Duolingo as an "Aid" to Second-language Learning
An Individual Case Study

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In this paper, the author (DRB) details and examines his use of the language-learning program Duolingo and discusses both the concerns and the merits of using the platform for second language learning, not only for self-study but also, and perhaps more appropriately, in the context of a more "traditional" approach.

While the standard academic paper normally begins with the review of the literature followed by a study, here we will often see an intermixing of observations of others along with those of the author. There was no survey conducted, and the author himself acts as the subject for this individual case study. Because anecdotal evidence can frequently perceived to be somewhat unreliable, DRB tried to, as much as possible, compare and back up his own experience and observations with that of others.

INTRODUCTION

When an international student wants to apply to an English-speaking university, they will often take either the TOEFL exam or its more recently-developed Commonwealth competitor, the IELTS. Not too long ago, however, the author found it interesting to see on a page (Jackson College) directed at prospective international students, that a college in Michigan lists not only those two exams, but also a third possibility--the Duolingo English Test--as as a way to evaluate and certify proficiency for non-native English speakers.

What is Duolingo?

Duolingo itself is a language-learning platform--accessible both as a website and as an Android or iOS app--which was launched for general public use just over four years ago, in June, 2012. It can be considered to fall under the category of Mobile-Assisted Language Learning (MALL), which itself can be categorized as a branch of ICT called M- (or Mobile) Learning.

According to a webpage (Educause) of a "nonprofit association and the foremost community of IT leaders and professionals committed to advancing higher education", M-learning entails the use of portable, or personal, computing devices (including tablets, laptops, tablet PCs, PDAs, and smartphones) in the learning process. Through their connectivity via wireless networks, this enables both mobility and mobile learning, and, in so doing, it permits teaching and learning to go beyond the traditional classroom. In the classroom itself, "mobile learning gives instructors and learners increased flexibility and new opportunities for interaction."

Duolingo, being accessible on so many mobile formats, offers a very clear example of M-learning.

A TYPICAL DUOLINGO COURSE

Learning activities encountered in a Duolingo course

Munday (2016) furnishes an excellent description of the activities for the Spanish course a Duolingo user will encounter when using the app or website. In (1), we can see a breakdown of the activities (slightly modified and with comments here) found in a typical Duolingo lesson.

(1)

1. Write (DRB: *input*) a vocabulary item after seeing a picture that represents it. (DRB: *along with the corresponding article, depending on the language you are learning*)
2. Translate a sentence into your native language. For vocabulary items which are being presented for the first time (DRB: *not always just the first time*), the user can hover over with the mouse or tap on the word to see its meaning.
3. Translate a sentence into the language being studied.
4. Write (DRB: *Input*) a sentence that you hear in the second language. Depending on the language, the sentence in the target language can be heard in two speeds--normal and slow. (DRB: *The Esperanto course only allows normal speed option. Perhaps it is considered to be easier to understand, and so the slow speed is not needed.*)
5. Pronounce a sentence. Through voice recognition software, the app will tell you whether your pronunciation is correct. (DRB: *you get three tries*)
6. Match pairs of words.
7. Put a series of scrambled words in order to produce a sentence (DRB: *or occasionally a couple of sentences*).
8. Choose from three items (DRB: *or expressions*) in the target language to see which ones fit the item in the base language.

It must be pointed out here that these activities essentially jibe with what DRB has experienced, but, especially with the A/B testing Duolingo conducts, activities can and do change over time. This extensive A/B testing (Duolingo1) allows the platform to continually fine-tune the features by dividing the users into two groups and then providing the groups slightly different versions.

Course structure

A Duolingo course consists of a "tree" for that language which has different levels, and each level has a number of skills. The skills themselves consist of varying numbers of

lessons. The number of levels, skills, and lessons appear to differ from language to language. For example, according to Munday, the Spanish tree contains 66 skills for a total of 329 lessons. The figure she gives for the total number of vocabulary items is 1571 words. (The vocabulary list DRB came up with for his Spanish course contained 2973 items--or nearly double that Munday's calculation--but the list included variants (plurals, conjugations, etc.) of the same vocabulary items, and the lower figure should present a more accurate representation.

EFFECTIVENESS AND DUOLINGO

Fluency: Will Duolingo make you fluent?

With a fairly recent "upgrade" to the platform, Duolingo has begun providing, for some users, an estimate of their fluency in the language they're learning. According to a post (Duolingo2) in 2015 explaining this addition, the fluency level was available to one half of the A/B test population and only for Spanish, German, French, Portuguese, Italian, and English. The author, for example, is occasionally treated to fluency evaluations for Spanish (including that for Russian speakers), but not for Russian, Polish, or Esperanto.

In principle, the fluency level should increase over time as the user learns more words and strengthens their skill, and conversely it should decrease if they do not keep up their "strength" through continued practice. The Duolingo team warns that just finishing a language tree will not give a level of 100%. Later on, we will see more on whether it is actually possible to achieve a 100% fluency level based on the Duolingo standards. As of yet, after more than two years of everyday use, the author seems to be constantly hovering between 47% and 50%. On a personal note, it would be nice, and encouraging, to find out concrete ways to bring this level up even further.

A major concern about this fluency level is just what is meant by fluency. According to the dictionary on the author's iMac computer (OS X 10.11), fluency is "the ability to speak or write a foreign language easily and accurately." This is a communicative definition, and, while learning vocabulary items and acquiring the ability to understand, parse, and translate individual sentences is, of course, important, this does not mean that a person will be communicatively fluent in the language.

According to some posters on one question-and-answer blog site (Quora1), Duolingo is not designed in such a way as to allow a person to achieve fluency in a second language. For one thing, it will not start a person thinking in another language, and for another, it does not train one how to respond. One example given (slightly modified here), was that a Duolingo user might learn how to say:

(2a) *Hola. ¿Cómo estás?*

"Hi. How are you doing?"

but not how to answer with something along the lines of:

(2b) *Estoy bien/mal/así-así. ¿Y tú? ¿Que tal?*

"I'm [fine/not good/so so]. And you? How are you?"

In other words, Duolingo appears to be constraining learning to the same sentence-level units that some linguistic theories ascribe to, ignoring the fact that communication often goes beyond the individual sentence level. Discourse-level communication ability is essential for fluency.

The author himself felt this acutely when he attempted to talk Spanish with a friend of his sister's on Skype who was a native speaker of Spanish. He had hoped that having completed the Spanish language tree and achieved a 50% fluency level in Duolingo would have enabled him to carry on a very simple conversation. Alas! This did not turn out to be the case. The conversation was very one-sided; he understood a lot of what was being said by the native speaker, but found it almost impossible to string two sentences together.

Another poster to the thread points out that, used exclusively, Duolingo is not sufficient to teach a person the language. It must be complemented with other means of learning, especially with regard to speaking. Methods for doing this include finding ways to talk with native speakers using something like Skype, exchanging letters with pen pals, getting books to read, and listening to the language in shows, podcasts, audiobooks, and on the radio and TV. One could also add news and movies here. In any case, this poster, along with many other people, including authors of academic papers, stress the need to use Duolingo in conjunction with other material.

Duolingo's measure of fluency

As mentioned above, Duolingo itself has fairly recently taken to providing fluency badges to its users, or at least to some of them. On one of its discussion pages (Duolingo

Help Center), Duolingo explains that these badges are estimates of the user's fluency in the language they are learning and that the calculation is based upon what words are known, how important the words are, how well they are known, and how likely they are to be forgotten.

They go on to explain that the fluency rating reflects a measure of the leaner's "mastery of the vocabulary and grammar of a language" and their "ability to understand and produce the language". The program estimates fluency based on progress through the skill tree and the accuracy of the answers. Another important factor is how regularly the learner practices. According to these metrics, a user "can achieve a fluency as high as 50-60%, which is equivalent to 'Advanced Proficiency'".

Fluency versus level

Duolingo also assigns levels to its users, and learners often confuse this level with fluency or proficiency. However, a user's level in a language is solely based on how many XPs (a kind of a credit point system) they have earned in that language, which means it essentially only reflects how much time the learner has put into the language and not necessarily how well they know the language.

As one commenter somewhat flippantly points out (Duolingo3), a user could conceivably be on Level 25 (the highest level) and only know three words of the language. A bit of an exaggeration--because to get XPs, one has to complete lessons, which would require knowledge of a tad more than three vocabulary items--but a person could conceivably repeat the same lesson over and over again and accumulate the necessary number of points. In other words, it only gives a person an idea of their cumulative mastery of a particular DuoLingo course and not their overall grasp of the language (in other words, proficiency). One must wonder about the value of the "Level" metric.

Using accumulated XPs, it is also possible to take proficiency tests through the Lingot Store on Duolingo--the author has taken these tests both for Spanish and Polish and received a 5 (the highest grade) in each--but the tests unfortunately will not tell you what portions you got wrong, just the proficiency level you have obtained.

Duolingo and real-life language use

The author personally feels that the learning environment should dovetail as much as possible what a second language learner will encounter when they actually attempt to use the language. Naturally, this varies according to the learner's goals. For the author, the original

impetus for taking Russian classes was to be able to read and understand to some extent academic papers written in Russian about physics, which was his major at the time. However, many second language learners are looking for communicative competence: in essence, the ability to carry on a conversation or conduct written correspondence.

The ability to translate what you hear or read into your first language--in other words, the ability to understand--is, of course, not only important, but also essential. However, communication is a two-way street; you also need production.

If you look at the Duolingo activities listed in (1) more closely, you will see that a vast majority of them entail translation in one direction or the other. Duolingo is in many senses a modern, gamified version of the tried and tested grammar-translation method for second language acquisition, but without the systematic grammar explanation seen in that approach. Naturally, translation plays an important part in learning a second language, particularly in the early stages, but there is much more to communication, whether in oral or written form. As such, the exercises in Duolingo do not always (and, in fact, seldom) emulate real-life language situations.

In particular, Items 1, 6, 7, and 8 in (1) seem to quite divorced from normal communication. For Item 1, if you are asked which picture (and word) means "horse", you can choose the picture showing the horse without worrying so much whether the word *caballo* (in Spanish) under it actually means "horse". You do not even have to look at the word; the picture gives it away.

The matching pairs exercise described in Item 6 also seems not to emulate any real-life communication activity. It is fairly easy to guess from the limited number of items which target item pairs with that of the base language. It is hard to imagine trying to talk with someone in a Spanish-speaking country by choosing cards with the vocabulary items you want to use, especially with only five or six pairs to choose from at a time. It must be noted that some users with accessibility issues find the choosing of items (by tapping) much more user-friendly than having to type in answers. However, not all users have issues with typing, and, in any case, using voice recognition could obviate this difficulty.

Item 7--in which scrambled vocabulary items are to be ordered to make an acceptable translation of a sentence in the base language--is the kind of exercise seen in many textbooks and on many tests (at least in the author's experience in Japan). While the beginning learner of a foreign language may actually be, in their mind, trying to consciously choose and order

vocabulary items they know in order to make a coherent sentence, this will only get a person so far. Also, occasionally (or perhaps more often than that), more than one order or choice of vocabulary items will not only have the meaning required, but also be perfectly acceptable in the second language. DRB has run into this situation a number of times in the Polish lessons.

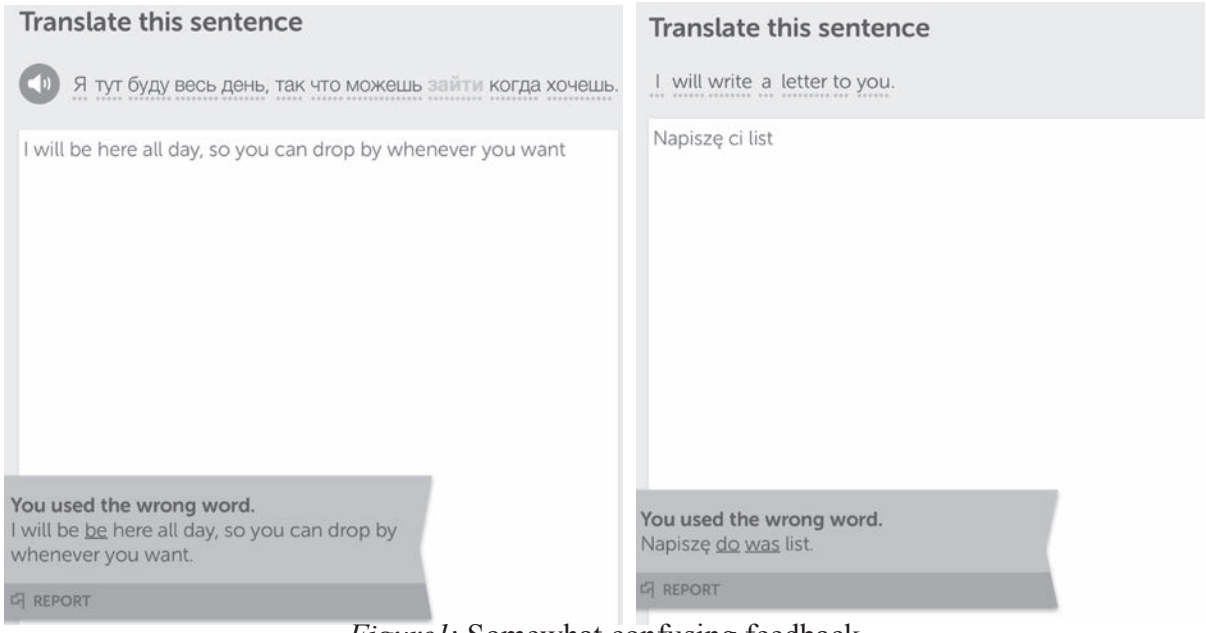

Figure1: Somewhat confusing feedback

Figure 1 shows feedback from Russian and Polish, respectively. Notice that, for the former, Duolingo says that either the user has used "be" twice in a row in *I will **be be** here* (which he has not), or that he should (which he should not.) For the Polish, on the other hand, DRB's *Napiszę ci list*. was not accepted as a translation of *I will write a letter to you*. An Internet search (with Google in this case), however gives "about 1,810 results" for this phrase (in quotes) compared to "about 408 results" for the *Napiszę do was list* "correct" answer supplied by Duolingo. Fortunately, the user can click on the "Report" button to contact those administering the course about their concern, thus taking part in the crowdsourcing aspect of Duolingo.

The last activity--that described in Item 3--where the user chooses one or more of three items in the target language match the same meaning in the base language, is actually quite similar to the matching exercise discussed in Item 6. It is interesting that this exercise seems to differ from language to language. For example, there tend to be many more cases of multiple correct answers in the Polish course than in the equivalent Spanish, Russian, and Esperanto exercises.

In accordance with his goal of communicative proficiency, DRB tries to use the built-in voice recognition function of the OS as much as possible for inputing answers. Speaking is more basic--and in most cases more natural--than typing, and, while Duolingo does occasionally throw a pronunciation exercise at the learner, DRB has found that its accuracy can be very sketchy at times. For example, there have been many instances of when his pronunciation has been completely off (even to the extent of having a whole word dropped), but where Duolingo accepts the input as correct.

The iOS voice recognition tends to be a bit stricter about pronunciation as a rule. Of course, the software will try to guess/correct your input by looking at the context, but that is what a native listener would try to do in a real-life situation anyway. While it might not lead to perfect native-like pronunciation, use of the voice recognition function forces a person to try and make themselves understood, which is what the production side of communication is all about. One problem occasionally encountered with the voice recognition occurs with numbers, times, and dates, because the function more often than not will give the numerical equivalents rather than the words spelled out. In such cases, it is best to just type in the words. Also, iOS unfortunately has no native keyboard for Esperanto, and so dictation in the target language is not possible, at least not right out of the box. There is a third-party keyboard, but the author has hesitated to install it and, therefore, can not attest to whether it allows voice recognition in the same way the native keyboards do.

Unfortunately, using the voice recognition function included in Mac OS (OS X) is less convenient. You have to click the function key twice to start it up, and then you have to switch languages as necessary. A great thing about Duolingo on iOS is that the keyboard automatically switches to the language that is to be inputed, which means that the voice recognition also makes the switch automatically. No doubt the Android version is the same. MS Windows may be similar to OS X by requiring user-instigated switching of the keyboard, but the author has never tried Duolingo on it.

Browser versus App (progress reporting)

As noted above, DRB enjoys using the app in iOS because of the adaptivity in keyboard changes for inputting text. However, one problem with the app is that it has become increasingly difficult to keep track of one's daily progress in the app when doing multiple languages. DRB is currently taking part in five courses simultaneously, and there

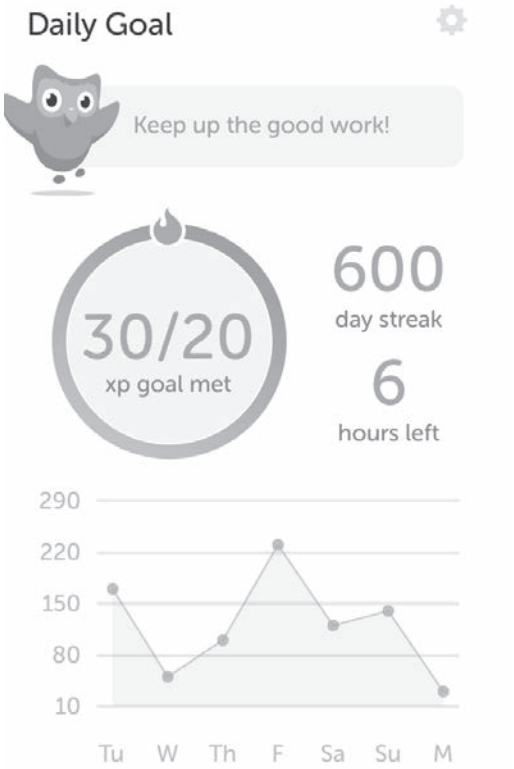

Figure2: Progress in Browser

does not seem to be an obvious way to tell how many daily lessons--measured in XP's--have been completed for each language. This is strange because Duolingo sends e-mail messages if you have not completed the daily allotment for individual languages, which indicates that the platform is keeping track of this progress somewhere.

Figure 2 and Figure 3 show sample screenshots of the daily progress reports available to the learner on the web and in the iOS app, respectively. The former tells the XP points achieved daily for the past week, but not how many points are achieved for any one particular language, leaving the user to guess which 10-point blocks are from which language when working with multiple languages.

DRB has set a modest goal of two lessons a day, but tries to do three for each language when he has time. Therefore, ideally he should have 150 points per day. Figure 2 indicates that, when the screenshot was taken, he had completed three lessons (and incidentally completed a 600-day streak) so far that day. It does not, however, show what language the points are from, which means they could easily be one lesson each from three different languages. With a 150-point total, unless you have somehow kept close track of the lessons while doing them, you can only hope that the 150-point total results from completing three lessons (30 XPs) in each of the five languages.

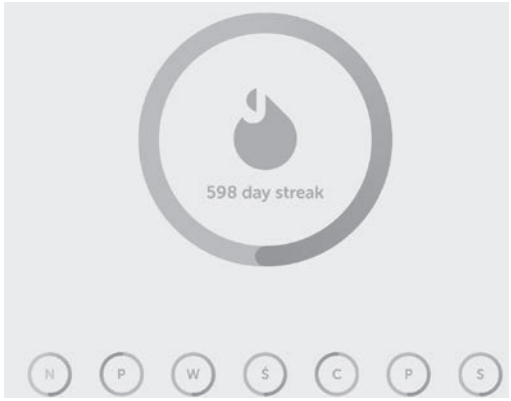

Figure3: iOS Progress Report

The iOS app used to provide a similar progress report, but has recently switched to the kind of "report" seen in Figure 3. For the longest time, DRB had no idea of what the letters in the circles meant, until he figured out that, because his iPad language was set to Polish, the letters are the first letters of the days of the week in Polish. The circles are

divided into two, no doubt representing the two-lesson per day goal. When one lesson has been completed, the right half is darkened, while completing the second lesson will have the left half darkened. When you go beyond two, this repeats, and it appears that you can only see whether you have completed an even or odd number of lessons that day.

This is particularly unenlightening and detracts from the gamification aspect of the platform. The web representation is much better in that respect, but it would still be nice to be able to quickly see what point blocks are from what languages.

Using Duolingo in conjunction with a traditional classroom situation

In their study, García & Fombona (2015) conclude that ICT and especially Mobile-Assisted Language Learning (MALL) applications present materials in "playful and friendly ways" for the users, but that the teachers should not rely solely on such technology, and instead use it to complement traditional methodologies. For example, the activities can be used to help develop reading and listening abilities.

Munday's work (2016), mentioned earlier, provides an excellent study on how to use Duolingo as a "part" of the language classroom. She endeavors to determine whether adding Duolingo to a Spanish course could improve the course and also whether it would furnish students with a new tool to continue using once they have competed the course Her survey results found that students appeared "to find Duolingo an easy-to-use, helpful, and enjoyable app" for practicing Spanish. They also enjoyed it more than typical book-based homework because it could be accessed through a variety of formats, most notably through mobile access. The gamification aspect of the platform also turned out to be a big plus with the students. She points out that, according to studies such as Brown, Roediger, and McDaniel (2014), such methods, in conjunction with spaced repetition, can make learning more efficient.

There were, however, some drawbacks to Duolingo which were also noticed by students. One major problem involves the accuracy of its translations. These may not always be exact, and the platforms often does not accept other versions which would also be acceptable to native speakers (see DRB's personal experience note above). Fortunately, however, the browser app, in particular, permits the user to discuss their answer with other learners. Ideally, the moderators of the course will make adjustments accordingly.

Munday feels that Duolingo can ultimately provide a worthwhile addition to a language course, whether online or face-to-face, because it allows students to review the language at their own level. She concludes that it should not represent more than 15% of any course grade and feels that it is more geared towards beginners. She also recommends that students conduct their learning by doing a number of XP per week, and spread it out over several days, allowing them more frequent contact with the language. Instructors are now able to monitor this easily through the recently-added instructor's dashboard feature. As already noted above, this type of M-learning allows students to augment the classroom learning by providing flexible learning that can enrich the classroom experience.

As an interesting side note, the instructor observed that about 10% of students in both of the study groups continued using Duolingo after the semester ended. This means that 90% did not, which is perhaps not so encouraging.

Krashen (2014) points out in his discussion of the Duolingo-sponsored Vesselinov and Grego study (2012)--in which they equated 34 hours of Duolingo to a university language course--that language learning is different from language acquisition. Kashen notes that Duolingo involves conscious learning, which, according to evidence he points to, does not lead to language competence. In his opinion, acquisition-oriented methods that use subconscious learning are superior to skill-based methods such as those seen in Duolingo.

Positive aspects of Duolingo

The discussion so far in the previous section paints what some might consider to be a somewhat bleak picture of Duolingo, but the platform has many things going for it. In another on-line thread (Quora2), a poster pointed out that, while Duolingo might not in itself make a person fluent or conversant in a second language, it does have strengths. First of all, the gamification makes it interesting and encourages learners to continue. It can become, as DRB found out himself, quite addictive (as is evidenced by the 600-day streak shown in Figure 2).

In addition, it follows a traditional syllabus, allowing it to be used to "review, reinforce or support" (Quora2) learning in traditional courses or using traditional materials. It includes a reasonable number of high-frequency vocabulary items. Duolingo evaluates a learner's vocabulary knowledge by means of a spaced-forgetting, or "spaced repetition", algorithm, through which the user's “word strength” will deteriorate over time if they do not

review items at intervals determined by the algorithm. Therefore, the skill ratings more accurately reflect reality. A person can not normally expect to just master a language skill once and then be able to remember it years later without any reinforcement.

The skill (or learning) tree in a Duolingo language course organizes the lessons in manner resembling the self-contained teaching (knowledge) paths seen in other learning platforms. Lower levels along the tree have to be completed before higher levels can be accessed. Unfortunately--in DRB's experience--Duolingo seems to be exhibiting less of this gamification as time goes on. When he first started the Spanish course, making a certain number of mistakes during a lesson would cause the learner/player to lose all their "hearts" and require them to start the lesson over again. There was also a bonus point given for lessons completed with no mistakes. Such incentives serve to keep the learner on their toes, and it is to hoped that they will be reintroduced in the future.

Duolingo also allows practice in all the skills at least to some extent, and it is not limited to basics and travel phrases. It provides important repetition/reinforcement, especially for a learner who is not in a traditional or immersion learning setting. It also forces output, and perhaps, most importantly, gives a high level of negative feedback. The "negative" portion of "negative feedback" comes across as, for lack of a better expression, "negative", but language learners need to receive information about errors they make when producing or processing the target language. The feedback Duolingo delivers is both timely and tailored to the learner, something difficult to provide in a traditional classroom setting.

FINAL OBSERVATIONS

The author intends to continue using Duolingo for the foreseeable future. While there are some drawbacks and a tendency toward plateauing, the platform can, on the whole, be a very useful tool depending on a person's goals and level in the language.

With the Spanish course, for example, DRB has reached a plateau. He began this course with nearly zero knowledge of the language and high hopes for using it gain some communicative ability. However, as noted above, he still can not carry on even a simple conversation. For him, some other sort of contact with the language is needed for this communicative ability to be achieved. The vocabulary "mastered", and which is being constantly reinforced, will no doubt prove to be very useful at that time. In fact, DRB has found that he can "read" a simple news article (mainly from BBC Mundo) in Spanish and

understand much of the gist. Unfortunately, with regard to conversational Spanish, there is not much opportunity for talking with native speakers in the town in Japan where he lives, but no doubt there is some way to arrange for conversations/lessons online. Also, podcasts can provide listening comprehension practice.

Polish presents an example of the other extreme. The author at one time was fairly competent in the language and finds Duolingo to be a great way to recover and reinforce his knowledge, which is quite important because he has been worried for some time now about the degradation in his ability through a long period of disuse. The lessons provide a great method for refreshing vocabulary, and using the dictation function in iOS to input answers keeps him on his toes in a language that is famous for being difficult to pronounce.

Russian and Esperanto fall in another category. They are both research languages for the author, and while he would at some point like to learn how to actually communicate--especially in the former--for the nonce, Duolingo is at least providing some useful exposure to these two languages. And Esperanto, with its regularity and simplified rules, provides a great stepping stone for learning "natural" second languages, which is why the author is presently using it in the research class he is conducting with high school students. The Instructor's Dashboard for Esperanto has been giving more detailed and organized feedback on grammar and vocabulary, and the author wishes he could create a course in Spanish for himself in which he could be both instructor and student in order to get the same feedback.

In conclusion, therefore, although Duolingo should not be considered to be an all-in-one or end-all language-learning tool, it does seem to shine through in two cases. For the beginner it constitutes an excellent means for introducing and reinforcing vocabulary and simple sentence structure, and for providing fundamental practice in the four skills. For someone already competent in the language, on the other hand, it can be used as a maintenance tool for keeping up with the language when contact would otherwise be limited.

At present, Duolingo is free for users, and it is hoped that its monetization model of providing certification exams and crowd-sourced translation will allow it to keep going, for it is very useful second-language tool.

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