HG2052 Language, Tech & The Internet, Assignment 1
Duolingo: The Lingo of Language Learning with Technology

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1 Introduction

Duolingo, a free award-winning online language-learning platform founded by computer scientist Luis von Anh, has helmed the educational technology field for the past eight years since its release in 2011, garnering a total of 300 million active users to date (Smith, 2019). It offers 37 languages, such as Esperanto, Hebrew, Japanese, etc., customised for users of different language backgrounds (Lee, 2018), where they can acquire languages anywhere in the world and at their own convenience too (Smith, 2019). The amalgamation of data sets such as a corpus of 7 million words, metadata and longitudinal errors assembled from Duolingo learners, and the formation of the half-life regression (HLR) spaced repetition algorithm enable Duolingo to refine its language-learning model to better suit the needs of its users as part of computational linguistics and psycholinguistics automation (Settles & Meeder, 2016). The rationale for analysing Duolingo points to the increasing number of foreign language speakers in the new era and the challenge to capture their short attention span, relating to Dörnyei's Model that encompasses different motivation of language-learning at the language, learner and learning situation levels (Root, 1999). Oxford (2006) also emphasises on the environment of language instruction that plays a key factor in the success of language acquisition, making Duolingo an exemplar online case study, comparing its properties with speech and text, its effects on communication, language and society.

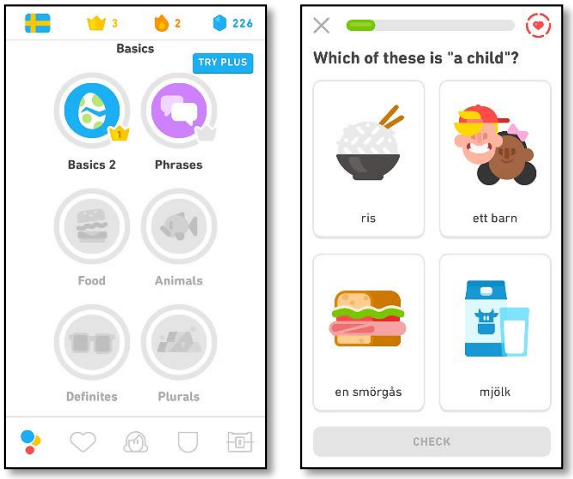
2 Literature Review

Using translation drills through gamification as a cornerstone, a study has found that 84% of its participants reaped significant improvements in language learning by using Duolingo, quantifiable by equivalating 34 hours of free Duolingo learning to a paid semester of language learning in schools. This was achieved through the motivation that Duolingo cultivates, driving the success of language-learning (Vesselinov & Grego, 2012). Garcia (2013) also reports that Duolingo thrives over machine translation due to its inclusion of human intelligence and knowledge gained from the world from the advanced language learners, used to refine translated variations taught to other users. Its effectiveness in teaching users a

language can be further proven by a study done by Ahmed (2016). It reveals that simultaneous acquisition of two languages is possible using Duolingo but only applicable for beginner levels due to its direct-translation strategy, echoing the findings of Garcia (2013). Higher levels of language learning will require the use of traditional school that can be supplemented by Duolingo but not as a replacement. Ratzlaff (2015) argued that students who engaged in classroom learning outperformed the students who used Duolingo to learn a language based on his study done. He reported that classroom settings triumphs in human interaction because it aids in the reinforcement of the language acquisition process. However, online applications such as Duolingo can assist teachers in its ability to capture the students' attention, surpassing language-acquisition beyond the course-content (Pourreau & Wright, 2013).

3 Properties of Duolingo and Its Effects on Language

Operating on both the desktop and mobile application, Duolingo benches on the Grammar Translation Method popularised in the 1960s where translation serves as the fifth macro linguistic skill for language learning (Anselme, Bizingre & Mohanan, 2016). Calis and Dikilitas (2012) has found that translation practices four other linguistic skills, namely speaking, reading, listening and writing, ultimately reinforcing comprehension. Users are introduced to different sets of exercises of a 'skill tree' containing categories such as food, animals, plurals, etc., and they learn word-for-word translations continuously that are supplemented by pictures as illustrated in Images 1 and 2 respectively.

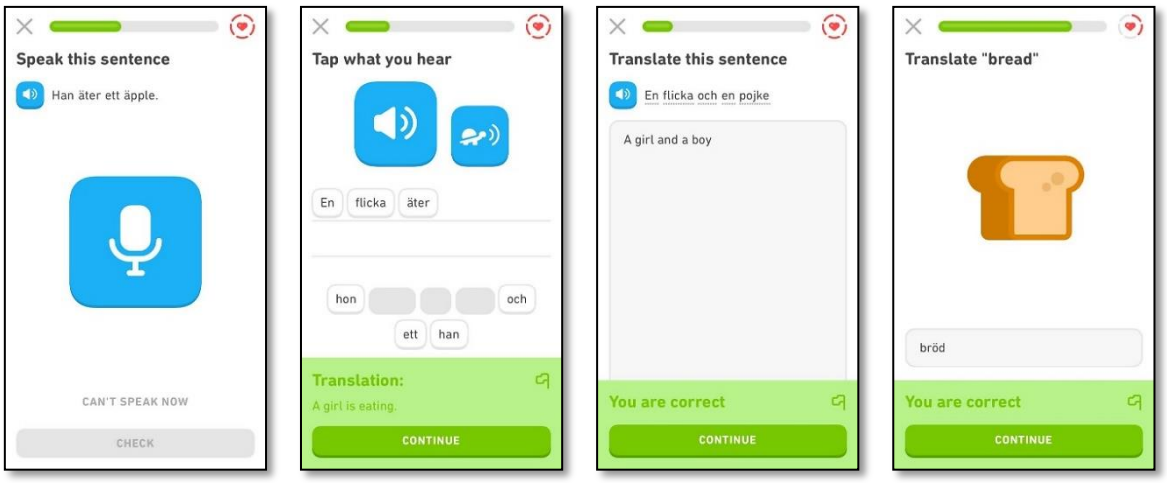


Images 1 and 2: Components of the 'Skills Tree' and Translation Activities

With the use of translation, it trains users in simultaneous interpretation, stimulating two brain regions, the caudate nucleus and putamen, to coordinate executive functions and orchestrate better control on the different activities in the brain to cope with hearing, comprehension and

articulation. A study has also found that translation tunes out distractions especially for translators who will only focus on the words for translation, where they pay less attention to their surroundings and own voice, restricting their language thought process to the boundaries of the translated language (Watts, 2014). This is beneficial in channelling all concentration to the process of the semantic translation but missing out non-verbal linguistic cues such as body language that is useful for interpretation and communication can be critical.

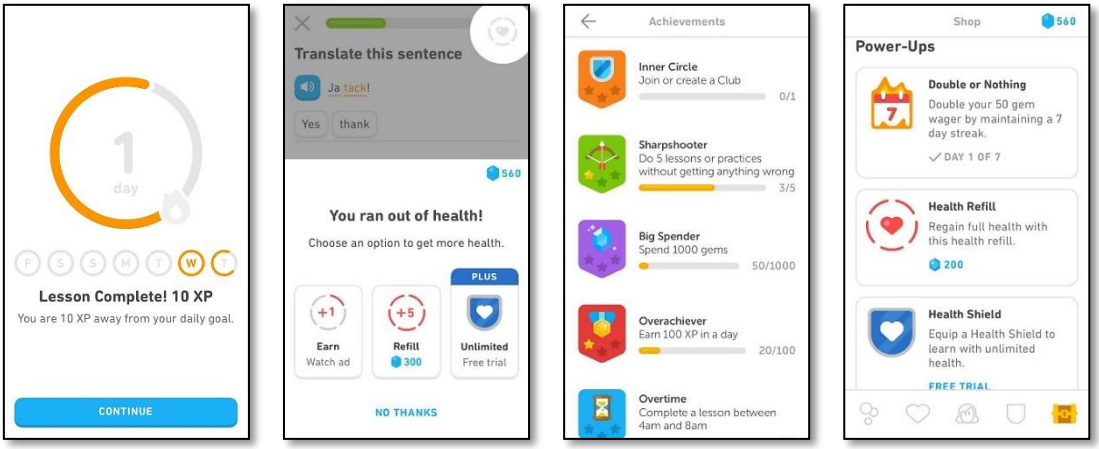
Secondly, as users hover over the new words while practising the activity sets in Duolingo, pronunciations of the words will be heard. This trains their ability to extract linguistic patterns and the development of vocabulary words. The repetitive and instant exposure to the sounds of the words are heard in activities involving sentence structure, reading, writing and listening, particularly highlighting the activities where users are required to read out words or phrases through their microphone (See Images 3, 4, 5 and 6).



Images 3, 4, 5 and 6: Activities for Sentence Structure, Reading, Writing and Listening

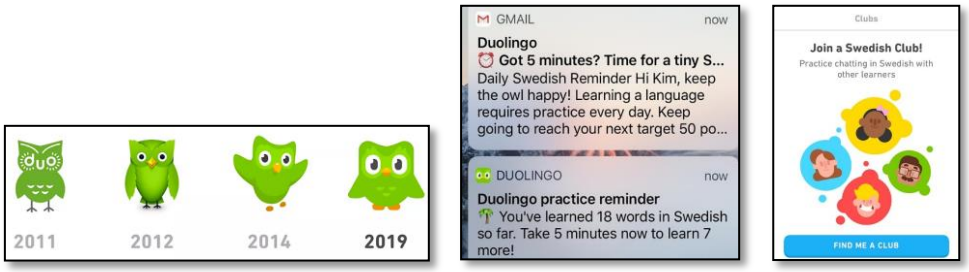
Mueller, Friederici, & Mannel (2012) concluded that auditory production helps both infants and adults to identify linguistic rules of new languages and their awareness of transitional probabilities between units of words. Learners depend on the distributional and prosodic cues that provide them with extra information on the perception of grammatical rules in languages. Kimppa (2017) has also discovered that repeating the sounds of new words can enhance vocabulary growth due to the neural response enhancement that stimulates memory-trace formations. Therefore, Duolingo's property of enunciating new words as the user engages in the activities helps to develop grammatical rule learning and strengthen their memory traces in the perisylvian brain region, acquiring more new information of words and also activating pre-existing neural representations.

Thirdly, according to Werbach and Hunter (2012), the concept of gamification employs the use of gaming components and strategic game designs in non-gaming conditions. It acts as a motivational tool that increases the rate of language acquisition and the use of the language. XP health points and streak counts are utilised to sustain, accelerate or motivate users to earn more points for their game progress, providing them a sense of satisfaction and anticipation to acquire a language faster (Figueroa, 2015). As seen in Images 7, 8, 9 and 10, game elements such as progress bars and leader boards have a common meta-centred goal of completing a conquest and this contribute to the engagement and productivity of a language-learning process.



Images 7, 8, 9 and 10: Duolingo's Gamefication Features

A study has also reported an improvement of 9% in students' grades and a decrease of 16% in course failure rates. Gamification acts as an augment for teachers' arsenal in encouraging more student accomplishments in language learning and can also be a type of formative linguistic assessment. Besides computing its language model with games, Duolingo engages in daily outreach engagement through emails that personifies their green iconic mascot owl to create a personal attachment to the mascot and a commitment to learn a language (Lee, 2018) (See Image 11). A sense of community is created through language clubs that allows for real-life discussions among users using the new language (See Image 12). Thus, the use of a mascot as a motivational tool and community belonging can speed up the process of language-learning, affecting the quantity and quality of language used to communicate.



Images 11 and 12: Duolingo's Mascot, Daily Push Notifications and Language Club

4 Duolingo and Its Effects on Communication

Firstly, online language learning platforms allow for communication on-the-go with just a mobile phone or desktop connected to the internet (Bachore, 2015). Users can learn a language at any given time by accessing Duolingo instantaneously when the motivation to learn a language is at its highest but can also delete the application within a few seconds when the thrill of using computer technologies has ceased. The connectivity and portability of online devices provide users with the avenue to satisfy their need to connect constantly and communicate with an application or community forum users of Duolingo. Thus, communication is made flexible, easily attainable and customised according to the learning needs of the user, enhancing the effects of language learning technology on communication (Gangaiamaran & Pasupathi, 2017).

Secondly, Duolingo prepares for formal communication trained through the constant translation drills but it eliminates the preparation for real-life contexts when communicating with a native speaker or users with different idiolects and accents (Saradha et al., 2016). Formal standardised variety of the new language is taught and although Duolingo offers online forums and clubs that the user can immerse in and form a sense of community, it is not effective in replicating the repertoire, dynamics and registers used for discussing trending topics as it lacks the opportunities for human interactions. The user might lose the ability to converse fluently and engage in authentic communication when met with impromptu discussions that restricts the time given to think about the subject. According to Hooks (2009), students learn a language best through engaging with real-life dialogues so that they will be able to enunciate coherently in their target-speech community. To solve the problem of unrelatability to real-life situations, language applications such as Babble and Rosetta Stone have included recorded conversations and live video chats respectively to stimulate real settings for users to practise their language skills (Saradha et al., 2016). Therefore, while the use of formal pedagogical translation technology in Duolingo can help to instil new words into a speaker's memory, it is not sufficient in producing an articulate speaker for real-life conversations, impacting meaningful communications.

4.1 Duolingo and Its Effects on Language and Society

With lesser real-life interactions, an increase in time spent on technological devices will be witnessed too. While Duolingo boasts of its benefits such as high improvement rates, a faster language acquisition process and sustained user satisfaction and motivation (Vesselinov & Grego, 2012), it should also be noted that Duolingo users embark on a self-regulated learning,

ultimately determining how much time is utilised to connect with the society and develop cultural awareness at their own discretion. With more technological usage, this decreases the personal interaction between humans and inculcates the habit to engage in less quality conversations (Elsobeihi, 2017).

5 Crystal's Seven Characteristics of Speech and Text

Comparing Duolingo with Crystal, D. (2006) characteristics of speech and text, Duolingo's language-learning new technology exhibits a combination of both speech and texts, carefully crafted for the 21st century users. However, as seen in Table 1 below, Duolingo leans more towards text-like characteristics where the process of language-learning is generally contrived, visually decontextualised, elaborately structured, factually communicative, repeatedly revisable and graphically rich.

Speech-like Features	**Duolingo**	**Text-like Features**	**Duolingo**
Time-bound	✓	Space-bound	
Spontaneous		Contrived	✓
Face-to-Face	✓	Visually Decontextualised	✓
Loosely Structured		Elaborately Structured	✓
Socially Interactive	✓	Factually Communicative	✓
Immediately Revisable		Repeatedly Revisable	✓
Prosodically Rich		Graphically Rich	✓

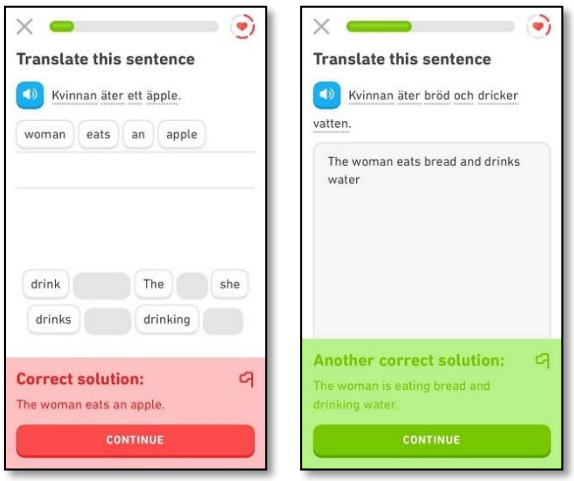
Table 1: Analysis of Duolingo with Speech and Text-like Features

Firstly, the total storage of Google, Microsoft, Facebook and Amazon is estimated to accommodate 1.2 trillion terabytes, pointing towards a huge and possibly unlimited capacity on the internet (Secondini & Forestieri, 2017). Although the Nonlinear Shannon Limit postulates that there may be an 'information crunch', this problem can be solved by expanding the bandwidth of a channel and the input power. Moreover, there has not been any true presence of limits demonstrated (Mitchell, G., 2013). This relates to how Duolingo as an online application is able to have an abundance of space bytes and networks to incorporate an unlimited number of activities and content for language learning, thus not being space bounded. The questions asked in each Duolingo activity do not explicitly state a time limit however, the user is aware that another question awaits as Duolingo operates as a game. Ultimately, Duolingo will continue running till the phone or desktop runs out of battery. Also, there is a

dynamic interaction between both the user who has a registered profile in Duolingo and the 'person' behind Duolingo that is represented with a convincing natural voice produced through text-to-speech synthesising, albeit only providing one type of intonation, idiolect, prosody and accent variation. 'The voice' acts as a consistent person who will be present to guide the users along with the pronunciations and the user has to repeat certain phrases that will be detected as correct or wrong, a dynamic exchange seen in speech too. Overall, Duolingo is not space-bound but not be entirely time-bound too.

Secondly, the activity sets in Duolingo are displayed as codified alphabets like in a writing system, providing extensive time for users to analyse sentence structures, read the words repeatedly and constantly listen to the pronunciations of the words as they are read. Users are exposed to the writing system of that particular language visually, taking note of the units of discourse and sentence boundaries that can be identified by punctuations and its layout. No spontaneity is involved so users have ample time to think about the syntax and morphology used that can be useful as the difficulty of the language progresses, emphasising on the clarity of expression and careful organisation. This gives rise to a lag between the production and reception of words that fortunately, does not affect the operation of Duolingo due to its time allowance and technological modulations.

Thirdly, Duolingo is visually decontextualised, similar to texts and it does not promote any face-to-face communication. As language is context-dependent, users can only rely on different extralinguistic possibilities such as Duolingo's animated pictures, sounds, colours and fonts, instead of facial expressions and gestures. However, Duolingo provides immediate feedback for questions that have been answered wrongly or with alternate solutions, leaning towards a partial speech-like back channel feature (See Images 13 and 14).

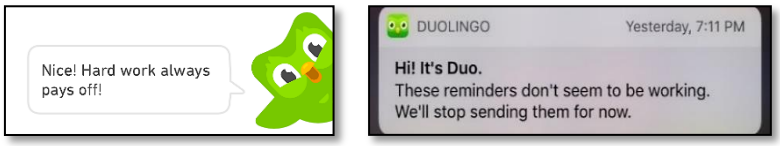


Images 13 and 14: Duolingo Immediate Feedback Feature

It is also expected that texts reduce the use of deictic expressions as there are lesser references to point to. Nonetheless, Duolingo continues to use words such as *you*, *here*, *there* and *now* enabled through their translation activities, familiarising the user with deictic terms of the new language. Duolingo is able to use deictic expressions similarly in speech by stating the identity of the reference at the front of the sentences using names. Thus, Duolingo manifests text and speech-like features through decontextualization and deictic expressions respectively.

Fourthly, Duolingo abides by an elaborate structure observed in text-like writings as the style of an educational language teaching system follows a formal and standardised variety. Slangs, short-forms obscenity, non-standard vocabulary, informal speech are not employed, including contractions such as *weren't* and *she's that* are not taught but commonly used in speech. Longer words such as chemical compounds rarely present in texts are also not used in Duolingo, possibly associated with the irrelevance to language-learning too. However, Duolingo allows for the use of relative clauses and complex syntactic patterns, exhibiting the subordinating conjunctions of texts-like writings.

Fifthly, Duolingo is factually communicative as it teaches users the complete and proper conventions of communicating ideas and factual rules of language. Words from the new language can be comprehended at the user's own pace as it is visually easy to read and internalise with no time restrictions. It is also noticed that Duolingo inputs socially interactive features of speech such as greetings and casual discourses that maintain the social relationship between Duolingo and the user. For example, Duolingo uses their green owl mascot as a messenger for encouragement words when a question is answered wrongly (See Image 15), and at times, adopt passive-aggressive messages when the user does not seem to be interested in learning a language (See Image 16), similar to that of a communicative relationship shared by people.



Images 15 and 16: Motivational Messages and Passive Aggressive Messages by Duolingo

Thus, although Duolingo is a virtual system that includes adequate factual contexts for language-learning like that of texts, it cultivates an amiable relationship with the user to ensure that the motivation and enjoyment of learning a language is kept high, observed in speech too.

Sixthly, Duolingo allows for repeated revisions of inadequacies that is a feature of texts, while these inadequacies are unable to be recalled and are visible to both the user and Duolingo,

similar to the feature of speech. Once the user has keyed in the answer for a question asked in the activity sets, the answer will be submitted and marked as correct or incorrect at once. Errors cannot be withdrawn once the 'submit' button has been pressed, similar to how speech cannot be retracted once spoken. Feedback is given instantaneously and Duolingo tracks the specific questions that have been attempted wrongly so the receiver (Duolingo) is aware of the mistakes. Those questions will be refreshed and asked once again, giving the user a second chance to rephrase their answers, albeit in the next few rounds of questions, similar to how we are able to rephrase our published errors through revisions in text. Also, as Duolingo flashes questions and answers systematically, it is improbable for any interruptions or overlaps that are prevalent in speech. However, they can come in the form of visible system lags or crashes in Duolingo, similar to how communication failure occurs audibly in speech. So, we observe that Duolingo integrates both speech-like and text-like features specific to the capacity of revising errors.

Lastly, the dynamic interactivity portrayed through gamification in Duolingo brings about graphically rich displays evident in text-like contexts. Users are able to study the capitalisation, page, spatial arrangements, punctuation and line rules practised widely in texts and are crucial indicators to convey accurate messages between interlocutors. To maintain a simple and comprehensible layout, Duolingo does not incorporate complex equations, tables and graphs. Therefore, Duolingo conveys more graphically appealing information found in texts that can be further improved if prosodic knowledge of speech such as intonation, tempo, rhythm, etc., can be presented for a well-rounded analysis of speech.

6 Conclusion

Overall, language-learning through technology opens another avenue of communication as it alters the way people interact and acquire new knowledge instantly and in an enjoyable manner. Duolingo allows for immediate access to knowledge at any geographical location and time, simply available through the connection of the internet. Fundamentally, it still practices more text-like characteristics but its convenience, complimentary service and ability to capture users' attention are the quintessential winning determinants over traditional school teaching of foreign languages.

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