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A NETNOGRAPHIC ANALYSIS
OF HOW DUOLINGO SUPPORTS
GERMAN AND SPANISH LEARNING NEEDS

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Abstract: *Duolingo is a gamified language learning app that improves users' language acquisition and learning through game mechanics built into the curriculum. This research examined Spanish and German Duolingo discussion boards to assess how learners' needs evolve as they progress from unit to unit throughout the course (beginning, intermediate, and advanced levels). This study used netnography to analyze 144 subunits in Duolingo German and 159 subunits in Duolingo Spanish. Based on the findings, non-native Duolingo Spanish users had the benefit of being immersed in discussions that included many native-speaking Duolingo Spanish users, which increased the accuracy of answers and cultural immersion in the language. These findings indicate that users on the Spanish discussion boards may be more open to tolerating ambiguity and uncertainty, which is important for learning a second language and intercultural competency. This research shows that having a culturally competent and knowledgeable user base significantly improves the emotional climate of the discussion boards, which may allow the users to more fully absorb the content and interact with other users with increased intercultural competence.*

Keywords: *Online language learning, discussion boards, digital education*

Introduction

Duolingo is a gamified language learning app designed to advance users' language acquisition and learning through game mechanics built into the curriculum (Shortt et al., 2021). After the start of the COVID-19 pandemic, Blanco (2020) reported that there were approximately 500 million Duolingo users in 194 countries. In addition, there are 142 million Duolingo Spanish users on the application (Curry, 2021), while almost 9 million people use Duolingo German (Duolingo, 2021).

This study focused on learners' acquisition of Spanish and German as foreign languages through the Duolingo learning app. Spanish is spoken by 559 million people around the globe, with 460 million native speakers (Thompson, 2021). The Spanish language holds the second largest number of native speakers globally. By 2050, one in every three people will speak Spanish in the United States, although the United States already holds the second largest population of Spanish speakers apart from Mexico (Thompson, 2021). Another language of interest to the current study was German, which has an estimated 130 million native speakers worldwide. German is the official language of four countries within the European Union, including Germany, Belgium, Austria, and Luxembourg. Switzerland and Liechtenstein also list German as an official language. Seven and a half million people speak German as a language minority in 42 countries worldwide (Thiele, 2020). In the United States, 45 million people are of German heritage, with 1.4 million German language speakers among them.

This research examined Spanish and German Duolingo discussion boards to assess how learners' needs evolve as they progress from unit to unit throughout the course (beginning, intermediate, and advanced levels). Currently, Duolingo is based on scaffolding theory, which allows learners to advance to more difficult levels after they achieve competency at simple levels (Wood et al., 2007). According to Yakaeva et al. (2017), scaffolding is one of Duolingo's strengths because it may help learners achieve their language goals in areas such as enunciation of speech, proficiency in common words and phrases, and echoing.

The theoretical frameworks used in this study included Vygotsky's (1978) sociocultural theory and Deardorff's (2006) pyramid model of intercultural competence, both of which are useful for researching second language acquisition in relation to cultural and social interactions, especially in the context of the discussion boards. One of Duolingo's learning tools is asynchronous discussion boards, which provide users an avenue to share their knowledge, questions, and concerns with other language learners in an online interactive environment (Neuschafer, 2021). According to Vygotsky's (1978) sociocultural theory, cultural and social interactions play a large role in shaping the mental capabilities required for language acquisition and learning. Deardorff's (2006) intercultural competence model posits that real-life contexts and culture should be incorporated into second language learning programs to give students access to authentic cultural experiences, reinforcing the more technical aspects of studying a new language. Gay's (2000) four domains of culturally responsive teaching include (a) caring, (b) communication, (c) curriculum, and (d) instruction. In Lawrence's (2020) study on culturally responsive online pedagogy, communication and caring were highlighted as the major online domains. In an intercultural learning model, Duolingo discussion boards may portray each learner's diverse and evolving learning needs within a culturally responsive environment.

These theoretical models can help educators and researchers understand the dynamics of Duolingo discussion boards, where users seek to connect with other learners, often to clarify questions or concerns not emphasized in the Duolingo courses (Shortt et al., 2021). This research used a theoretical framework that focused on the social and cultural elements of learning to examine Duolingo's Spanish and German programs, thereby building upon previous research about its discussion boards and the language learning needs of its users (Neuschafer, 2021) to illustrate how

learners' needs progress throughout the course. One important aspect to mention is the nature of Duolingo and its discussion boards. Duolingo will periodically remove discussion boards for various reasons, such as no new discussions being added or the posting being deemed outdated. Except in specific limited circumstances, many of the discussion boards used for analysis in this study are no longer publicly available.

The current study aimed to examine the similarities and differences between evolving learning needs of Duolingo German and Spanish users as gleaned through discussion boards. Specifically, this study asked, "What are the similarities and differences between evolving learning needs of Duolingo German and Spanish users as gleaned through discussion boards?" In answering this question, this research may inform language learning stakeholders about the evolving learning needs of Duolingo users in relation to the app. Additionally, this research helps address the gaps in the literature pertaining to structural and educational tools such as Duolingo that may complement language learning programs and better prepare educators to track the learning outcomes of users themselves.

Methodology

The purpose of this qualitative netnography study was to examine similarities and differences between evolving learning needs as expressed on Duolingo's German and Spanish discussion boards. Discussion boards are the data analyzed in this study in order to understand how ongoing conversations among Duolingo users may point to possible variations in learning needs between the two languages. The research question explored through netnography was, "What are the similarities and differences between evolving learning needs of Duolingo German and Spanish users as gleaned through discussion boards?" The current study used netnography to examine publicly available online data from Duolingo discussion boards. The netnography methods outlined by Kozinets (2010) are academically rigorous and based on reflexivity. Netnography is a non-intrusive method to collect accurate data through digital datasets in a naturalistic setting (Heinonen and Medberg, 2018). Netnography also has the benefit of collecting data from participants who are comfortable engaging in their chosen environment with pseudonyms. Netnography supports opportunities to examine learners' ideas, concerns, thoughts, and questions (Delaney, Kummer, and Singh, 2018) as they progress through Duolingo German and Spanish, unit to unit. Analyzing Duolingo discussion boards may elucidate users' learning needs as they work through the language learning software.

While netnography has benefits, some limitations need to be addressed. Belz and Baumbach (2010) noted that netnography is used to capture data that represents lead users. In Duolingo, not every user participates and contributes to the discussion boards; therefore, the data gathered from the discussion postings may not be representative of the average Duolingo user. Also, in netnography, there is a focus on content over practice (Wojcik and Hughes, 2019). As a result, data analysis is conducted on the content that users provide, and their experiences may not reflect the practices they are engaged in. When conducting future studies, researchers may consider these limitations, using other methodologies to gather details and experiences from users who are not discussion leaders.

Data collection and participants

Traditional ethnography requires the recruitment of participants to conduct interviews, which is not necessary for netnography (Kozinets, 2010). The participants in this study are Duolingo users who commented on German and Spanish discussion boards pertaining to beginning, intermediate, and advanced level learning units, from which discussion boards were randomly selected for

analysis. The data for a netnography is available on public domains, and the only identifiers are usernames. However, because users create usernames and avatars to participate and engage in dialogue (Alptekin and Temmen, 2018), many users may use their identity as their name, so ethical considerations on presenting data were taken. Therefore, no user names were reported in the results or findings to protect the identity of the users. Excerpts used from the data will be labeled with Commenter 1 or Commenter 2. Following the recommendations of Kozinets (2019), the criteria for the selection of users and their data from discussion boards included identifying information that was relevant, active, interactive, diverse, and provided rich details.

Duolingo has improved its course content to align with the Common European Framework of Reference (CEFR), which standardizes the skills of language learners at different stages of proficiency (Jiang et al., 2020). Duolingo includes 144 subunits for German and 159 subunits for Spanish. Each unit contains four to five lessons that increase in difficulty and require more proficiency for recall and production (Jiang et al., 2020). Users take a placement test to determine their appropriate level to begin the course. Users then receive feedback for correct or incorrect answers through Duolingo's machine learning algorithms. The negative feedback informs the users about opportunities to improve in novel exercises. Duolingo also offers personalized practice exercises based on repetition algorithms to match individualized learning experiences, depending on learner needs and goals (Jiang et al., 2020). According to a Duolingo Research Report DDR-20-04 (Jiang et al., 2020), users may also engage in discourse-level exercises through enhanced reading and listening, in which:

> Real-world context for language use demonstrates how language is organized beyond the sentence-level and features more interactive and social aspects of the target language. For example, Duolingo Stories offers engaging narratives that scaffold learners' reading comprehension in their target language with mid-story exercises. (p. 2)

In the beginning levels, learners typically focus on basic phrases and vocabulary. The pronunciation and vocabulary topics in the beginning levels may include food, animals, and clothing. In later stages of the beginning units, learners may focus on grammatical topics such as negatives and adverbs. The intermediate units of Duolingo German and Spanish focus more heavily on vocabulary acquisition and pronunciation. Such units may cover topics such as money, family, the body, shopping, numbers, and colors. As the intermediate levels progress, Duolingo implements scaffolding to achieve a higher level of understanding of grammar topics such as adverbs and vocabulary and pronunciation topics. The advanced levels focus on verb tenses like the past perfect, preterit, and future tenses. Scaffolding is continued in order to build upon previously discussed vocabulary pronunciation and grammar and introduce new vocabulary and pronunciation topics, such as education, science, the internet, weather, and business. At the advanced level, Duolingo learners must have progressed from a basic and intermediate understanding of grammar in order to understand the higher-level grammar principles. The length of the Duolingo "trees" or subunits varies between Spanish and German. The Spanish tree contains 159 skills, while the German tree contains 144 skills.

This study used netnography to analyze 144 subunits in Duolingo German and 159 subunits in Duolingo Spanish. The discussion boards analyzed contain data from the beginning, intermediate, and advanced levels that employ scaffolding and negative feedback based on machine learning algorithms. The data from Duolingo German was obtained by Neuschafer (2021) in a previous study, while Duolingo Spanish boards were additionally analyzed for the current study.

Each Duolingo course comprises 25 levels for each language, including access to discussion boards related to specific items. Additionally, there are 144 units overall. For Duolingo German, 48 boards were selected and analyzed by Neuschafer (2021). The current study selected 46 additional

Duolingo Spanish discussion boards to compare whether Neuschafer's (2021) results could apply to the Spanish discussion board dataset.

Data analysis

Kozinets (2010) outlined the six steps of data analysis for netnography, which was implemented in the methodology of this study. The steps include (a) coding; (b) noting; (c) abstracting and comparing; (d) checking information and refining; (e) generalizing; and (f) theorizing. The first step of *coding* is to draw codes and categories from the data. The researcher uses *noting* to create reflections and memos on the margins of the note-taking medium. Then, the researcher uses *abstracting and comparing* to identify patterns, including similar phrases, shared sequences, and relationships, as well as differences. *Abstracting* allows the researcher to construct hierarchical categories out of general concepts and constructs, making it easier to locate instances of distinction or discrepancies (Kozinets, 2010). *Checking and refining* isolates and filters the interpretation of differences, similarities, patterns, and processes. The step of *generalizing* explains how the data may pertain to the overall participant base as a whole and suggest reasons for any inconsistencies in the dataset that may cause potential issues for the validity of the results. Finally, *theorizing* helps the researcher to draw conclusions about the data based on the cumulative findings.

Results

The researcher analyzed the Duolingo German and Spanish discussion boards alongside the units and activities associated with the course to understand the discussion at each level and unit and explored the concepts within the beginning, intermediate, and advanced levels. In Duolingo German and Spanish, there are 144 units each, which yielded 484 discussion boards to build a sample. Due to the large number of discussion posts that accompany each learning unit, approximately 15 boards were randomly selected from each of the beginning, intermediate, and advanced levels of both languages in order to elucidate the evolution of learners' needs at all three levels of study. Using the selection criteria of Kozinets (2019), data that were relevant, active, interactive, diverse, and provided rich details, including 94 discussion boards, were analyzed in total (48 = Duolingo German; 46 = Duolingo Spanish) to understand users' perspectives in their discussions online. One month was dedicated to collecting Duolingo German and Spanish data. This study aimed to examine similarities and differences between evolving learning needs as expressed on Duolingo's German and Spanish discussion boards, answering the question: "What are the similarities and differences between evolving learning needs of users on Duolingo German and Spanish discussion boards?" This research used Duolingo German discussion boards, as Neuschafer (2021) outlined, to compare the previous findings with newly examined discussion boards on Duolingo Spanish. However, to re-emphasize the earlier notation, an important aspect of Duolingo is its practice of periodically removing discussion boards for various reasons. Therefore, except in specific limited circumstances, many of the discussion boards used for analysis in this study are no longer publicly available.

Themes

Initially, the results from Neuschafer's (2021) study on Duolingo's German program showed that discussion boards allowed users to (a) seek support during the initial stages of learning; (b) learn to navigate Duolingo; (c) use moderators and plus users to explain difficult concepts; (d) seek support to address areas of concerns of mistrust with the Duolingo software; (e) understand why their answers were wrong; and (f) demonstrate more advanced levels of fluency. While Duolingo Spanish users exhibited similar themes, the Duolingo Spanish discussion boards appeared to be

more effective at alleviating anxiety related to app navigation, pronunciation, vocabulary, grammar, and general understanding.

The novel themes that applied to Duolingo Spanish discussion boards include: (a) learners seek support during the initial stages: (b) Spanish language expert users; (c) confusion leading to mistrust; (d) answers perceived as wrong; and (e) advanced-level learners demonstrate fluency and cultural competence. These themes are slightly different from those found by Neuschafer (2021) regarding the Duolingo German boards. Neuschafer (2021) previously found five overarching themes, including (a) seeking support during the initial stages of learning; (b) learning to navigate Duolingo; (c) using moderators and plus users to explain difficult concepts; (d) seeking support to address areas of concerns with the Duolingo software; (e) understanding why their answers were wrong; and (f) demonstrating more advanced levels of fluency. Since the Spanish users did not exhibit issues with navigating the app, this theme was omitted in the Spanish discussion board themes. The Spanish discussion boards contained many Spanish language experts, while these were not present in the German discussion boards. As such, the theme, *using moderators and plus users to explain difficult concepts* in the German thematic analysis, was replaced with *Spanish language expert users* in the current analysis. Additionally, since Duolingo Spanish discussion board users demonstrated cultural competency, this aspect of the theme was not included in the German discussion board themes.

The researcher postulates that Duolingo Spanish users may exhibit less anxiety and frustration as fewer comments and discussions were noted related to accessing Spanish experts on the Duolingo discussion boards. There were usually one to five Spanish language experts observed in each Duolingo Spanish discussion board compared to only one or two experts observed in Duolingo German discussion boards. The number of experts available throughout the selected discussion boards was from observation and may not represent all discussion postings in all languages. As such, based on observations, the presence of more Spanish experts on the discussion boards could possibly suggest why there is less expression of mistrust towards Duolingo and frustration about the course content. However, one instance of frustration was that Duolingo Spanish users perceived that the orators on the Duolingo Spanish modules spoke too fast and did not enunciate proficiently when transitioning from one word to the next. In contrast, this issue was not present in Duolingo German, which may be a feature of the inherent pronunciation differences between the Spanish and German languages.

Theme 1: Learners seek support during initial stages

An examination of beginning-level Duolingo Spanish users demonstrated how individuals sought support from other discussion board participants. Participants included learners, users who pay a fee to use Duolingo (plus members), and people who have been invited to act as moderators on the discussion boards. The findings of the Duolingo Spanish boards show that users were particularly interested in one main grammar concern: the use of the irregular verb *hacer* (which means "to do" or "to make"). Nineteen out of the 46 analyzed discussion boards contained questions about the use of *hacer*, which decreased to zero after the advanced levels began. The Duolingo German discussion boards did not contain any single word that caused so much confusion amongst the learners.

Another issue that caused frustration amongst the users was the use of *tiempo* (which means "time," "climate," or "temperature"). The users frequently asked for clarifications regarding the use of *hacer* and *tiempo* in the same sentence, which is a common grammatical structure used to describe or ask about the weather in Spanish. This structure was the central topic of focus in 10 discussion boards out of 46 in total.

Theme 2: Spanish language expert users

Duolingo Spanish users had very effective moderators and users, who had a much higher level of expertise compared to Duolingo German discussion board moderators and plus users. It is possible that many Duolingo Spanish users speak Spanish as their native language but are using Duolingo to broaden their knowledge about variations in speech. Spanish language expert users provided more comprehensive support for users who had questions about the items within the subunits, including support with definitions, grammar rules, provisions of examples within sentences, and dialectical and cultural contexts. This is illustrated in the conversation below, wherein Commenter 2 delineates the usage of terms used in Spain and Mexico:

> **Duolingo Spanish Comment 1:** *Tiempo* is dominantly known to be time. Weather is *clima*.

> **Duolingo Spanish Comment 2:** I believe the usage is regional. In Spain, *tiempo* is commonly used for weather. In Mexico, *clima* is commonly used for weather and climate. For *tiempo*, one of the definitions in the dictionary of The Royal Academy of Spanish is 'Estado atmosférico. Hace buen tiempo.' That corresponds to the English word *weather*. The RAE definition of *clima* is 'Conjunto de condiciones atmosféricas que caracterizan una región.' That corresponds to the English word climate. I will not argue about the use of either one. You can generally tell from the context what a person is talking about.

Another conversation centered on the differences in the use of the verbs *haber, hacer*, and *estar* between the regions of Argentina-Chile, Spain, and Peru. One user had issues about the context in which these terms should be used differently or interchangeably:

> **Duolingo Spanish Commenter 1:** The correct sentence is: 'Siempre está soleado aquí.' Or a lower level 'Siempre hay sol aquí.' (Argentina-Chile, not Spain or Perú apparently)

> **Duolingo Spanish Commenter 2:** Thanks, D****l. From what I've picked up on DL [Duolingo], whether 'Siempre está soleado aquí' or 'Siempre hace sol aquí' sounds better to a Spanish speaker's ear depends on where the 'hearer' lives. For that reason, I'm trying to learn both the 'hacer' and estar' phrases--with an occasional 'ser' or 'haber' phrase thrown in when you or Grace point them out. There are enough variations that this weather lesson is taking me forever!

> **Duolingo Spanish Commenter 2:** Now I am with a doubt, because reading some forums, people in Spain and Peru say there is correct, and Argentina like me and Chile clearly incorrect. Apparently is like you say, depend where are you speaking. Again, here it sounds really bad, but I found this, from the Real Spanish Academy: https://twitter.com/RAEinforma/status/424193007559397376. They say it´s correct to say *hace sol/viento*, *hay sol/viento*, and of course *está soleado/ventoso*.

> **Duolingo Spanish Commenter 1:** Thank you again, D****l, for looking that up. And, please, continue to let us know how things are said in your part of LA [Latin America]. We learners need to understand the various ways Spanish is spoken in different areas (just as we often "wrangle" about the various ways English is spoken in different places).

The data suggest that Spanish discussion boards provided social in cultural interactions that enhanced second language acquisition and learning in alignment with the sociocultural theory (Vygotsky 1978). This is provided by users who demonstrate Spanish language expertise in explaining definitions, grammar rules, examples in sentences, and dialectical and cultural contexts. Duolingo Spanish users diligently explained the various functions of *hacer* with expertise, which may have decreased the need for moderators in the Duolingo Spanish discussion boards. Unlike Duolingo German, most of the questions were answered by regular users instead of moderators,

which points to a greater level of expertise among the casual discussion board members.

As seen below, the users were able to communicate the various uses of hacer effectively with descriptions and examples:

>**Duolingo Spanish Comment 1:** The impersonal *hace* has two functions in Spanish.

>**Duolingo Spanish Comment 2:** You can use it together with a length of time to mean "ago":

>*Estuve allí hace veinte años.* - I was there twenty years ago.

>*Te espero desde hace media hora.* - I have been waiting for you for half an hour. (lit. "I'm waiting for you since half an hour ago.")

>Or you can use it to describe weather phenomena. Usually, you'll only come across these constructions:

>*Hace sol.* - It is sunny. (lit. "It makes sun.")

>*Hace viento.* - It is windy. (lit. "It makes wind.")

>*Hace calor.* - It is hot.

>*Hace frío.* - It is cold.

>*Hace buen/mal/[cualidad] tiempo.* - It is good/bad/[quality] weather.

Since Duolingo Spanish users were able to receive constructive feedback, it is possible that the experts on the Spanish language present on the discussion boards helped students achieve higher levels of understanding instead of giving into their anxieties. The users who demonstrated Spanish language expertise showed an ability to differentiate subtle differences in verb use depending on the context of the sentence. Another such discussion is shown below:

>**Duolingo Spanish Comment 1**: Just curious, if you say, "*Hace muy oscuro hoy,*" it translates the same. I suspect it is grammatically incorrect but understood. Can someone explain the difference between using *hace* and *está* in this case? When talking about temperature, *hace* is used, as in, *hace frio hoy*.

>**Duolingo Spanish Commenter 2***: Hacer* is used with a handful of weather phenomena that are all nouns. *"Hace calor, frío, sol, viento."* *Estar* can only be used with adjectives.

>**Duolingo Spanish Comment 3:** Cold, hot, and windy are not nouns; they are adjectives.

Duolingo Spanish users frequently exhibited a level of expertise not seen in the Duolingo German discussion boards, which may potentially create a more productive and proactive learning environment; this may be more akin to an actual classroom setting that often provides contextual references that are helpful in communicating common phrases, as seen in the beginning level conversation below. Also, it shows that the discussion boards conversations provide these benefits apart from the repetition and memorization exercises required within the app.

>**Duolingo Spanish Comment 1:** Why is it not using *hace* since we're talking about weather?

>**Duolingo Spanish Comment 2:** Not all weather expressions use '*hacer*. A few use *estar*, and some just use the appropriate verb:

>***Llueve.* = It's raining.**

>***Nieva.* = It's snowing.**

You might also see *'hay'*, such as in:

Hay niebla. = **It's foggy.** (Literally, "There's fog.")

Hay humedad. = **It's humid.** (Literally, "There's humidity.")

A contrasting conversation from the Duolingo German discussion board is presented below, wherein the answers to questions written in German are not confidently answered. When Duolingo German users attempt to answer the question, they state that they are not fluent in German or say "I believe that..." instead of answering confidently, as seen in Neuschafer (2021):

> For example, one beginning user commented on a post about the translation of 'This is not easy' or *'Das ist nicht einfach.'* A user asked, 'Why not "it is not easy?"' A non-Plus user answered, 'I think that would be *"Est ist nicht einfach,"'* and a Plus built upon the simpler response by extending this explanation: *'Das'* vs. *'Es'* like the other guy mentioned. The 'D-words' (*das, der, die*) are the 'these' and 'thats' distinguished by masculine, feminine, and neuter contexts. Clearly, this case is neutral, so *'Das'* is used. *'Es'* seems to usually mean 'it,' but I believe in some cases it can even mean more like 'there' when the word 'it' is not an applicable translation. (Plus User)

> I'm not fluent in German, so maybe someone with more knowledge could further elaborate on it (or perhaps correct me if I'm wrong about anything) ... but maybe that much detail is more than what you needed to know regarding your question (Plus User). (p. 88)

Theme 3: Confusion leading to mistrust

Compared to Duolingo German users, Spanish users were less likely to complain that Duolingo was an inherently incorrect application. As some Duolingo German users tried to mitigate the anxiety they felt over "glitches" in the app, Spanish users were more likely to offer constructive insight and problem-solving strategies. For instance, when one Duolingo German user tried to assuage users' anxieties about memorization, the responses could be perceived as sarcastic and critical.

> **Duolingo German Comment**: English does not make sense either, yet we learned by memorization of other people's speech patterns. We must train our brains to be like that of children's. For children don't question why; they copy what they hear/see. Once we get the basics down, we can start evaluating grammar deeply.

However, the responses to this comment included, "What a deep and philosophical insight" (Reply 1) and "Thank you. That was VERY helpful" (Reply 2). This is counter to a dialog found on a beginning Duolingo Spanish discussion board. Duolingo Spanish users repeatedly justified Duolingo's negative feedback system and cautioned other users about criticizing the app. When a user pointed to their answer as being correct when it was marked incorrectly, other users made efforts to decrease critical comments. However, this finding was not present in the Duolingo German discussion boards. As such, it is possible that having many native Spanish speakers on the discussion boards helped improve the emotional climate of the forum.

For example, a user commented that "'It is hot at the beach' and 'It is hot on the beach' should be accepted in both English and Spanish" in response to the fact that Duolingo marked one of the answers wrong. While many users agreed, another user added that both forms are correct, but it would be more productive to simply report the issue to Duolingo and to stop criticizing the app:

> **Duolingo Spanish Comment 1**: 'It is hot at the beach' is more common in English.

> **Duolingo Spanish Comment 2:** Thank you - I was going to make that very comment!
>
> **Duolingo Spanish Comment 3**: Actually, my experience made me want to put 'on' first. In my experience, 'on' is more common (but not any more right or wrong than 'at').
>
> **Duolingo Spanish Comment 4:** There you have it everyone: Duo now accepts 'it's hot at the beach.' Please stop being so defensive of yourselves and so critical of Duo. It takes them time to get the translation right. Both 'on' and 'at"' are perfectly acceptable. Although their meaning in English *is* slightly different, it is not consequential for Duo's purpose. Don't get too emotional. Let Duo know about your thoughts and move on.
>
> **Duolingo Spanish Comment 5:** Why isn't 'It's hot at the beach' acceptable?
>
> **Duolingo Spanish Comment 6:** 'It is hot at the beach' is acceptable, but Duo hasn't added it yet. Just report it, and eventually, Duo will get there :)

The results from this analysis show that users are able to vent their anxieties and frustrations about technical issues, such as the possibility that Duolingo's correct answers are not broad enough within a real-life community that supports sociocultural theory's elements of learning needs (Vygotsky, 1978).

Theme 4: Answers perceived as wrong

Compared to Duolingo German discussion boards, Spanish users were less likely to perceive Duolingo as making mistakes. Additionally, Duolingo Spanish users were less likely to provide or ask for external sources of information in relation to their question, as Spanish language experts were abundant in the forum. For example, many native Spanish speakers appeared throughout the discussion boards, from the beginning to intermediate and advanced levels. However, most of the presumably native speakers tended to blame the differences in Spanish grammar on the vastness of the language, as it is used differently in various Spanish-speaking countries. Many users expressed that the corrections for questions were simply not broad enough to include all the variations in all the countries that speak the language.

Deardorff's (2006) pyramid model of intercultural competence posits that there are requisite attitudes of respect, openness, curiosity, and discovery (level 1) that lead learners to value other cultures, cultural diversity, and respect other cultures. In the second level, learners develop a greater understanding and knowledge about the culture, culture-specific information, and sociolinguistic awareness (Deardorff, 2006). The access to users who demonstrated Spanish expertise may facilitate more requisite attitudes of respect, openness, curiosity, and discovery that are not available solely on the Duolingo app. Thus, the discussion boards provide benefits that may facilitate greater intercultural competence when learning Spanish on Duolingo.

Users were quick to understand the reasoning behind why the Spanish language presented on Duolingo seemed to be narrowed to one way of speaking in relation to the many ways of speaking Spanish globally. Many users simply commented that they reported alternative correct answer choices to Duolingo, and they shared the date that alternative choice was accepted as being correct on the app. This is illustrated in the conversation below that appeared on a beginning level of Duolingo Spanish, where one user, who posted in February 2018, found an answer that should have been marked as correct. A user who responded in February 2020 reported that Duolingo subsequently added this answer as a correct response with the date of the noticed amendment:

> **Duolingo Spanish Comment 1:** My answer 'what is the weather in Sevilla now' should be accepted.

> **Duolingo Spanish Comment 2:** Report it. Click the little flag and choose 'my answer should have been accepted.'
>
> **Duolingo Spanish Comment 3:** I agree, as this is gramnatcally (sic) correct in English and means exactly the same!
>
> **Duolingo Spanish Comment 4:** There is no "like" in your sentence.
>
> **Duolingo Spanish Comment 5**: If you're younger than 20, you may not realize that the word 'like' is optional. If you're over 60, you may think 'like' is at best superfluous. It's like you know like the use of like kind of like corresponds to your generation. Sorry. I got carried away. :-)
>
> Anyway, Duo now accepts the translation with or without 'like.' (2/13/2020)

In another discussion about the use of hacer, one user made a possibly critical comment about the accuracy of the app. However, Spanish Duolingo users were more likely to correct these misperceptions before the conversations dominated the discussions. This may be possible because there were more Spanish language experts on the discussion boards who could intercept these anxieties and point the user to a more productive discussion. However, in the Duolingo German discussion boards, most users continued to make comments about the inaccuracies of Duolingo, possibly because no one else was present in the discussion board to steer the conversation back to the language topic. Below I examine an instance of a user using their expertise in Spanish to change the tone of the conversation away from Duolingo's possible inaccuracies:

> **Duolingo Spanish Comment 1:** Now here it's *está* instead of *hace*. Make up your mind Duolingo por favor.
>
> **Duolingo Spanish Comment 2:** Duolingo can't help how Spanish works! There are different expressions for weather that use different constructions.
>
> One important thing to note is that if an expression uses *hace*, it's followed by a noun (it makes rain or makes heat, for example). But if you use *está*, it's followed by an adjective that describes the current state (it is cloudy or sunny, for example).
>
> But you will just need to learn the expressions for describing weather in Spanish-- languages are not going to be consistent about things like this.

This exchange implies that some Spanish users on Duolingo may have more experience in dealing with variations in the language and may not be as critical of discrepancies between the answers presented on Duolingo and the way Spanish is spoken in other real-world contexts. Many users expressed that others should not be frustrated with inconsistencies, which may reflect a more advanced understanding of fluid languages.

Theme 5: Advanced level learners demonstrate fluency and cultural competence

The advanced level users were more likely to demonstrate fluency and cultural competence when engaging with Duolingo Spanish users. The advanced users often spoke Spanish within the discussion boards instead of using English to communicate. For instance, a discussion board entitled "No vamos a la playa en enero" precipitated a conversation about terms to describe people from Brazil. The interest in learning about different segments of culture related to the Spanish language may indicate a higher level of curiosity, discovery, and openness related to intercultural learning (Deardorff, 2006) compared to the results from Neuschafer (2021) seen in the German discussion boards. The differences in perceived culture among different Spanish speaking nations are highlighted throughout the Duolingo Spanish discussion boards, as seen below:

> **Duolingo Spanish Comment 1:** en florida van a la playa :/
>
> **Duolingo Spanish Comment 2:** Y aquí en el hemisferio sur.

Duolingo Spanish Comment 3: pero los brasileros van a la playa en enero xD

Duolingo Spanish Comment 4: Brasileños en español :)

Duolingo Spanish Comment 5: *Brasileros* y *brasileños* son igualmente correctos.

Duolingo Spanish Comment 6: Really? I've always been corrected when using Brasileros (by native speakers).

The results of the netnography analysis showed that patterns and themes found in Neuschafer (2021) concerning Duolingo German discussion boards were also present in Duolingo Spanish discussion boards. Specifically, the analysis showed overlapping themes between the findings from Neuschafer (2021) and the current study: (a) learners seeking support during initial stages of learning; (b) the contributions of language experts or moderators/plus users in discussion boards; (c) confusion and mistrust, which may lead to answers being perceived as wrong; and (d) advanced level learners demonstrating more proficiency. The analysis found that Duolingo Spanish contains many more Spanish language experts compared to Duolingo German discussion boards. This may lead to a more proactive and positive climate of discussion, which may potentially improve learning outcomes and cultural competence. However, as Saraswati and Purwati (2021) postulated, having access to self-regulating learning through computer-assisted language learning may lead to a more proactive and positive climate of discussion, supporting positive learning outcomes through engagement.

Although features of sociocultural theory (Vygotsky, 1978) and the pyramid model of intercultural competence (Deardorff 2006) may be important for more immersive second language learning experiences, the repetition and memorization-based exercises on the Duolingo app may not promote these competencies. However, the discussion boards may provide users with more relevant information that is helpful for understanding dialectical contexts and cultural knowledge. It appears that since the Spanish language is so widely used with many variations around the world, many native speakers use Duolingo to learn more about a variation they are less confident in. This dynamic may present great benefits to non-native speakers in the discussion boards, as they can receive much more detailed and confident answers to their questions.

Discussion

Vygotsky's (1978) sociocultural theory states that social and cultural interactions are central to the process of language acquisition and language learning. Vygotsky (1978) posited that interactions with other individuals could influence and shape mental strategies used in language learning. The discussion boards within Duolingo present an interactive environment where users can communicate their concerns, questions, and knowledge asynchronously and instantaneously. As such, the German and Spanish Duolingo discussion boards were analyzed through netnography to answer the research question, "What are the similarities and differences between evolving learning needs of Duolingo German and Spanish users on discussion boards?"

Non-native Duolingo Spanish users had the benefit of being immersed in discussions that included many native-speaking Duolingo Spanish users, which increased the accuracy of answers and cultural immersion in the language. These findings indicate that users on the Spanish discussion boards may be more open to tolerating ambiguity and uncertainty, which is important for learning a second language and intercultural competency (Deardorff, 2006). As such, the Duolingo Spanish discussion boards had fewer comments that criticized the accuracy or effectiveness of the app compared to Duolingo German users. At times, when non-native Spanish-speaking users expressed criticism about the negative feedback system, native Spanish speakers were quick to point out that the Spanish language came in many variations and suggested that they report any inconsistencies to Duolingo.

This dynamic informs the researcher that learning about variations in Spanish is simply an inherent experience of the native Spanish speaker, and the criticisms or negations they observe may be a constant process that they deal with in their day-to-day lives. As such, this relationship to an ever-evolving and fluid language opens up platforms for Duolingo users to engage with the Spanish language in a more culturally competent way. For instance, the use of different vocabulary and grammatical rules were discussed as being distinct from country to country, such as Mexico, Spain, Brazil, and Peru. Spanish includes eight broad types, including U.S. Spanish and Mexican Spanish, European Spanish (Castilian, Andalusian, Murcian, Canarian), Latin American Spanish (Caribbean, Rioplatense), and African Spanish (Equatoguinean) (Mackenzie, 2020). German comprises 16 dialects such as Bavarian, Upper Saxon, Berlin, Low German, and Pennsylvania Dutch (Deutschland.de, 2020). However, there were no conversations found in the sample within the Duolingo German discussion boards that pertained to regional dialects.

According to Deardorff's (2006) pyramid model of intercultural competence, learner's manifest uncertainty within dialogs about novel situations, contexts, unknown variables, and intercultural learning. Learners progress to the top of the intercultural pyramid by engaging in certain behaviors and communications that are effective and appropriate based on their knowledge, skills, and attitudes. The native Spanish speakers on the Duolingo discussion boards exemplified a high level of intercultural competence by deflecting the use of "right versus wrong" terms and criticisms about the Duolingo app, and instead were very open to variations in the Spanish language, as dictated by country, culture, and geography. This research posits that these behaviors, attitudes, and pieces of knowledge may trickle down to the non-native Spanish speakers on the platform through behavioral modeling, which yields more proactive and productive discussion boards that may be more optimal for learning a second language.

Jennings and Greenberg (2009) found that social and emotional competence skills are important for learners. Albrecht and Goldsmith (2003) stated that navigating emotional experiences within the learning process is even more important than the provision of the course content. In this line of thinking, learners cannot fully absorb new material if they do not contend with their fear, anxiety, and sadness (Albrecht and Goldsmith, 2003). It is possible that the depth of knowledge exhibited by native speakers on the Duolingo Spanish boards provided protective effects against worries related to understanding the course content and materializing their goals. While many of the discussion boards used for analysis in this study are no longer publicly available, the research shows that participants who have access to a culturally competent and knowledgeable user base significantly improve the emotional climate of the discussion boards, which may allow the users to more fully absorb the content and interact with other users with increased intercultural competence.

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