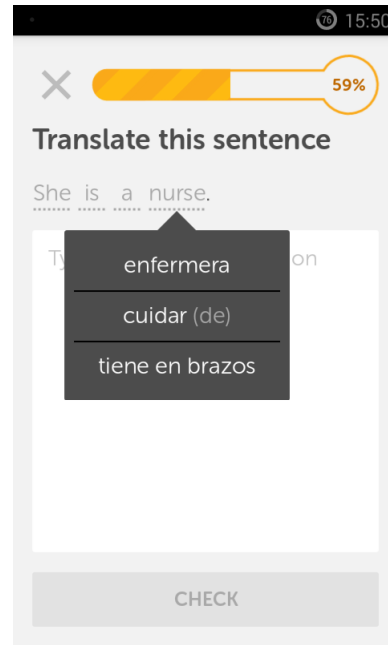
If a user meets the daily goal (10–50 XP) three times consecutively, they will start a 'streak'. The streak mechanic is an example of encouragement for daily practise with the use of gamification. Users with long streaks earn rewards and potentially also social acknowledgement from peers or online leaderboards. One of such leaderboards is updated by a single user, and the highest reported and verified streaks were tied at 928 days (Duolingo: The streak hall of fame (updated 24-jul-2015)).

These users and many more are likely to develop a protective mentality on their long streak which been achieved with a considerable amount of effort and dedication. Leaderboards reflect interest and ability in the system, and they can influence users' motivation by affecting a sense of competence and relatedness (Exton & Murray, 2014). Depending on the foci, perceptions and enactments of users, game interpretations can be made in non-game contexts as well, as discussed in section 2.4. (Deterding et al., 2011). The user-maintained streak list is an example of a competitive game interpretation that comes from outside the context of the application. The motives and goals of competitive users may differ from others who simply want to learn a language without comparing their performance to others. According to the activity theory of the SCT (Lantolf et al., 2000, p. 8–11), these two types of users can be seen as participating in different activities, as they have different motivations and goals.

Lingot is the in-game currency of Duolingo, represented by a red ruby symbol (figure 8). Users are awarded with lingots when they reach a new level or when they reach a long streak. The currency can be used to buy power-ups, such as the *Heart Refill* (no longer available in March 2015), which refills the hearts once during an exercise, the *Streak Freeze*, which saves the user's streak from breaking in the case of not playing for a single day, or *Double or Nothing*, a wager where the user can double five lingots by completing a seven-day streak. Other in-game purchases include *Outfits* for the mascot owl, or *Bonus Skills*: in the case of Spanish, for example, the user can purchase the skills 'Idioms and Proverbs' and 'Flirting', adding them to the skill tree for additional practising.



**Figure 8. Lingots are rewarded.**



**Figure 9. Hypertext vocabulary aids.**

Unlockable content, such as new levels and power-ups are common rewards in video games and gamified applications. Rewarding the user with in-game currency encourages daily practise, and the purchasing of virtual goods affects the feeling of competence and social relatedness in the system (Exton & Murray, 2014). However, after the removal of the Heart Refill, Duolingo does not offer much variety for the use of lingots in our example language, Spanish. Dressing the mascot owl in a new costume might not be as entertaining for adult users, and there are only two new skills to unlock. It usually will not take long after the learner has access to these materials. The Streak Freeze power-up can be useful for those users who want to achieve a high streak. As stated, this study concerns only with the Android version of Duolingo. However, on the PC version, users can give lingots to other users as a reward, which Android users are unable to do. This gifting is often a sign of recognition for providing helpful answers for questions of other users in the comment section. Occasionally a humorous comment may also receive lingots. According to Exton and Murray (2014), gifting can give a sense of privilege in the community, affecting the senses of autonomy and relatedness. Because users of the Android version are still able to comment, their insight may lead to receiving lingots from PC users: thus they can be in the receiving end. This limits the choice of how to use their own lingots, which may as a consequence lose their value as a motivating factor.



Strengthening is Duolingo's gamified equivalent of revision exercises and another example of encouraging daily practise. Each skill has its own strength bar (figure 1) which starts as full and depletes over time until the user completes a strengthening exercise. These exercises can be completed as a single-skill exercise, which fills up the bar of a specific skill more, or as a collective exercise of multiple skills, which spreads out the gained strength and adds it to multiple skills. Duolingo constructs a personalised lesson based on the problem areas of the user. A full strength bar will make the skill icon golden. As the number of individual skills increases over time, a considerable amount of training is required to keep strength bars up. Repeating past exercises continuously may become tedious due to the already repetitive nature of Duolingo's lessons. It seems, therefore, that the design intention is to have users complete strengthening exercises as part of the daily practise so that revision is consistent but does not feel overly repetitive.

Whether or not the strength bars are an accurate representation of "words fading from memory" (as described in Duolingo) is irrelevant from the perspective of gamification. Their intention is to motivate the user for revising as well as practising with new material. They are also a concrete visualisation of revision, which may be an abstract concept to many learners. Filling up the bars can result in a satisfying feeling that the learner has maintained control over past exercises. Golden skill icons also serve as badges, which target the users' level of interest and sense of competence (Exton & Murray, 2014). The 10 XP reward for strengthening exercises is the same as given for practising new skills, both counting towards streaks and increasing the user's level. Strengthening does not unlock new skills in the skill tree, however: users can only unlock more skills by completing regular exercises.

Different beliefs about language learning can affect the results of the learner. Kalaja and Barcelos (2012) consider them as crucial in discovering how learners approach their learning. Beliefs are influenced by learning strategies developed during school years, with teachers, peers and parents sharing their own tacit knowledge. Examples of such beliefs may include an image of oneself as a "worse than average" language learner or that language competence can be achieved by memorising a long list of words. Individual beliefs on the effectiveness of language maintenance and revision will affect how much users spend time on Duolingo's strengthening exercises. Conversely, the visualisation of the strengthening exercises may also have a positive effect on the beliefs of some learners. It underlines the importance of regular practise that certain users may not have considered.

It can be said that Duolingo is highly gamified. Exton and Murray (2014) also came to this conclusion, finding 11 out of 16 game elements that matched their taxonomy. These elements are listed as follows: achievements, avatars, badges, content-unlocking, discussion forums, gifting, leaderboards, levels, points, social graphs, and virtual goods. The gamification of Duolingo only includes some of the elements defined by Kapp (2012). It provides a safe environment for trial and error, reward, punishment and immediate feedback. However, it is also lacking some common game components, such as storytelling. This seems to be a minor problem, but it might have an effect on the interest curve of some users. Repeating a similar set of exercises multiple times a day with the only variable being the target of the exercise may become tedious over time.

#### 4.2. Affordances for language learning activity

In the previous subsection, I discussed the use of gamification in Duolingo and its affordances for motivation. Here I will be examining the activity of using Duolingo and its affordances for language learning. What is relationship between the different learning contexts and the activities, and what are the possible outcomes of those activities? The context here is not uniquely on the design intention of Duolingo: I will also present different possibilities for using the application. In addition to this, I will look at the affordances which Duolingo offers for learner autonomy in the form of controlling the learning experience. The following paragraph will consider briefly the role of user feedback, and the final part of the subsection will concentrate on different affordances for learning syntax.

Duolingo offers affordances for different activities. Some users may have a stronger focus on the game-like side of the application, for example. Others seem to approach Duolingo purely as an affordance for learning a language, trying to maintain self-awareness of their own learning process throughout the exercises. This can be seen in excerpt 1, quoted from the comment section of Duolingo, where a user has requested more information regarding the use of a preposition tied to a verb. The ensuing answer to this is followed by a discussion on learning from mistakes. The number in parentheses represents the sum of positive and negative votes the comment has received from other users.

### Excerpt 1. Users discussing the relationship between failure and learning.

Translate: **I dream about my girlfriend.**

Yo sueño con mi novia.

**MsLagerkvist:** I do not understand the use of “con” here. (+189)

**rspreng:** Another Spanish expression where a verb needs a specific preposition after it. “sonar con” = to dream of/about/something/someone. (+241)

**SaraCdB:** If we are learning Spanish how are we supposed to inherently know this? Duolingo teaches thr[ough] penalties- not by actual teaching and explaining. :-( (+68)

**Justin:** You’re not expected to get every right the first time. Explanations come here in the comments or from another resource. I know it can hurt to lose a heart, but that should help you remember so you remember this sentence next time you see/hear it. (+226)

**quzee:** I love the learning format. You have to accept mistakes as part of the learning process. (+164)

**quzee:** I am learning [S]panish using only [D]uolingo. I know so much more than I used to. It is a different way to learn a language (or [M]ath... which I teach) than is expected, but it is affective if you can accept learning through failure. I do get mad when I think I have translated correctly to find out I missed it because it means something different than the words. Example: Good morning is actually good days. But I will remember eventually. (+83)

(Duolingo, September 9<sup>th</sup> 2015)

After the concise yet comprehensive response of rspreng, user SaraCdB responds in frustration and making a point that the exercise is unfair. This is supposedly the result of Duolingo not giving the user any hint that *con* in combination with the verb *sonar* signifies ‘dream about’, causing the user to make a wrong answer. The problem is that usually *con* is translated as ‘with’, which in the context of the verb ‘dream’ seems to be an ambiguous yet a possible sentence ‘I dream **with** my girlfriend’. The teaching methodology of Duolingo also receives critique for punishing for mistakes and not representing “actual teaching and explaining”.

The comments provide some insight into how users approach language and learning. Based on her negative reaction towards Duolingo’s pedagogy, SaraCdB seems to view language teaching as detailed

explanations of separate aspects of language. Practising a particular aspect should be preceded by an introduction to the mechanics or grammatical rules of that aspect – this could be what the user means by “actual teaching and explaining”. For example, a learner should not be asked to do anything that contains grammatical combinations which cannot be logically derived from previous explanations.

Another reason for SaraCdB’s frustration could be the result of a game interpretation: the comment reveals a focus on the fairness of an exercise. The experienced unfairness occurs when a player is punished for lacking knowledge which has not been mentioned earlier. If the user treats Duolingo as a gaming activity, i.e. the application is used for entertainment or sense of achievement, this punishment can indeed be viewed as an unfair challenge, and if it results in failing the whole exercise, it can be especially frustrating for a game-oriented user. Therefore SaraCdB’s experience of unfairness in Duolingo’s design might be an indication of a game interpretation. After the change in the design of the progress bar (see section 4.1.), the health game element is no longer available, and potentially such reactions have been reduced in number.

In response to SaraCdB’s comment, two users explain their view of language learning in Duolingo. Justin seems to believe that the punishment of losing a heart will help the user in future encounters with the same sentence. The user quzee, a teacher in Maths, comments from a personal point of view that if failure is accepted as a part of the learning process, Duolingo can be affective. Both of these users recognise that losing a heart can be a negative experience, but that it is also an effective lesson. This potentially reflects their view learning with Duolingo as an activity based on trial and error, and shows that the users try to maintain a self-awareness of their own emotions and progress in language learning. User quzee also shares an experience in translating phrases which demonstrates how words cannot always be translated with direct word to word association. It may be a sign of a wider understanding of language as a mediator of ideas rather than a list of words and structures.

Comment chains such as these provide an affordance for seeing how other users perceive language and language learning. It can be argued that users partaking in the commenting activity are more likely to develop their awareness of learning and language than users who never or seldom read comments. This way, users are not only learning a language, but they are also learning about learning itself. In some cases, the comments contain a consideration of languages in different contexts, e.g. the variants of

Spanish in Latin America and Europe (see excerpt 3 in section 4.3.). This interaction offers users affordances for developing a view of language as a flexible and multicultural phenomenon.

The game aspect of Duolingo can cause users to become aware of its mechanics. This seems to cause them to optimise their actions so that mistakes are minimised. It is only debatable whether SaraCdB's reaction in excerpt 1 is of any indication of a game interpretation. In excerpt 2, user Jeanne Marinak shows that she has a clear idea of how to complete exercises using game logic.

### **Excerpt 2. User comments on the game logic of Duolingo.**

**Él entrega la comida.**

*Translation:* He delivers the food.

**Jeanne Marinak:** Entrega is listed as a new word meaning "turns in." By now, I know how Duolingo is, so I use the first definition it gives me. In this case, "turns in" is the ONLY definition, and I know the sentence sounds weird [-] "He turns in the food." [-] but it seemed my only option. WRONG! (+8)

(Duolingo, November 23rd 2015)

Although she was aware of the peculiarity of the hypertext translation in the context of the sentence, user Jeanne Marinak chose to use it because it was the only translation that Duolingo provided. This can indeed be seen as unfair from the user's point of view, as correct translations of new words are generally included in the hypertext. It would seem that it was not the intention of the designers that the hypertext did not include the correct translation, 'delivers'.

However, it is remarkable that, based on her comment, Jeanne Marinak seems to have learned a specific way of completing exercises in Duolingo. She chooses the first definition given in the hypertext aid, based on her experience of the nature of the application. Even though the hypertext can provide many different translations, her opinion is that the first option is somehow favoured by Duolingo. Having conceptions of such a pattern in the system may affect decision making in the exercises: users may choose the first translation even when the context favours a different one. As an automated system, the application is not always able to account for the plethora of different translations that users invent, and therefore it might be safest to use the most general wording as possible when trying to avoid mistakes. During the period of data collection, there were also other commenters who

seemed to share a similar idea with Jeanne Marinak. In translation, some users seem to have gone from writing sentences that they think consider as acceptable English into writing what they think Duolingo is most likely to accept as an answer. User Eugene Tiffany wrote “The trick to get through the Tree is to give [Duolingo] what it wants” (Duolingo, 23<sup>rd</sup> November 2015). It is unclear whether users do this on all exercises consistently. On one hand, the game interpretation can guide learners into thinking different options for their translations. On the other hand, they might feel that their expression and strategic language use has been limited by the system.

In excerpt 1, Justin states that users gain linguistic knowledge from comments left by other users or from “another resource”. The other resource is probably another medium of linguistic information, such as a grammar book, a language textbook or another web page. This implies that learners are using other media while they are using Duolingo. The hypermedia functionality allows users to view the translation of a single word on demand, but there might be a motivation to seek more information: users may want to have a more structured understanding of syntax, for example. Unlike many educational materials, comments can be inconsistent and may not always provide users with the desired linguistic information in the desired form, and users may have to look for information elsewhere.

This raises the important question of how Duolingo is used. For some learners, Duolingo may play only a supporting role in their language learning. It can be used as an additional or expanding exercise in combination with formal and informal learning. This will presumably result in less demand for external sources, since there is a higher potential that learners have prior lexical, syntactic and semantic knowledge. They may also access this knowledge from written notes, home assignments and language textbooks relating to their formal education. Other learners may have Duolingo as their primary language learning platform, from which they turn to the help of the language learning community or external sources when they have a demand for it. Duolingo may therefore represent different activities for these two groups of users, where one approaches it as an affordance for supportive learning, and the other uses it as a fully-fledged language tutor that affords learning a language. The latter view is potentially enforced by Duolingo’s way of promoting the user’s sense of competence with badges (as discussed in subsection 4.1. for gamification). One of these badges contains text such as “You are now 24% fluent in Spanish!”, and the user can publish it on their LinkedIn profile (a social networking platform for professionals and businesses).

When it comes to using external resources, there may be a difference between the experience of mobile users of Duolingo and those using a PC platform. This is important to keep in mind when reading comments on the mobile platform. PC users of Duolingo can be considered having an advantageous position during the use of external resources due to the bigger screen size, potentially faster wired data connections and computer hardware, which offers better affordances for multitasking. These users may have a dictionary, a grammar web page, and a search engine open in their web browser, enabling them to access these resources quickly when they are needed. On mobile devices, the limitations of the screen size and distracting everyday environments may sometimes be considered as a constraint to the learning experience (Reinders & Hubbard, 2013; Stockwell, 2013). Multitasking on the small screen is still possible, and printed sources may also play a part in the activity of mobile users.

A considerable amount of exercises in Duolingo are based on translation and spaced repetition<sup>2</sup>. The same types of exercises are repeated in every lesson, which raises questions regarding user motivation and creativeness. Reinders & Hubbard (2013, pp. 362–364, 366–368) note that reusing and combining of materials constantly may constrain creative language production. The direct translation exercises in Duolingo could be seen as being designed for building vocabulary through translation and repetition. An example of direct repetition is seen in figure 3, where the task of the user is to repeat a sentence after the model given by Duolingo by speaking it to the device's microphone. The speaker must attempt to copy the phonetic structure as closely as possible. This is not comparable to imitation in the context of the sociocultural theory, where the role of the learner is communicative. In addition, Duolingo also seems to repeat exercises that have already once been answered, as if it would need to recycle old exercises. This occurred most commonly in the strengthening lessons, which are custom-built from the words that users have had problems remembering in the past. Repetition in this case is obvious, and tied together with the fact that lessons can take longer to complete with the design of the new progress bar, it might affect user motivation negatively.

However, benefits can be found in repetition as well. Words are repeated in different contexts and they are presented multimodally in text, pictures and speech. Also the exercises require the users to repeat words by typing, speaking, or selecting from a number of choices. When this variation is combined

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<sup>2</sup> Spaced repetition here refers to learning vocabulary by reviewing words with increasing intervals in order to help memorisation.

with some humour and all the different contexts where a word can be produced, it is reasonable to assume that some users consider spaced repetition as an enjoyable form of exercise. The ecological view, in particular, views multisensory information and language context as vital for developing the L2 identity and perception; however, it also criticises the separation of linguistic information to exercises as being a possible hindrance for linguistic growth (van Lier, 2004b).

It can also be worth considering that different users react differently to Duolingo's spaced repetition depending on their learning intention. Learners have different motivations for using Duolingo: it could be a recreational activity, or the learner could have a strong motivation to learn a new language for work, for instance. Prior knowledge of the L2 as well as the general awareness in learning may also affect how users approach Duolingo as an activity. As discussed earlier, it is reasonable to argue that learners have different reactions to the repetitiveness of Duolingo's exercises if they use the application as a secondary form of practise or if it is their only tutor. It is necessary to consider how learners respond to the repetitiveness, as it might affect beliefs on Duolingo and its effectiveness. In other words, the repetitive design of the exercises combines with other factors, such as extrinsic motivation, and causes different reactions as to whether practising with Duolingo is worth the user's time or not.

Due to the design of Duolingo, learners are able to benefit from specific features in order to control their learning experience while performing exercises. They are related to the research of Reinders & Hubbard (2013) on CALL affordances and restraints for learner autonomy. In the following paragraphs, I will discuss some of the different affordances these features can offer for language learning.

First, many text translation exercises have word-by-word translations in a hypertext format, allowing learners to view each of translation separately (see figure 10.1.). Translations may also include syntactic knowledge, such as information about verb forms and verb-related prepositions. It allows the user to quickly check the translation of a difficult word as one would check from a vocabulary. Learners can also choose to continue attempting to remember the word, or simply make a guess if they so desire. The hypertext may help users with maintaining attention on the application, allowing for a quick inquiry without the need for switching applications or browsing a dictionary. This might allow for more well-timed affordances as less time is spent searching for information, and the distracting nature of hypertext pointed out by Reinders & Hubbard (2013, pp. 368–371) is arguably not as serious



an issue as the user is only reading one sentence at a time. The use of hypertext in an application such Duolingo can be viewed as having some of the benefits of ZPD, since it is a cultural artefact which helps the learner achieve more than they can achieve alone (Lantolf et al., 2000). The ZPD of the learner is the difference between a sentence with one unknown word and a fully translated sentence. The hypertext acts as scaffolding for the learner at the time of need. If the user has used hypertext, Duolingo will usually ask the word again in another exercise, either in the same lesson or during strengthening exercises. Vocabulary aids are not provided in the later exercises of the lesson, and if the word reoccurs in the same exercise where the user received help, hypertext might not be available any more. This can be seen as the removal of scaffolding: Duolingo is testing whether the learner can recall the word without support. Sharples, Taylor and Vavoula (2007) view learning as communication and sharing an understanding between systems, which both people and computers (including smartphones) represent. In our case, Duolingo gives the learner the translations when they are needed, much in the same way as in peer-to-peer or expert-novice interaction, when a learner asks a quick question about a difficult word.

Second, audio cues in listening exercises can be slowed down significantly for a more distinct pronunciation. The effect is similar to asking a person to speak slower in a conversation, although the slow-down of Duolingo is greatly exaggerated. This allows users to hear the sounds of the speech sample in more detail, distinguishing phonemes and the edges of words with less difficulty. However it must be said that in the case of Spanish, the language may sound unauthentic when the slower audio cue adds long pauses between each word. This may be problematic in some cases if the user begins to copy this pronunciation as it may be considered as strange by native speakers. Learners can choose between the normal and the slower rhythm, listening to them as many times as they feel necessary until they feel confident enough to perform the exercise. It can be helpful to confirm an answer by listening to the slower audio before confirming it.

Third, although it is not embedded into Duolingo itself, automatic text correction (or text prediction) is a basic function of Android smartphones that makes predictions based on what the user has typed. This not only makes typing faster, but it can help users when they are writing in L2. It could be argued that text correction might make translation exercises unnecessarily easy in some cases, because some text correction applications can remember and predict entire sentences, linking together words that are

usually connected. It is entirely up to the user whether they want to use this functionality, as it can be switched off. However, it is a widely used functionality on everyday smartphone communication, and some users might consider it inconvenient to constantly enable and disable this function on their device. Many may also find typing with text correction more enjoyable. On the other hand, it could be argued that using the aid of modern technology in typing is an authentic context of language use, since it is probable that native speakers use these aids to speed up their typing as well. All that can be said is that it remains as an option for modifying the learning experience with Duolingo.

Fourth, learners have the option to choose the amount of XP they need to fulfil the daily goal, setting it between 10–50 XP. This allows them to decide on how much daily practise they believe they are capable of performing consecutively. Although Duolingo can be used on a less constant basis, frequent use is encouraged by the ‘daily streak’ mechanic, which rewards the user with lingots and gives them a sense of achievement and competence. Setting the right daily goal may give the learner motivation to continue practising every day. It provides a schedule and a way of monitoring the progression of the learning process. Finally, learners can ‘take shortcuts’. This is an option for non-beginning learners who wish to advance more quickly to the more challenging skills (exercise sets). They can complete a large set of skills by succeeding in a test measuring the capabilities of the user. These tests are longer and more challenging than regular exercises, and they are not accepted if the user makes four mistakes. This ensures that the users have enough knowledge of the skills that they intend to skip.

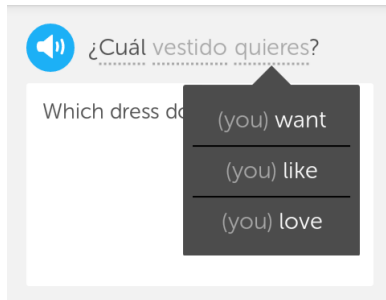
For the purpose of learner autonomy, these features empower learners into making decisions about their learning. Agency is increased by giving learners more control over their experience. Varying the difficulty and length of practise also means that the user experience is more flexible and conforming to the needs of the learner, which could result in an overall increase in motivation to continue practising. As pointed out by Reinders and Hubbard (2013), empowerment and control do not always lead to better results in CALL. Learners need to have strategic knowledge of using Duolingo efficiently, which requires recognising their own learning needs initially. The exercises should feel challenging enough so that frustration and inefficiency in learning can be avoided. Reinders & Hubbard argue also that learners who are not instructed in the use of technology have a tendency of using it inefficiently in language learning. For example, if a more advanced learner uses the help of the hypertext vocabulary in every Duolingo translation exercise regardless of whether or not the word is known, it is possible to

perform some of the exercises mechanically and very rapidly without having to spend a long time considering the sentence or the translation. This way of drilling might affect motivation negatively, and its effectiveness as a learning method is questionable. This way the user's avatar is rapidly gaining XP in Duolingo, which may give a false representation of learning at a fast pace. It could be argued that there are more suitable approaches to using these aids, so that they adjust to the skill of the learner instead of making the experience excessively easy. As it can be seen from this example, having awareness of one's own learning and competence are vital for autonomous learners using of Duolingo, but that alone is not enough. Users should also have knowledge of how to adapt the exercises to meet their own needs as a learner.

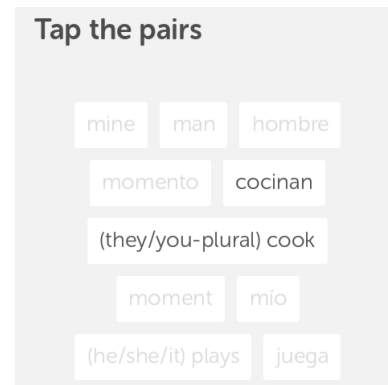
User feedback can also be seen as a way of affecting the learning experience and partaking in the design process. Since users are encouraged to giving immediate feedback with commenting and reporting errors, they have a level of control in their learning experience. If users are dissatisfied with an exercise, they can tap on the red flag icon ('report a problem') and give feedback to the developers. It might be the consequence of a variety of different problems with the software: there could be ambiguity in the question or the correction. A voice recognition problem might also prevent the user from completing an exercise, even if during the data gathering period this did not seem to be a frequent problem. It was more common that mispronunciations in the speaking exercises were accepted: sometimes even sentences that broke off mid-sentence and were followed by a long silence or even an incorrect and unrelated utterance were accepted as correct answers. It must be mentioned that such issues affect the user experience directly, and it is important that the user community are given the power to give feedback to the developers.

In the Android version of Duolingo, there is no separate section for grammar where learners can search for information about syntax. They must acquire syntactic knowledge through in a different means. Throughout the skill tree and its lessons, new verbal agreements and tenses are gradually introduced in the translation exercises. They are presented across the different exercise types and using them in varying contexts. Some of the skills, such as "Present 1", "Prepositions" and "Possession", are designed for practising the use of particular grammatical forms and items. These lessons introduce items that are new to the user, such as a set of irregular verbs in the present. Learners are asked to use correct forms in sentences right away: they may encounter a past tense for the first time in the middle

of a vocabulary lesson, for example. If they are in doubt, hypertext aids can be used, revealing both the translation and the inflection of a verb in parenthesis (figure 10.1.). ‘Tap the pairs’ exercises are match making drills where the learner connects L2 words with their corresponding translations (figure 10.2.). The translations of verbs include syntactic information in the same way as hypertext.



**Figure 10.1. Syntactic guidance in hypertext aids.**



**Figure 10.2. Duolingo teaching verbal inflection.**

The design intention seems to be that the context of language remains as authentic as possible within the limits of the exercise, and syntax is learned organically alongside vocabulary. Reinders and Hubbard (2013) list authenticity as one of the potential advantages of CALL for autonomous learning. For example, the lack of irregular verb agreement tables is one factor that suggests this type of design. There are no exercises such as ‘fill in the gap’ or ‘choose the right verb form for the sentence’. The gradual introduction of grammar also suggests an emergentist perspective for language learning, where grammar emerges from lexis. However, unlike in emergence, grammar may not be viewed as a complete by-product of communication in Duolingo. This is mostly due to the grammar-specific skills and the fact that grammatical information is provided in parenthesis. The ecological perspective, for example, considers such drilling and explanations as unfavourable (van Lier, 2004a, pp. 89–90).

Spaced repetition forces learners to re-encounter verb forms which are problematic for them. This gives them new opportunities to producing translations without using the hypertext. The process can be considered as bearing a similarity with scaffolding. Upon the new encounter, the learner has a chance to remember the correct form without the use of hypertext, and so the process continues. This affords a well-timed removal of support that is vital to scaffolding (Abdullah et al., 2013), only takes place when the learner feels confident enough to recognise the verb form unaided.

Users also discuss grammar in the comment section of each exercise. It seems that discussions often begin with one of the users posting a question about the use of a specific grammatical item (e.g. excerpt 1). Based on this, there seem to be several learners seeking further explanation for the use of syntax. From the design perspective, Duolingo's solution to this demand seems to be that learners have the option to communicate, discussing all of these linguistic problems as a community. In their analysis of Duolingo's game elements for motivation, Exton & Murray (2014) describe user commenting as the building of a community of practice and "very useful for learning Q&A". However, the asynchronous nature of commenting results in the learner not receiving an instantaneous response. Unlike the Duolingo webpage, the smartphone version does not notify the user when the comment has been replied. Past user discussions can nevertheless prove helpful for the mobile learner. Language-related discussions in the comment section will be discussed in more detail in the following subsection, where the focus is placed on the interactional affordances which they provide for language learning.

#### 4.3. Interactional affordances for language learning

Exton and Murray (2014) described the Duolingo web page as having a high emphasis on communication and social interaction. In this subsection, I will present some of the language learning affordances that the 100 million users of Duolingo can create for each other. The study will focus on the mobile version of Duolingo, but some of the features are shared across different platforms. In the context of this study, *interaction* refers specifically to interaction between users: such aspects of Duolingo that provide possibilities for learning through social means. These are mainly associated with the concepts of ZPD, scaffolding and language awareness. First, I will outline some of the possibilities with setting learning goals with peers, which enables some opportunities for scaffolding. I will then explore the learning affordances provided by the Duolingo community. Users can share valuable information commenting on exercises, which potentially affords possibilities for both scaffolding and developing language awareness. I will use excerpts from the user comments to underline specific topics. Finally, I will also discuss the potential issues relating to the comments and the status of native speakers in the community.

Duolingo offers a number of learning affordances through social interaction. It enables users to search for the profiles of their peers, viewing their progress in different languages. Users are able to view these profiles, following and comparing their own XP amount and streak count to those of others. They can even set a notification on their smartphone or email that informs them when another user exceeds their current amount of experience points. From the point of view of gamification, these types of ‘micro leaderboards’ can be a motivator for learners who enjoy competitive activities: such users may want to achieve the highest score and see their name at the top of a ranking list, and they may give more effort trying to stay ahead or catch up with their peers. The user-maintained streak leaderboards I have discussed in subsection 4.1. may also be seen as representing a social affordance to learners who are competitive and want to test their limits.

Viewing profiles offers affordances also for users who wish to set language learning goals together with their peers. For example, in the case that two or more users set a goal of gaining 150 XP individually each week, they are able to give support for each other in case one of them falls behind. This activity can be seen as aligning with the sociocultural theory through its affordances for peer-to-peer interaction, scaffolding and learning occurring inside the ZPD (Lantolf et al., 2000, pp. 16–17). A close relationship between peers might enable them to communicate and recognise the needs of each learner, enabling supportive scaffolding (Abdullah et al., 2013). As the learner dyad or group interact as part of their the social learning process, they may also expand their language awareness through the exchange of information, such as their knowledge of L2, their learning progress, experiences with the application, and learning in general. Discussing goals and learning offers possibilities for a critical perspective of how they are progressing as learners and users of Duolingo or the L2. Learners can approach language from an analytical, metalinguistic or even a critical perspective. We might even imagine a scenario where the two users of Duolingo have discussions in L2, discovering their own identity and voice in the language, which van Lier (2004b) considers a vital part of second language learning.

However, Duolingo is constrained by its limitations in communication: the smartphone version lacks a system of private messaging, for example. Users might interact face-to-face or through other media such as video calls and voice-messaging through Voice over IP (VoIP) services or instant text messaging. The hindrances of multitasking on smartphones, which I have discussed in subsection 4.2.,

may restrict the learning experience if the user needs to constantly switch between Duolingo and a text messaging application. It is considered important that external support is removed at the right moment for scaffolding to be successful (Abdullah et al., 2013). Noticing the support needs of another learner and timing support correctly may prove difficult in text messaging, since it is an asynchronous form of communication. This means that messages may not always be read as soon as they appear, and even when they are, it might be difficult to discuss problems being only limited to communication with only text. Face-to-face interaction and VoIP or video calls are synchronous and therefore surpass such problems. Their constraints are tied more to location: learners must either be in the same location or they must speak into microphones, which are susceptible to interference from environmental noise, and cannot be used in quiet places such as libraries. It can be seen as problematic, because the advantage of mobile technology is considered to be its ubiquitous access to learning opportunities (Kukulka-Hulme, 2010; Sharples et al., 2007; Stockwell, 2013).

Learners also receive support from the Duolingo learner community. They have the option of reading and posting comments by selecting the speech bubble icon (for an example, see figures 6 and 7). This opens the 'leave a comment' view, which shows all comments related to the particular assignment. In this view, learners can find more information about the sentence, and oftentimes another user has already asked for more information on the same or a similar correction. Exton & Murray (2014) studied the Duolingo web page (PC version) as a case study for their gamification taxonomy. They found the social interaction and communication to be a central part of the web page, describing the comment section "a community of language learners, working and struggling through together". The Android smartphone version of Duolingo, which this study concerns with, benefits from these conversations as well. Users have the option of reading and writing comments to the same discussions, as long as they push the speech bubble icon after answering the question involved. For the Android smartphone user, searching and browsing for discussions is not possible at the time of writing this study in late 2015. Mobile users are constrained by this as they are not notified and cannot read replies to their comments unless they access the Duolingo web page.

Nevertheless, taking a moment to look at comments left by other learners can be helpful. It is not only a way to find answers to linguistic problems, but also an affordance to developing language awareness by noticing how others learn, use and perceive languages. The learning community is massive, with

over 100 million users (June 2015) whose proficiency levels range from total beginners to skilled users and native speakers. Users often ask for the help of native speakers in their comments. Beginners are also able to take the role of an advisor by collecting information from online resources to the comment section, making it quickly available to the rest of the community. Comments come from users across the world, which affords learning about the different variants of languages, e.g. Spanish in Latin America and Spain (see excerpt 3 for reference). Simply following discussions on Duolingo affords increasing awareness on the differences between languages, synonyms with slight variations in meaning and items that cannot be translated directly, for example. We saw an example of this in excerpt 1, where user quzee noted in his comment that ‘good morning’ is translated as ‘good days’ in Spanish. The user community seems to be connected by their common goal of learning the L2. It does not adapt to each learner’s personal needs. However, it affords peer-to-peer and expert-novice scaffolding on a more general level.

Despite these social affordances, discussions of vocabulary and grammar usually take place in the language of instruction, e.g. English for Spanish learners. There seems to be little negotiation of meaning or languaging in the target language itself. In general, users are not using L2 in a meaningful context when posting comments: in the case of Spanish for English speakers, the interaction is mostly based on direct questions and explanations in English with the occasional example, joke or exclamation in Spanish.

Users may find answers to a range of questions related to syntax or lexis relatively quickly by reading comments. In excerpt 3, users are commenting on the meaning of the Spanish word ‘techo’ (roof, ceiling).

**Excerpt 3. Users commenting on the meaning of *techo* (roof).**

**soldmymind:** Really the common usage is to mean ‘roof’ not ‘ceiling’ (+4)

**The Neeno:** Growing up, we used ‘techo’ for roof and ‘cielo’ for ceiling. This varies depending on where you are. (+17) [...]



**Mark:** Are they the ones that are used in Spain? (0)

**The Neeno:** [...] If you mean which words do they prefer, I've heard that they prefer 'tejado' for all roofs and 'techo' for 'ceiling' in Spain. [...] This may vary by region in Spain as a few other things do. [...] (+11)

(Duolingo, July 29<sup>th</sup> 2015)

Users soldmymind and The Neeno give their insight on the usage of the Spanish word 'techo', and they have received positive votes from other users. The Neeno's comment implies that the user comes from a Spanish-speaking community outside of Spain. The user is trying to create a general description of the differences between his or her language and the Spanish spoken in Spain and the rest of the Hispanic world, while trying to avoid generalisations. The comment has the potential to increase the sociolinguistic awareness users in the Duolingo community, some of which might not have yet considered the existence of lexical differences between the many Spanish-speaking cultures. In contrast, the comment of soldmymind is stricter in its definition, and refers to a "common usage" without providing context, e.g. the location of such usage.

The information provided by users can sometimes be ambiguous or simply incorrect. To maintain better quality, users have the ability to rate comments as positive or negative (also commonly referred to as 'upvotes' and 'downvotes') based on whether they find them helpful. Ideally, helpful comments will usually show at the top of this section, and unhelpful, incorrect or inappropriate comments will be sent further down the list or are removed entirely. This is not always the case, however. The following excerpt relating to this problem is taken from the comment section of a translation exercise.

#### **Excerpt 4. Users discussing the meaning of 'dormitorio'.**

**AnkitSpanish:** Is "dormitorio" mainly used for "bedroom" or "dormitory"? My Spanish dictionary has quite a few words for bedroom, so I am kinda confused. (+11)

**calebrankin:** Dormitory. Alcoba is more often used for bedroom. (+5)

**iamnothernan:** I am a native Spanish speaker, and the words "Dormitorio" "Habitacion" "Pieza" "Alcoba" are used for bedroom and dormitory [...] ie are synonymous in Spanish (0)

(Duolingo, 23<sup>rd</sup> March 2015)

The question left by username AnkitSpanish has a sum of eleven positive votes, making it the top comment of the exercise. This suggests that many users have found this question important. Following are two answers which may cause confusion. The one posted by calebrankin has a sum of five positive votes. Iamnothernan's has a zero, indicating either no votes or a tie between positive and negative votes; however the user claims to be a "native Spanish speaker" in order to signify an expert status. The order of these two comments indicates that calebrankin answered the comment first, which could partly explain why it has more positive votes. Another explanation could be that native speakers and advanced learners have acknowledged the answer. It is also a concise and precise answer, which could be more appealing to those who are looking for and are pleased with a simple answer. On the other hand, the lengthier answer defines a set of related words more vaguely, and it does not answer directly to the question regarding the main use for *dormitorio*. The actual use of the word may depend on local and the context of use, and therefore such questions may receive confusing answers like these from the online community, where Spanish speakers around the world give their insight. Having multiple contradicting or confusing answers without the cultural knowledge of different speaker communities can become a constraint for autonomous learning.

The community of Duolingo seems to expect answers that are short and easy to understand. It is still unclear whether the form of the answer is more important to the users than the answer itself. Users who give concise and simple answers to complex questions may in some cases gather a greater number of positive votes than such long answers that go more into detail, or have ambiguity in them. In a worst case scenario, this could lead to incorrect or oversimplified answers being at the top of the comment section of an exercise, because a large group of users seeking knowledge has perceived them as helpful and accurate.

Finding the right information from user comments can be time-consuming. Misconceptions, humorous and reoccurring comments can leave the user reading for a long time in between the exercises. Excerpt 5 is an example of a discussion that may require some time and critical reading skills in order to reach a conclusion. The users are commenting on the syntactic function of a word.

### Excerpt 5. Discussing the use of the function word ‘a’ in an exercise.

#### La madre culpa al hijo.

Translation: The mother blames the son.

**moebe97:** Because it translates more directly as [“]I gives blame to the son[”]. Just as de el is combined to form "del" for certain phrases, a and el are combined to form "al". It is easier to say than a el hijo - and the "a" is necessary in Spanish to form the sentence correctly. Just because we would not say "blame to the son" in English does not mean that it is not proper in other languages. (+30)

**Eugene Tiffany (ET):** Sure that's not a "personal a" ? (+27)

**Nealbo:** I agree, it's just the personal a being used. (+11)

**Johnny-Jay:** This is not the personal a. The preposition goes with the verb "culpar". Babella, who I believe is a native Spanish speaker, explains in this discussion. <https://www.duolingo.com/comment/664721> (+12)

(Duolingo, 23<sup>rd</sup> November 2015)

User Johnny-Jay ends the discussion by providing a link referring to a different discussion, where the supposed native speaker Babella explains that, in the context ‘to blame somebody (or something)’, the verb ‘culpar’ requires the preposition ‘a’ before an object. This suggests that the function is not the personal ‘a’ which users Eugene Tiffany and Nealbo are referring to, but that the preposition is tied to the verb, just as user moebe97 was originally trying to explain. Moebe97’s original arguably lacks clarity that many users might desire. It should also be noted that, although the Babella’s explanation is a well-rounded one, opening links on can be time-consuming for the mobile user, as they are opened on the browser application of the smartphone, not in Duolingo.

It could be argued that reading comments repeatedly throughout the exercises constrains mobile learning from a time management perspective. Finding information among the often humorous and misleading comments can take a while, or the desired knowledge might not be available. The search restricts the game flow as the users will progress slower in the game, affecting their motivation and concentration. For users whose L1 is not English, finding information can be challenging, and the extra time spent searching for the right explanation can break concentration. The user already has to switch modes between L2 and English, and potentially translate English into L1 for better comprehension. Users of Duolingo will benefit greatly from English skills, as it has the largest selection of languages.

However, the number of instructional and learnable languages has been increasing, giving users more options to learn languages without using English.

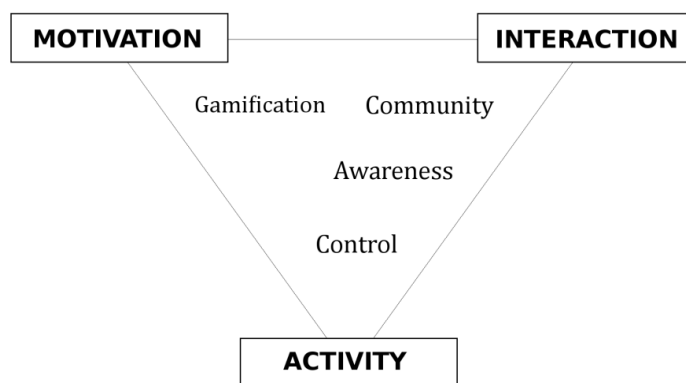
The community seems to respect native speakers as a source of knowledge. Returning once more to excerpt 5, user Johnny-Jay uses Babella's comment as a source, while he also mentions that she is potentially a native speaker. Her explanation can be considered as being sufficient and providing enough examples, but this might not always be the case with native speakers. While it can be assumed that they are able to rely on their knowledge and intuition to tell when language is used correctly or incorrectly, native speakers might not always have enough syntactic knowledge of their language to be able to provide learners with thorough explanations. In Duolingo, learners have different backgrounds, and may therefore approach languages from a multitude of perspectives. A single explanation is unlikely to clarify a problem for all learners: being able to understand the learners' perspective may help in providing more appropriate answers. Online resources such as grammar guides can often provide a faster source of information that can be considered more reliable than user comments.

## 5. Discussion of results

In the analysis, I have described some of the language learning affordances in Duolingo from the point of view of the SCT and the ecological perspective. The idea was to examine the degree to which these theories are present in the application by viewing its different parts as affordances for language learning. In this section, I will gather the main findings of the analysis and discuss their relationship with the sociocultural and ecological language learning theories.

In the analysis, the language learning affordances of Duolingo are divided into three main categories: gamification, activity and interaction. Van Lier (2004a) defined affordances as relationships of the learner and the environment, which makes them difficult to categorise due to their interconnected nature. Therefore the three categories of affordances often overlap with each other. As an example, a game interpretation can be the result of interaction between users, which potentially makes the interaction an affordance for increasing motivation. Activity is a particularly challenging category to discuss as an affordance for learning, because it blends in with the other two categories: every possible action the user is offered in Duolingo can be interpreted as an affordance for a multitude of activities.

In order to discuss the results of the analysis in a comprehensive way, the categories of affordances should be considered as perspectives instead of classifications. In figure 11, the categorisation of the different language learning affordances of Duolingo are illustrated as a triangle in order to show their interconnectedness.



**Figure 11. Language learning affordances in Duolingo.**

In the figure above, the three categories of affordances form the corners of a triangle. The sides connect the corners together, enclosing a field of affordances. Their location relative to the corners indicates how closely each of them relates with the categories. For example, the Duolingo community can be an interactional affordance for language learning by scaffolding, but awareness can also be developed through interaction.

Beginning with the *motivational* elements of Duolingo, the gamification elements are specifically designed to build and maintain a motivation for a consistent language practise routine. This design can be seen in the gamification elements such as sounds, colours, badges, experience points, levels, streaks and in-game currency. The level system and the progress bar allow users to monitor their own progress with the possibility of experiencing a sense of achievement and competence. Learning through a meaningful activity, and having motivation for doing so are viewed as important in the ecological perspective (van Lier, 2004a, p. 223–224). But what can be regarded as a meaningful activity? The example given by van Lier involves practising pronunciation for an oral presentation. It seems that the primary function of gamification in Duolingo is to create fun and exciting experiences in order to motivate the user into increasing the length and frequency of practise sessions. Increased practise leads to more points, and higher status levels lead to feelings of reward.

However, Duolingo does not define goals other than language learning: it is a tool that affords *activity*. During the analysis, I have shown examples of users who seem to demonstrate game interpretations: one experiencing unfairness (excerpt 1) and the other thinking about the meta-game (excerpt 2). Although it can be questioned whether these interpretations are beneficial from the perspective of language learning, the activity itself may be meaningful for the learners. Their goals are tied to points, levels or simply their own enjoyment, but learning languages will still help them achieve those goals. It is because of these different possibilities for interpretations why it seems limiting to view activity solely from the design perspective of Duolingo. For an all-inclusive language learning program, Duolingo lacks the interactional negotiation of meaning: it does not provide enough affordances for using the target language in authentic contexts or in a creative and social manner, which are considered as important in the ecological perspective (van Lier, 2004b, p. 83). The spaced repetition that Duolingo's exercises are based on seems to discord with the sociocultural and ecological theories that seek social, meaningful interaction. Although repeating speech is part of the pronunciation exercises, it

is not comparable to the concept of imitation in the SCT (Lantolf et al., 2000, p. 17–18). It seems likely, however, that many use Duolingo in a supportive role, complementing other forms of language learning. The affordances of control are numerous and support autonomous learning by increasing the learner's agency in the exercises: their possibilities and constraints were discussed in detail in the analysis (4.2.). So were the affordances for developing language awareness, which are tied firmly in the activity and interaction of Duolingo.

Awareness is one of the key affordances in the *interactional* category. The comment section of Duolingo offers opportunities for users to discuss their views concerning learning and languages. It is to be expected that misconceptions and various beliefs may guide learners in the wrong direction, but at the very least they have an opportunity of becoming aware of language as a complex phenomenon, not a long list of words one needs to memorise. The community provides answers to linguistic problems, which are commonly syntactic or lexical. The information is either gathered from various sources of literature, or native speakers and advanced learners write from their experience. The opportunities for scaffolding would be more notable if the comment feedback could somehow be more immediate. The constraints in communication in the smartphone version make well-timed scaffolding a challenge: users are not able to read replies to their comments, for example. Learners can read comments only after they have answered in an exercise, leaving them with no support other than the hypertext translations for each word. The affordances for scaffolding and learning in the ZPD are much improved when learners are in face-to-face interaction, or using online communication with speech or instant messages. Also, having the option to view the progress of other profiles enables users to provide support and compete for points.

## 6. Conclusion

In the previous section, I presented and discussed the main results of the study. In this final section, I will draw them as a conclusion according to the research plan of the introductory section. I will also discuss the significance of the findings, the strengths and weaknesses of the study, as well as ideas for future research on the subject of education and MALL at the end of section.

The aim of this pro gradu thesis is *to explore different language learning affordances in Duolingo from the viewpoint of the sociocultural theory and its ecological perspective*. With the Android smartphone version of Duolingo as the subject, I have described the application from the user perspective using phenomenography and by analysing the discussion of learners in the comment section. Special attention was paid to the language learning affordances in the gamification elements, language learning activities and user interaction.

The analysis shows Duolingo having numerous affordances for language learning that align with the sociocultural theory of language learning (SCT) and its ecological perspective. The most notable affordances found were related to learning in the ZPD through scaffolding with peers and more knowledgeable others (MKOs), and developing language awareness in discussions with other users. The gamification elements of Duolingo reward the learner in an attempt to create a motivation for daily practise. Whenever Duolingo succeeds in creating a sense of competence, it can become a goal-motivated activity that has meaning to the learner. Some learners also seem to make game interpretations of the application. Due to its nature as a tool for language learning, users may participate in different activities depending on their perspectives and goals. From the perspective of the language learning theories in question, Duolingo has also certain constraints. The most notable ones include constraints in the communication system which affect scaffolding, and the spaced repetition method, which in some cases can be regarded as separating the linguistic information to exercises, which can hinder linguistic growth according to the ecological perspective (van Lier, 2004b).

These results are significant to those who are interested in MALL studies or the use of gamification in language education. It shows that Duolingo aligns with the SCT and its ecological perspective in many respects. This may help language educators in considering the role of mobile applications in their pedagogy from a general perspective. Applications often appear to be comprehensive learning solutions



due to their features and marketing. However, the results of this study suggest that, from a sociocultural and ecological standpoint, Duolingo is more appropriate as a supportive tool alongside other forms of learning. The strength of this study lies in its direct phenomenographical description, which allows the researcher to collect data while developing and improving the theoretical background simultaneously. I believe the method has increased cohesion between the theory framework and the analysis. Due to the nature of qualitative research, further studies would be required in order to gain a wide generalisability of the results.

Future studies could be directed towards the community of Duolingo and the nature of peer support among learners. Interaction could also be studied more extensively than in the current study, using test groups in order to seek information about how the application is being used. One aspect to study could be the interaction of subjects using Duolingo each on their respective device in a setting where instances of scaffolding may occur.

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