

# Evaluating student use of Duolingo, an online self-study platform

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## Abstract

As computer-assisted language learning tools become more commonplace, it is important to understand whether such tools are actually effective. It is tempting to adopt new technology, but it is vital that its effectiveness is evaluated. This study aims to assess how students used the mobile application *Duolingo* when delivered using the *Duolingo for Schools* platform. It was found that these tools offer teachers numerous benefits, whilst also being an engaging method of study for students. The platform provides useful insights into how students study and it is proposed that Duolingo could form part of a blended course utilizing face-to-face classes and online study, particularly in first year university English classes.

## Introduction

A fundamental responsibility of a teacher is to monitor the work that students are doing in the classroom. A teacher should have a good understanding of how well their students are working, what their class participation is like, and how well they are understanding the content that they have been assigned. However, monitoring how well students are working outside of the classroom is more challenging. Firstly, there is the binary nature of homework: assignments are created and the students either meet the deadline or they do not. Furthermore, there is usually only one assignment per week. This could be a section of textbook or perhaps some writing. The students will almost certainly receive the same assignment, as any attempt to create bespoke assignments for each student is immensely time-consuming. Furthermore, the time investment on the part of the teacher is not only in creating the material, but in reviewing it and providing feedback, either in class or as written feedback completed outside of the class.

The problems can be summarised as follows: students need to receive regular, level-appropriate as-

signments and they need to get timely-feedback on those assignments, but teachers have limited time, both in and out of the classroom. Beyond actual language learning, teachers also hope to foster a language-learning habit among their students and to help them understand that small amounts of daily study can lead to considerable, long-term language gains. If teachers could offer students daily study tasks which required only a small time-investment from the teacher, then it is possible that students could learn the habit and benefit of regular English study. A language learning tool called Duolingo could provide help with all of these issues.

Duolingo (available both as a mobile application and on computers) is an online language learning tool that allows students to experience regular, level-appropriate study in the form of simple games. In this paper, I will briefly outline what Duolingo is and how I used a feature called *Duolingo for Schools* with my students. I will also analyse data that I collected to try to answer the following questions:

1. Would the students use Duolingo regularly?
2. Were all of the students of similar levels when they started using Duolingo?
3. Would the students complete the homework assignments?
4. Would the students enjoy using Duolingo?

### **Background of Duolingo**

Launched in June 2012, Duolingo is a free, online platform for language learning. There are over 300 million registered users, making it the largest language learning platform in the world (Duolingo, 2018). It can be accessed via the platform's website as well as a mobile application (both iOS and Android). As of December 2018, a total of 82 language courses were available in Duolingo across 37 languages; for example, there are different Spanish language courses depending on the native language of the user. The *English for Japanese speakers* course was released in 2015 and currently there are almost 1 million users registered (Duolingo, 2018).

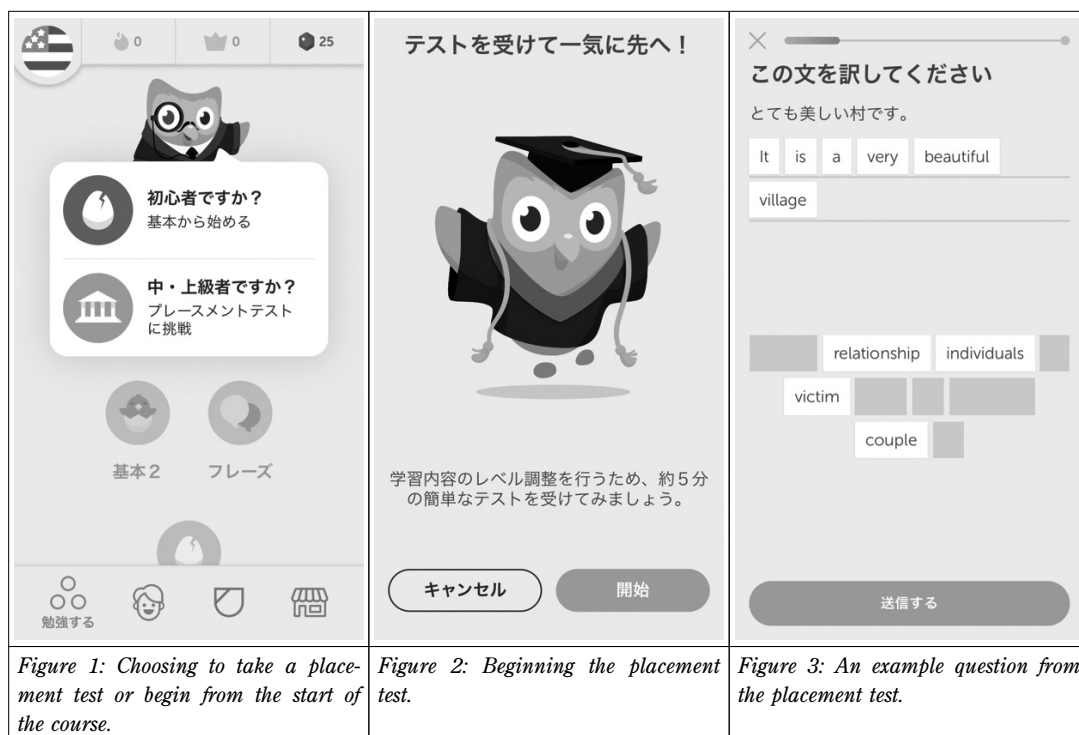
An effectiveness study conducted in 2012 (Vesselinov and Grego) found that 34 hours study with Duolingo was equivalent to a full semester of university language study (the study was conducted with American students learning Spanish). Considering that a semester of study (actual class time plus out-of-class study) is likely to be significantly more than 34 hours, it was concluded that Duolingo is an effective alternative to traditional language instruction for beginner students.

## Features of Duolingo

In this section, I will briefly outline the key features of Duolingo that are directly relevant to the current study.

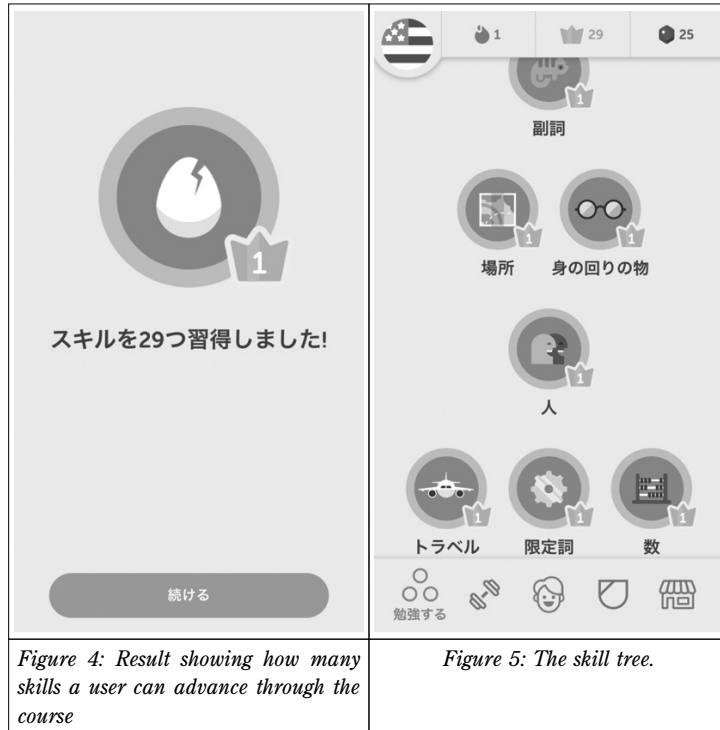
### Placement test

After selecting a language to study, users are offered a choice of taking a placement test or beginning at the very first level of the course. The placement test takes approximately five minutes and the result determines how much (if any) of the course the user can skip; the stage that they are assigned to should provide challenging content within their range of competence and limit the time spent working through content that they are already familiar with. This zone that balances challenge and ability is known as the flow channel (Csikszentmihalyi, 1997). If a user is placed at a stage of the course which is either too challenging or not challenging enough, they are likely to experience frustration, anxiety or boredom.



Following the placement test, users are placed on the Duolingo skill tree (see figure 5). This is a visual representation of the course contents. The user may only progress up the skill tree by complete lessons in Duolingo; this requirement to “unlock” to advance is a common feature in video games,

and it is just one of the gamification elements utilized by Duolingo.



At this point, the users are asked to create a user profile so that their progress is recorded each time they use the application.

### *Skills and lessons*

The course content in Duolingo is arranged by skills. The term skill is used to broadly refer to grammatical items such as present perfect tense or prepositions, topics such as personal belongings, or other language items such as idioms. Each skill consists of between 2 and 10 lessons depending on the complexity of the skill being learned (see figure 6). The English course for Japanese speakers has 56 skills and a total of 298 lessons. To complete a skill, all the lessons for that skill must be completed, and to complete a lesson, users must acquire 10 experience points (XP). One XP is gained for each correctly-answered question. Therefore, to acquire 10 XP, users must answer 10 questions correctly. If an incorrect answer is given, a new question is automatically generated to give the users the chance to reach 10 XP and thus complete the lesson. Therefore, in the course of acquiring 10 XP, a user may have to answer for more than 10 questions. This example of adaptive learning is one of the features that sets Duolingo apart from traditional, paper-based language exercises (Kerr, 2015).



### Activities

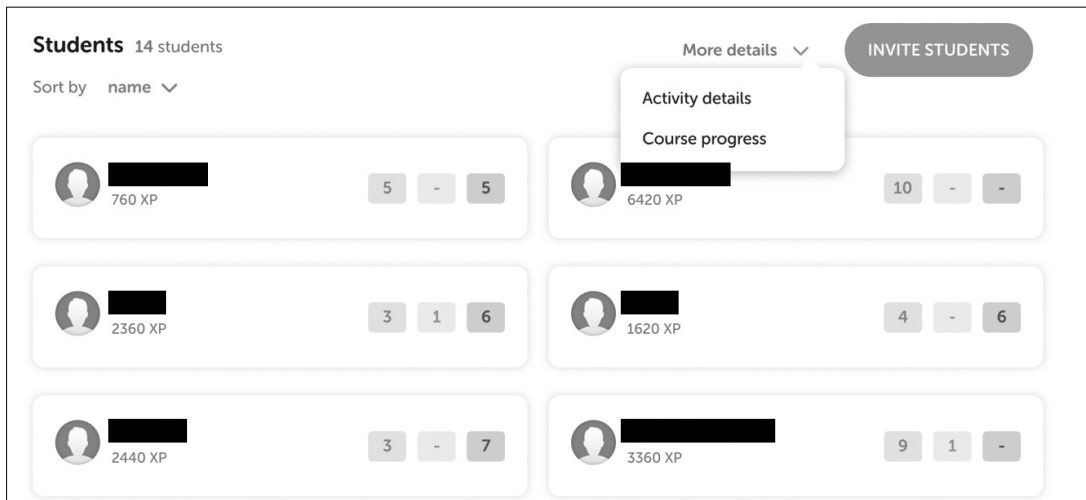
Within each lesson, the range of tasks are as follows:

- Match a spoken word with a picture.
- Write a word for a presented picture.
- Translate a sentence from the target language into your native language.
- Translate a sentence into the target language.
- Dictation (write a sentence that you hear).
- Reading out loud (voice recognition software assesses pronunciation accuracy).
- Match pairs of words.
- Put scrambled words in order.
- Matches the best sentence with a choice of three in your native language.

Each lesson will involve a variety of different activities, requiring both receptive and productive skills.

*Duolingo for Schools*

This feature, which became available in October 2015, allows a teacher to create and manage a class of students as they work through the Duolingo skill tree. There are currently over 100,000 registered teachers (Duolingo, 2018). Once the teacher has created a class, they invite their students to join. This connects the teacher with the students so that the teacher can view data relating to the work that the students are completing in their Duolingo course (see figures 7, 8, and 9). While the students are in the same class, they work independently of each other at different levels.



*Figure 7: Dashboard view of students in Duolingo for Schools. This view shows current XP and assessment completion status.*

Activity details				
Student	Days active	Lessons	Course progress	Points earned
Seminar 2018-20	51 days	140 lessons	34 skills	2440 XP
Seminar 2018-20	59 days	202 lessons	67 skills	3360 XP
Seminar 2018-20	49 days	218 lessons	39 skills	2160 XP

*Figure 8: Student activity details.*



Figure 9: Course progress class overview

It is also possible to see when students are working and how much work they complete in each study session (see figure 10).

Timestamp	Skill	Lesson	XP
Dec 2, 2018 6:22 PM	副詞	7/8	10 XP
Dec 2, 2018 6:19 PM	身の回りの物	10/10	10 XP
Dec 1, 2018 7:42 AM	副詞	6/8	10 XP
Dec 1, 2018 7:40 AM	副詞	5/8	10 XP
Nov 30, 2018 7:09 PM	家族	3/3	10 XP

Figure 10: Timestamps showing the work done by a student.

## Method

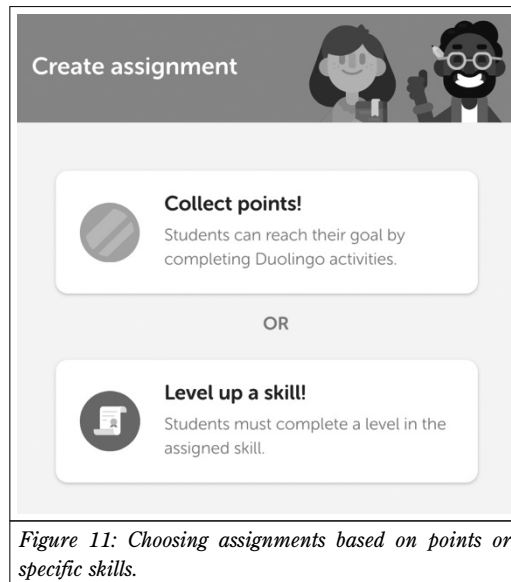
The current study was conducted in the spring semester of the third-year with 14 seminar students.

As this seminar was conducted exclusively in English, it should be acknowledged that the students who chose to take this seminar are likely to have been more motivated to study English than an average student at the university.

The students were instructed to download the Duolingo application to their smartphone and complete the short placement test. The result of this test places each student at level-appropriate stage within the course. Although many students were keen to avoid the placement test and begin the course from level 1, this would have been problematic; the students have all had at least eight years of formal English education and are far beyond the basic structures taught in the early stages of the Duolingo course. Working through these early skills would have been very time-consuming and could possibly have been de-motivating for the students.

After completing the placement test, the students registered user profiles and were invited via a link to join the class that had been created by the teacher. Once all of the students had joined the class, the homework assignments were set. The assignments in Duolingo for Schools can take two forms: specific skills to study or an amount of work to be completed (measured in XP) (see figure 11). As the current study was interested in utilizing level-appropriate work, assignments based on XP were chosen. By setting assignments based on XP, the work done by each student is weighted equally. This means that 10 correct answers by a low-level student on a low-level skill is valued equally as 10 correct answers by a high-level student on a high-level skill. Effort is what is being rewarded and this method places an emphasis on growth rather than proficiency (Ross 2005; Ho et. al. 2009).

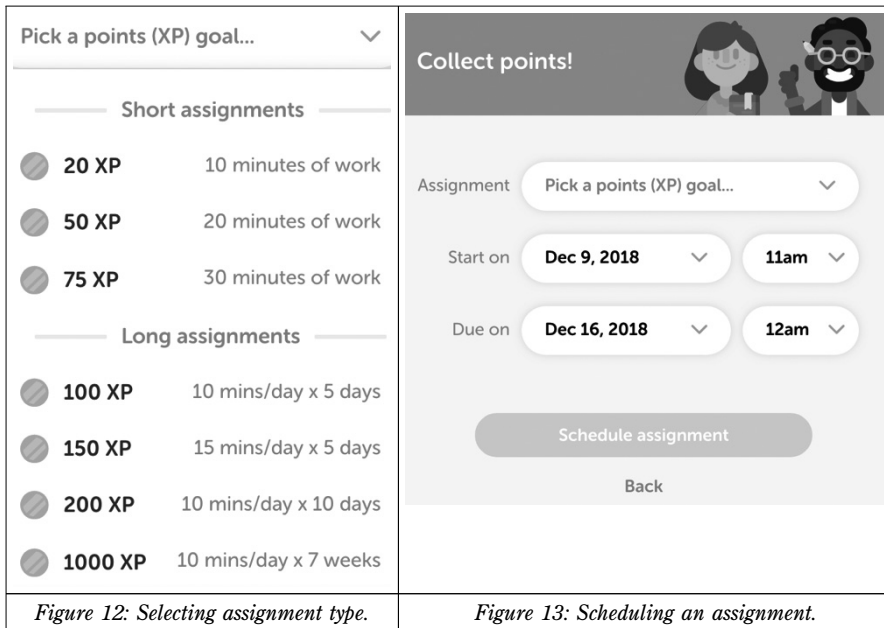




*Figure 11: Choosing assignments based on points or specific skills.*

Ten weekly assignments were scheduled to begin from the start of the semester. When creating the assignments, the teacher must select from a list of options, as shown in figure 12. The *short assignments* are for short, intensive period of study, perhaps done in class, so they were not appropriate for this current study. Only one assignment option ran multiple weeks, and only for seven weeks (1000 XP). Therefore, it was decided to create ten separate assignments, each for 100 XP, meaning each week the students would have to answer 100 questions correctly. It should be noted that all 100 XP could be earned in one session; it is not required for users to spread their work over a period of days. Ideally, students would have to study on five different days in order to satisfy the requirements of this assignment, thus helping them understand the value of short, regular study sessions over infrequent intensive study sessions.

From a teacher's standpoint, creating these assignments is very straightforward. From the class dashboard, select *assignment > new assignment* and then choose the type of assignment (point-based, or skill-based). On the following screen, select the date and time when the assignment will be set, when it must be completed by, and then click *schedule assignment* (see figure 13).



Repeating this process for each of the ten assignments means that in a matter of minutes, ten weeks of level-appropriate assignments can be created for each student. Each student receives an automatically-generated email to inform them when each assignment becomes “live” (meaning the scheduled start date of an assignment has arrived). Duolingo also sends daily study reminders in the form of application notifications, but these can be de-activated if the user finds them to be irritating or unnecessary. During the week, the teacher can log-in to check the progress that each student is making. Should some students be in danger of not completing an assignment, a reminder message can be sent by the teacher via the assignment page. The reminder message is sent only to students who have yet to complete the assignment for that week.

A useful feature is that at the end of the week Duolingo sends the teacher a summary of the work the students in the class have done. This lists the specific skills and lessons that each student has completed and the number of XP they have earned. This is an extremely convenient way to ascertain how the students are working and to identify students who might require encouragement.

**Results**

In this section I will use the data collected by Duolingo to answer the key questions I set out in the introduction.

*Q1. Would the students use Duolingo regularly?*

The assignments ran for a total of 10 weeks (70 days), and through the data collected by Duolingo, we can see how many days the students were active on the Duolingo application (see table 1).

Student	Days active	Days active %	Lessons completed	Lessons per day
1	21	30.0	96	4.6
2	69	98.6	254	3.7
3	31	44.3	124	4.0
4	13	18.6	43	3.3
5	51	72.9	140	2.7
6	52	74.3	176	3.4
7	41	58.6	199	4.9
8	27	38.6	72	2.7
9	18	25.7	154	8.6
10	69	98.6	346	5.0
11	29	41.4	119	4.1
12	35	50.0	230	6.6
13	15	21.4	142	9.5
14	21	30.0	105	5.0
<b>Average</b>	<b>35</b>	<b>50.2</b>	<b>157</b>	<b>4.9</b>
<b>Median</b>	<b>30</b>	<b>42.9</b>	<b>141</b>	<b>4.3</b>

*Table 1: Student activity.*

The average number of days active was 35, with two students being active for 69 of the 70 days. Unsurprisingly, students with a high rate of daily activity also completed the most lessons. However, students 9 and 13 had two of the lowest daily activity rates but completed the most lessons per day (8.6 and 9.5, respectively). Student 2, by contrast, was active on 69 of the 70 days but completed only 3.7 lessons per day. This shows that the students had very different study styles; some students spreading their workload across several days, while other students worked more intensely over short periods of time. By looking at the time stamps for each student, it would be possible to see exactly when students completed their work, thus enabling the teacher to see whether students have undesirable study habits, such as completing assignments at the last minute or studying in the middle of the

night; such students might benefit from guidance related to their time management skills.

In terms of days active, the students averaged 50%. This may seem low, but if a student has already completed their homework assignment for the week, it should not be surprising that their incentive to work on the remaining days of the week may be diminished.

Looking at lessons completed, we can see that while the average was 157 lessons (median 141), some students completed a very impressive number of lessons: student 10 completed 346 lessons, while students 2 and 12 completed 254 and 230 lessons, respectively. Each lesson requires 10 correct answers, so this number of lessons would mean thousands of questions answered. Also, looking at the lessons per day figures, we can see that students were completing an average of 40 or 50 questions per day, many more than could be realistically expected in a traditional paper and pencil homework format.

*Q2. Were all of the students at similar levels when they started Duolingo?*

As all students took sat the placement test, it is possible to see how they compared with each other. Figure 14 shows the placement test XP scores for each student and also the final XP scores at the end of the 10 weeks.

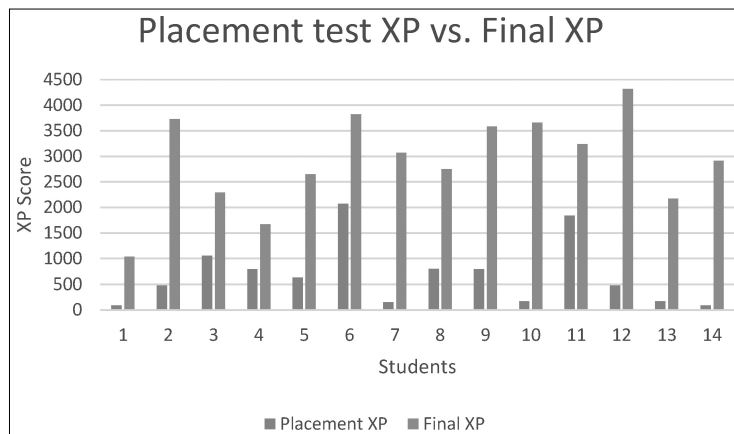


Figure 14: Placement XP scores and final XP scores

It can be seen that half of the students scored less than 500 XP on their placement test, and only 2 scored more than 1500 XP. By contrast, half of the students finished with over 3000 XP, including 4 students who had scored less than 500 XP in their placement test. Table 2 below shows this information in more detail.

Student	Placement test score	Final points	Points earned	Course progress (no. of skills)
1	90	1040	950	19
2	480	3730	3250	44
3	1060	2290	1230	23
4	790	1670	880	32
5	630	2650	2020	34
6	2070	3820	1750	56
7	150	3070	2920	38
8	800	2750	1950	47
9	790	3580	2790	38
10	170	3660	3490	50
11	1840	3240	1400	39
12	480	4320	3840	41
13	170	2171	2001	16
14	90	2910	2820	39
<b>Average</b>	<b>686</b>	<b>2922</b>	<b>2235</b>	<b>38</b>
<b>Median</b>	<b>555</b>	<b>2990</b>	<b>2010.5</b>	<b>38.5</b>

*Table 2: Placement test and final XP scores, and course progress*

Even though the Duolingo scores are not tied to formal tests, such as TOEIC, it is still possible to note that there was some considerable difference in placement test scores among the students. Such variation would suggest that the students would indeed benefit from receiving homework assignments at different ability levels, as Duolingo for Schools offers.

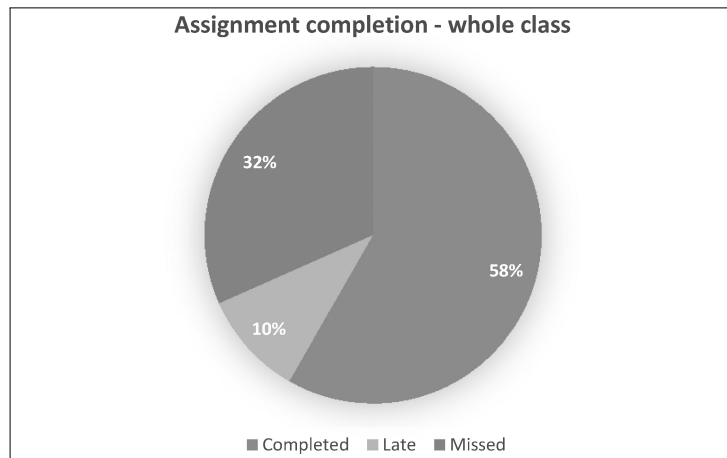
In terms of progress within the Duolingo course, one student completed the course in its entirety (student 6). This student began the course with the highest placement test result, thus joining the skill tree at a more advanced stage than other students. Students 8 and 10 also progressed considerably through the course (47 and 50 skills, respectively); interestingly, student 10 had one of the lowest placement test scores. Looking at the average points earned, we can see that students earned an average of 2235 over the 10 weeks, which is over 200 points per week. Only two students (students 1 and 3) earned less than 100 points per week.

It is important to note that the XP earned does not necessarily correspond to the course progress be-

cause students can earn XP in a variety of different ways. For example, reviewing a lesson will reward a student with between 3 and 10 XP depending on how recently the lesson was completed (more XP are awarded if the lesson was completed long ago, as the content is likely to be less fresh in the memory of the student). Students can also earn XP for level tests and for answering a certain number of questions correctly in a row.

*Q3. Would the students complete the homework assignments?*

Looking at the assignments, we can see a high rate of completion. In Duolingo, assignments can be marked as completed, missed or 'late', which means that they are completed after the deadline, but before the next assignment has been assigned. In hindsight, there should not have been any gap between assignments (i.e. as soon as the deadline for one assignment passed, the next assignment should have been available). Of the 140 assignments (10 assignments for each of the 14 students) we can see that 82 assignments were completed on time, 14 were late and 44 were missed.



*Figure 15: Assignment completion (class) (82 completed, 14 late, 44 missed).*

If we look at assignment completion at an individual level, we can account for most of the missed assignments with just a small number of students.

Student	Completed	Late	Missed	Completed + late
1	5	0	5	5
2	10	0	0	10
3	3	1	6	4
4	4	0	6	4
5	3	0	7	3
6	9	1	0	10
7	9	1	0	10
8	2	5	3	7
9	5	1	4	6
10	10	0	0	10
11	2	2	5	4
12	7	1	2	8
13	8	2	0	10
14	4	0	6	4

*Table 3: Assignment completion (individual students).*

We can see that six of the students (students 1, 3, 4, 5, 11, and 14) accounted for 35 of the 44 missed assignments (five per student), while the other eight students accounted for only nine late assignments (a little over than one per student).

#### *Q4. Did the students enjoy using Duolingo?*

A short questionnaire was conducted using Google Forms to receive feedback from the students regarding their user experience. All of the students felt that Duolingo helped to develop their reading, vocabulary and grammar, but there was less consensus regarding development of writing, speaking, and listening skills, with only a few students selecting these choices in the questionnaire. For most students (eight), this was the first time that they had used their smartphone to study English. All of the students said that they would recommend Duolingo to a friend and 13 of the 14 students believed that it helped to increase their motivation to study English.

Students were attracted to the convenience of Duolingo, citing that they could do the work quickly, anytime, anywhere, as all they needed was their smartphone (they did not need to find a desk to work at or a textbook to study from). We can conclude that this convenience demonstrates the re-

duced friction that students had to overcome in order to complete their work. This means that the possibility of actually completing the work increases; this concept of friction is fundamental in the development of a sustainable habit (Duhigg, 2013). The most common answer for when students completed their Duolingo assignments were on the train and before going to bed.

Some students said that they enjoyed the gamification elements of Duolingo and that they could gain a sense of where they were within the course as a whole via the skill tree. They found it motivating to know that they had completed a certain amount of the course and that they had to keep working in order to unlock other the upcoming skills and lessons.

There were few negative comments, but some students felt that the activities were too simple at times and that the sentences used in lessons were too short. The latter issue is possibly due to the fact that the sentences had to be displayed on a relatively small smartphone screen.

### **Limitations**

As this was the first time I had formally run a Duolingo class with a class of students, I chose not to include it as part of their course assessment. One might imagine that the assessment completion rate would have been significantly higher were their grades depending on it.

### **Discussion**

It seems that the students were happy to use Duolingo and spent considerable time doing so. With this in mind, it is even more impressive that the students had such positive feedback on the platform and that they would recommend it to their friends. The considerable variation in placement test results would suggest that allowing students to work at their own level is something that should be considered. Providing students with activities which challenge each of them equally is highly desirable, but difficult to provide [Hp4][ $\approx$  5]using traditional language learning materials.

The fact that only one student completed the course suggests that there is sufficient material for most students to work with, at least over the course of one semester. The question then becomes, how should Duolingo be integrated into an English programme? While Duolingo could not replace a course in its entirety, the questionnaire feedback from the students would suggest that Duolingo was effective in consolidating reading, grammar and vocabulary, which are core skills for all English language students. Integrating Duolingo with face-to-face lessons would produce a type of blended



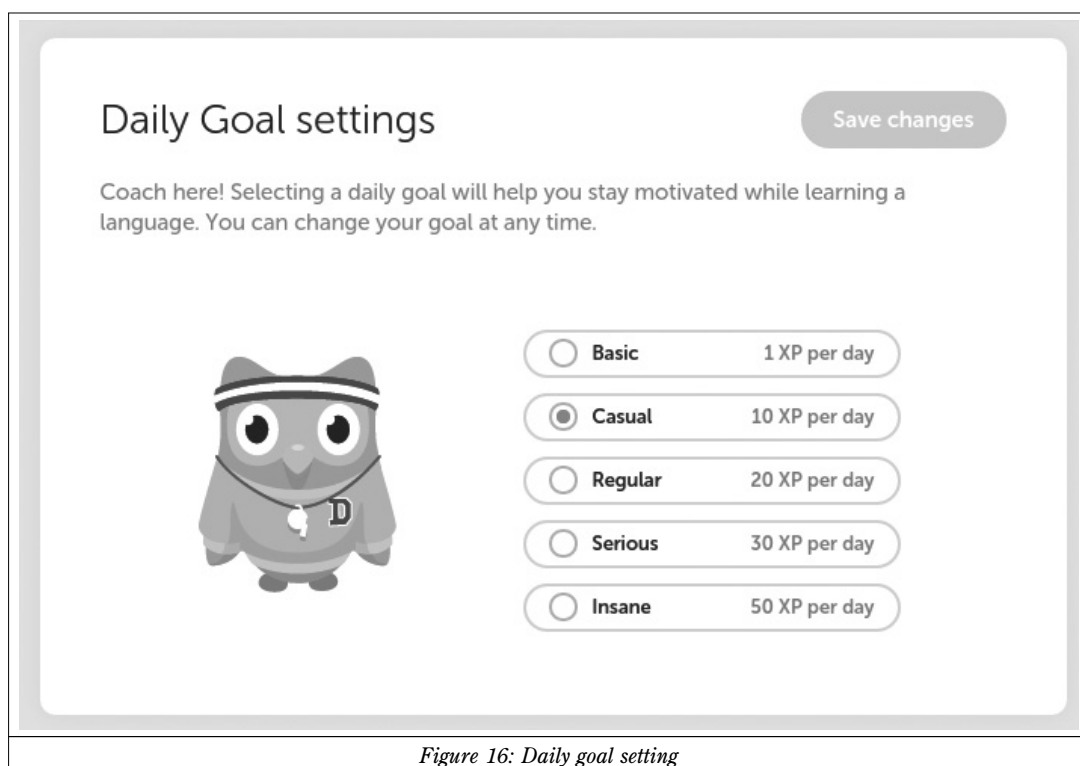
learning experience. Alternative options could be to use Duolingo as a warm-up at the start of class for five minutes, as a reward at the end of class, or as homework over a long vacation period in order to keep students engaged with English.

It is also useful for students to realise at an early stage of university that language study is not exclusively textbook-based, and that there are modern, creatively-designed online tools that they can be used to develop and consolidate their language skills. With this in mind, integrating Duolingo into first year compulsory classes could be a useful way to fill any gaps in language knowledge for lower-level students, particularly as these topics are unlikely to be covered in university classes, which often assume previous knowledge learned in high school. This work, if completed in the first semester of the first year, could prepare students well for their studies in their second year and beyond.

From a teacher's standpoint, Duolingo for Schools frees up considerable time and provides a low-maintenance solution for out-of-class study. The ability to see what and how students are studying is also very powerful, especially the ability to send timely reminders to students who need them. For students, Duolingo seems to be fun and attractively-designed. The gamification features appeal to students who have grown up playing video games and who understand the need to keep working in order to proceed to the next stage of the "game".

Possible concerns for teachers relate to whether such consistent study behaviour would actually transfer beyond the Duolingo application. It is not clear whether the students truly understand that a small amount of regular study can lead to considerable long-term language gains; simply, they may have felt that application was cute and fun to use.

Future research using Duolingo for Schools would aim to ascertain whether Duolingo could result in significant language skill development. For this, an external language test, such as TOEIC, would be required for pre-and post-tests. It would also be interesting to see what language study goals students chose for themselves, rather than having the teacher set the target study level. Allowing students to choose their own daily goal might result in the students being more invested in their performance and result in them working harder (see figure 16).



A final feature of Duolingo that could lead to some interesting results is the ability for students to create small study groups called “clubs”. These allow students to see how other members of the group are working and adds an element of competition. Comparing students studying as part of a club with a control group of students working alone could provide some insight into the importance of peers in motivation to study.

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