Original Article

Comparison of Language Learning Platforms to Choose a Suitable Platform for Korean Language Learning

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Abstract - This study focuses on the comparison of three Korean-language language learning platforms. In the process of acquiring a new language, various topics that require study are addressed. In today's era, with remarkable technological development, online platforms and mobile apps represent valuable resources for various purposes, including learning new languages. These tools provide organized access to relevant topics and, in many cases, incorporate gamification elements that facilitate the assimilation of concepts. Choosing the right platform is crucial when learning Korean, given its rich grammatical content that needs to be addressed to gain a clear understanding of sentence structure and conjugations. In addition, new language learning platforms were systematically analyzed in relation to their scientific production per year and CitiScore. The comparison between these three platforms was carried out by evaluating key aspects such as feature description, functionality, and comparative analysis. It is concluded that this research provides a guide that helps users identify the most suitable platform according to the skills they wish to reinforce in their Korean language learning process.

Keywords - Korean language, Online platforms, Mobile applications, Comparison.

1. Introduction

Language learning is an important skill and a very useful tool in today's world, as it helps develop communication skills and opens up more job opportunities [1]. The rise of the Korean wave has made Korean a highly in-demand language; it is believed that the increase that has been seen in the number of Korean learners in recent years is partly due to Korean popular culture and its prominence, particularly in the last two decades [2]. With the constant advancement of technology, online platforms and mobile apps play a crucial role in simplifying daily tasks and information retrieval, providing smartphone users with tools that streamline processes and foster organization [3]–[6]. These apps, easily downloadable from official marketplaces such as Google Play for Android devices or Apple Store for iOS, not only optimize time but also structure routines, incorporating strategic breaks for the user's well-being [7]. In an increasingly interconnected world, thanks to technology, the importance of learning a foreign language has increased significantly [8], [9]. By providing quick and efficient access to language learning resources, these apps play a key role in developing language skills, facilitating global communication, and connecting people from various parts of the world [10], [11]. One of the reasons why it is important to choose the right mobile app for a foreign language learning journey is because the app should have an established structure for the contents to be taught, from the most basic concepts to the most complex, and should have all the important grammatical content to help the user understand sentence construction and build links from their knowledge to your target language [12], [13].

Choosing the right mobile app to embark on a foreign language learning journey is a crucial decision with wide-ranging implications for effective and sustained learning [14], [15]. The essential core of this choice lies in the need for the selected application to provide a complete and carefully designed structure for the educational content [16], [17]. This structure should guide students from fundamental concepts to linguistic complexity, ensuring a methodical and progressive process [18].

Not only does the app's structured framework offer a systematic progression in language acquisition, starting with rudimentary foundations to build a solid foundation, but it also serves as a navigation guide [19], [20]. This guide guides learners through a clear path from the basics to the more advanced aspects of language, avoiding cognitive overload and encouraging gradual comprehension [21]. The inclusion of extensive grammatical content not only imparts knowledge of grammar rules but also clarifies the underlying principles of sentence formation [22], [23]. This goes beyond mere memorization, fostering a deep understanding of the structural mechanics of language.

In addition, the incorporation of diverse and challenging content ensures a comprehensive language education with a balanced mix of vocabulary, idiomatic expressions and cultural nuances [24], [25]. The effectiveness of the app is reflected in its adaptability to different learning styles [26]. A robust app should offer diverse modalities that cater to auditory, visual, and kinesthetic learners, using interactive multimedia, immersive audio experiences, and hands-on exercises to meet diverse preferences and strengths [1], [2], [16]. This study compares three platforms: Duolingo, Lingodeer, and Drops. These tools aim to aid in language learning, and all of them feature an online platform as well as a mobile app in the app store.

2. Mobile Apps for Language Learning

Mobile apps dedicated to language learning provide users with a foundational structure for their educational journey by offering meticulously curated content designed to facilitate gradual and systematic progress [5]–[7]. Beyond their focus on content, many of these apps also seek to support time management, encouraging users to maintain a consistent daily schedule and set periodic goals to strengthen consistency in the learning process [8]. These apps, mostly used by those with a specific interest in acquiring foreign language skills informally, allow for personalized learning without the need to enrol in formal classes or higher education institutions [27], [28]. This flexibility, often lacking in traditional educational settings, gives users the freedom to tailor their learning experience around their schedules and preferences. In addition, the availability of free versions of many of these apps further expands their accessibility [5]. This translates into an affordable option for students looking to access essential resources to master a new language, removing financial barriers that could hinder access to conventional educational opportunities. However, it is essential to recognize that while these applications offer significant advantages, self-learning requires discipline and commitment [28]. The user must take responsibility for following a pre-set curriculum and taking full advantage of the interactive tools provided by the app [3]. Constant interaction with the content, participation in practical exercises and the active search for opportunities to apply the language in real situations are essential elements to consolidate learning and achieve effective mastery [7]. This section is based on a general explanation of the platforms and their features.

2.1. Duolingo

Duolingo, the leading language learning platform, has conquered more than 300 million users globally [27], [29]–[31]. Its extensive catalogue spans more than 40 languages, offering a wide range of options for language learning enthusiasts [32]–[34]. What makes Duolingo unique is its innovative design, conceived to provide an educational experience similar to the dynamics of a game, turning the learning process into a playful and immersive experience[35].

Fig. 1 Duolingo language learning platform

This platform, accessible for free, has established itself as a benchmark in the world of language learning, allowing users to explore courses that go beyond traditional languages, including less common languages such as Korean[36]. Figure 1 provides a visual glimpse into Duolingo's distinctive interface, where the fusion between education and entertainment is clearly manifested[31]. Not only is Duolingo free, but it also offers a Pro version that gives users the ability to customize their learning experience more deeply[29], [30]. This premium option represents an added value, allowing students to tailor the course to their specific needs, facilitating more focused and efficient learning[34]–[36]. Duolingo's Korean course exemplifies its commitment to linguistic diversity. The inclusion of this language, along with other less conventional languages, expands the educational offering and reinforces Duolingo's vision of making language learning accessible to all[29], [33]. Figure 1 presents the platform image and illustrates how Duolingo creates a visually appealing environment that motivates users to immerse themselves in the richness of a new language in stimulating ways.

2.2. Lingodeer

Lingodeer stands as an online platform with a mobile app easily downloadable from [6] the app store, focused on language teaching. Its impressive offering encompasses courses for 11 different languages, opening the doors of language learning to a diverse audience. Students intending to immerse themselves in the rich free content offered by the platform must complete a simple registration process by using an email address [37]. In addition, there is the option to elevate the educational experience to new heights by purchasing a paid subscription, which unlocks a wider set of lessons and resources [38]. Each lesson on Lingodeer comes with an enlightening section called "Learning Tips," where users can anticipate the grammar that will be explored before embarking on the lesson itself [39]. This proactive approach provides students with a solid foundation and understandable context to maximize the effectiveness of their learning[40]. Users with free accounts enjoy access to essential resources, such as the "Alphabet" section, designed to teach Korean character reading, some initial lessons in the basic phase of the course, assessments called "Test Outs" for each unit, and the comprehensive "Travel Phrasebook" section[28]. They are also given the opportunity to consolidate and review their learning through the "Review" section. However, to access a wider range of resources and features, users are urged to consider subscribing to one of the Premium Plans. Figure 2 shows the image of its platform.

Fig. 2 Lingodeer language learning platform

Fig. 3 Drops language learning platform

2.3. Korean Drops

Drops, the online platform owned by the prominent Norwegian company Kahoot!, presents itself as a specialized tool for language learning. With an impressive reach, it offers courses for more than 50 languages, standing out for its specific focus on vocabulary expansion [41]. Its unique proposition focuses on empowering users to acquire more than 2500 words on various topics pertinent to each language. These words are carefully selected for their relevance and frequency of use, providing learners with a solid foundation on which to build more advanced language skills[36]. Drops distinguishes itself as an effective add-on when used in conjunction with other language learning platforms. It is critical to note that its focus is primarily on vocabulary development and does not provide content for other skills needed in the comprehensive acquisition of a new language.
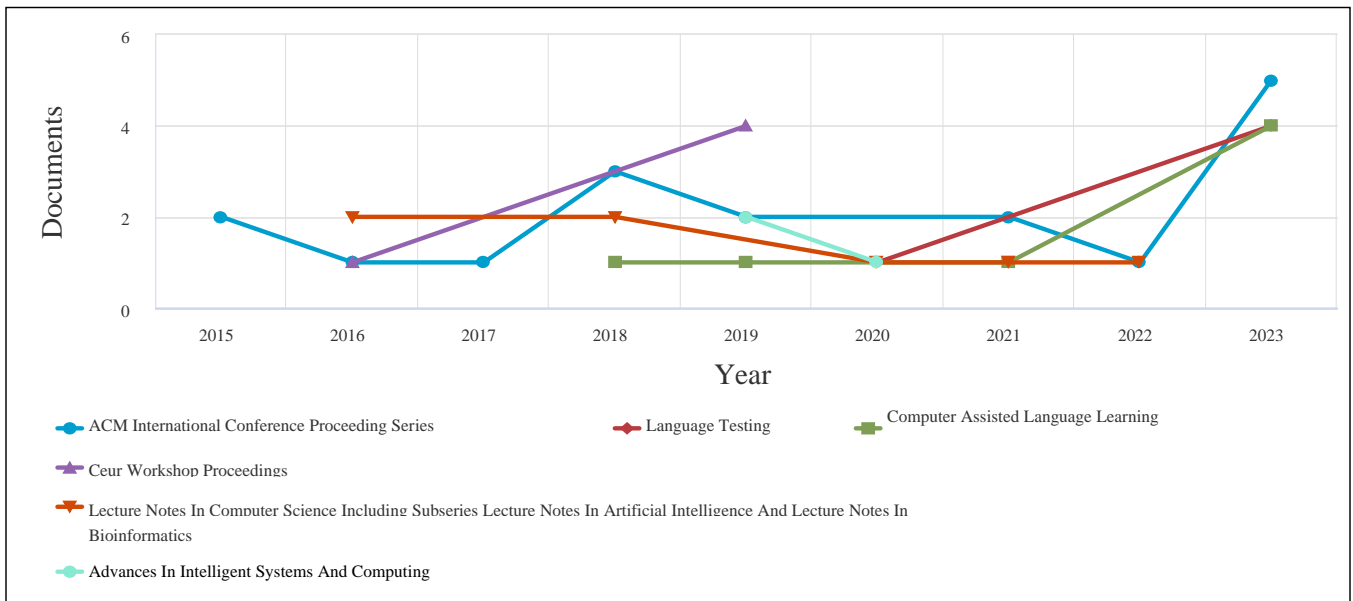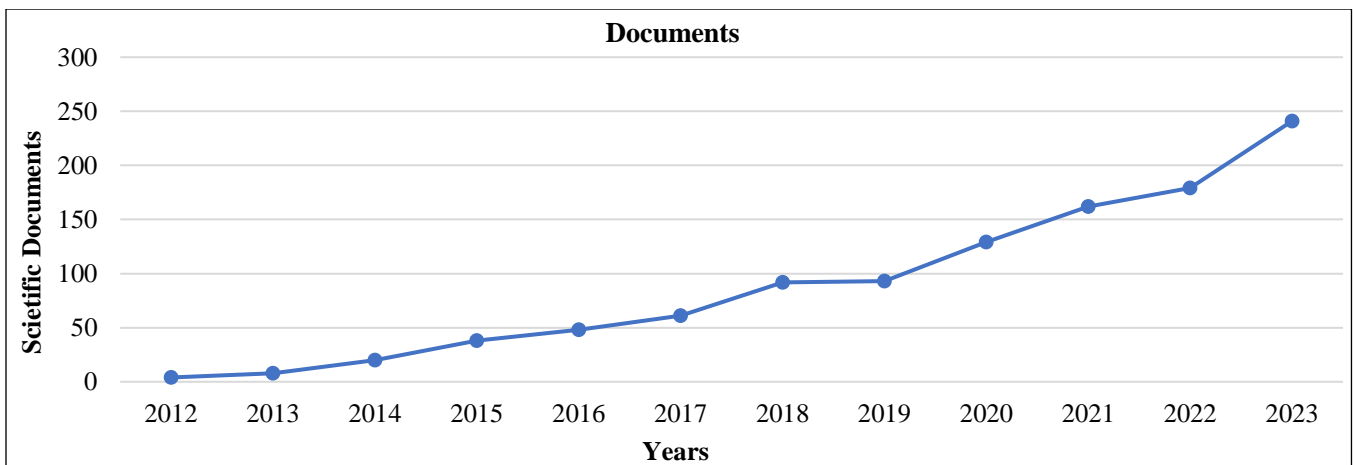

Fig. 4 Documents per Year by Source

Fig. 5 Scientific documents by year from duolingo

The meticulous design of Drops is designed to make it easy to memorize new words[42] visually. It seeks to create an immersive and engaging educational experience while stimulating the development of effective learning habits. Through the presentation of streaks, records, and personal statistics, the platform motivates users to maintain consistent practice, thus contributing to sustained progress in vocabulary mastery. Figure 3 shows the image of its platform. Finally, the list of documents per year of these 3 platforms is shown in the Scopus database, which, according to the 6 journals that have the most publications related to Language Learning with Duolingo, Lingodeer and Drops[36], [38]. Figure 4 relates the number of documents per year. Also, it compares the position of CitiScore, SJR and SNIP information for the quantification and evaluation of journals in terms of publication and citation of articles.

3. Description of the functionality of the Learning System

3.1. Duolingo – Features
Duolingo sends daily reminders to its users and also tracks progress. It shows the current streak, and with each lesson, it is possible to accumulate "gems" and experience points (XP).

Gems allow the user to purchase the following items in the "shop":

- Recharge Hearts: The user can purchase this item to recharge the hearts needed to take more lessons instantly. Duolingo has 5 hearts to start with, with every mistake during a lesson removing a heart. Each heart is restored every 5 hours or with each lesson completed.
- Steak Freeze: This element allows the user to maintain the current streak in the event of a day of inactivity.
- Double or Nothing: This item allows the user to double the amount of 50 gems by being able to maintain a 7-day streak.

Experience points (XP) allow users to climb the weekly leaderboard, which is also called "League" The competition starts every Monday; each league consists of 30 participants and at the end of the week, a certain number of participants at the top advance to the next league. On the other hand, Duolingo has a platform for mobile education; it is possible to carry out a systematic review within the SCOPUS database, which supports the visualization of documents per year as soon as the publication is indexed on a trusted platform, in Figure 5. It can be seen that in 2018, there were 92 articles related to the use of the Duolingo application. Likewise, in 2023, it has 241 documents which contribute to the production of knowledge and learning of new languages. This shows how Duolingo's scientific papers were born in 2013 and have been favoured with the evolution of mobile phones and the constant improvement of its platform. On the other hand, it can be seen that there was a decline in publications from 2020 to 2022.

3.2. Lingodeer – Features
Lingodeer, with its innovative approach to language learning, not only provides an effective educational environment but also cultivates consistent study habits by setting daily goals for its users. This feature is designed to create a daily learning routine, leveraging the psychology of goal setting to boost motivation and engagement. In addition, Lingodeer goes above and beyond by offering a robust tracking system that allows users to monitor various aspects of their progress. This includes the daily streak, a measure of consistency in learning, as well as cumulative progress over time. The platform also tracks the total number of hours spent learning, providing a more complete view of the user's time investment. The implementation of an achievement system expands the gamification of the learning process. Lingodeer offers a total of 32 achievements distributed in categories that cover learning time, consistency in study, languages and levels achieved. These achievements act as additional incentives, rewarding the user's efforts and adding an element of tangible achievement to their learning experience. To further motivate users, Lingodeer features a tier system based on the accumulation of Experience Points (XP). With a wide range of 110 levels, users have the opportunity to measure their progress more quantitatively and set long-term goals for their language development.

3.3. Drops – Functions
Drops display the words in the chosen language with their translation, display a picture for each one, and teach the pronunciation. It offers 5-minute lessons where users must match individual words and phrases to their corresponding images. In the free version, the user can only take one lesson per day. Record statistics after each lesson, keeping track of each correct and incorrect answer and the overall progress of words learned. In addition, DROPS is a new platform with an educational approach, which is why, since 2018, their first scientific document has been published in which they talk about the use and importance of the platform for learning a new language. Figure 6 shows that between 2022 and 2023, the scientific production of the drops platform remained constant.

4. Comparative Analysis
In the previous section, the main features, benefits, and functions of each platform were mentioned. This description will serve as a guide to help identify which platform is best to use based on the individual and the areas that need to be reinforced when learning the Korean language. Language learning platforms can help the user to have access to important topics when learning a new language in an orderly way, maintaining a routine through scraps, and memorizing new words and concepts through games and pictures. It is important to know what each app offers so that the learner can make an informed decision when they want to include an app as a tool to learn a new language.

Table 1. Contents coverage comparison among the three platforms

| S.no.	Contents	Duolingo	Lingodeer	Drops	
1	Korean vowels and consonants, Batchim and pronunciation		X	X	Lessons on how to write Korean characters and their components
2	Elements of a sentence		X		Coverage of the grammar used in each sentence
3	Markers and the function of words within a sentence		X		
4	Use of a great variety of words throughout the course	X	X	X	Coverage of the necessary vocabulary
5	Use of honorifics	X	X		Coverage of the speech styles and the use of honorifics according to the situation
6	Differences in speech styles		X		
7	How to conjugate sentences according to the situation		X		
8	Levels of formality		X		
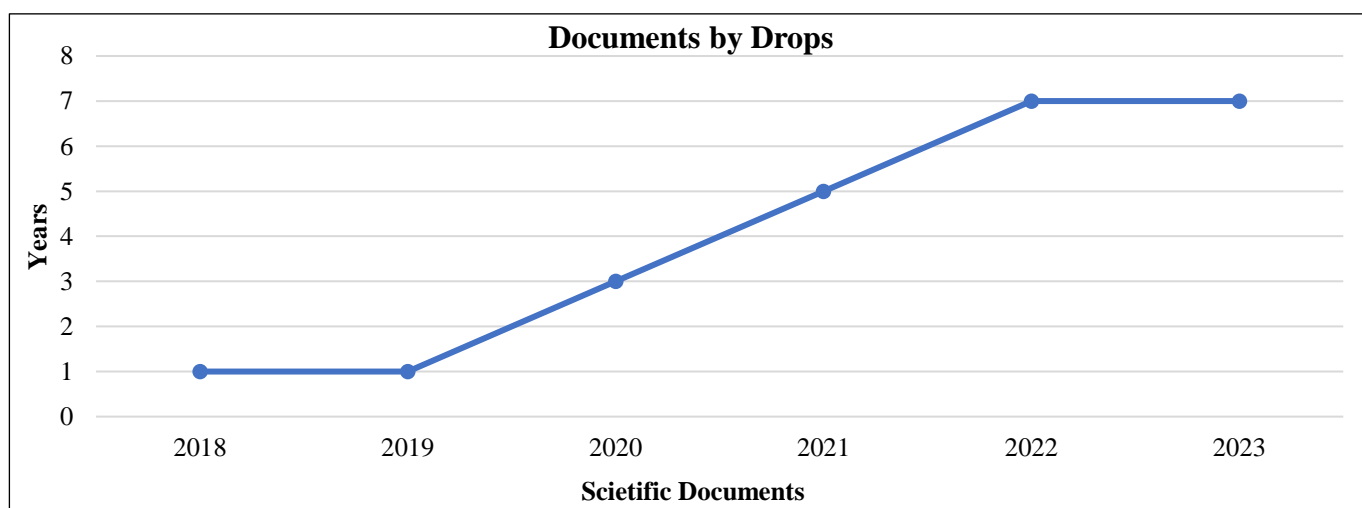
Fig. 6 Scientific documents by year of drops

In the comparison, the Duolingo platform was considered as the basis, as this is the most popular language learning app worldwide today. From Duolingo, the four aspects considered as a requirement for a comprehensive Korean language learning platform were lessons on how to write Korean characters and their components, coverage of the grammar used in each sentence, coverage of the necessary vocabulary, and coverage of speaking styles and the use of honorifics depending on the situation. For the lessons on how to write Korean characters and their components, the aspects that were taken into account were education about Korean vowels and consonants, Batchim and their pronunciations. In the coverage of the grammar used in each sentence, the aspects that were taken into consideration was a section in which the platform would educate the user about the elements of sentences, the markers for each element, and the function that each word has within a sentence. In terms of the coverage of the necessary vocabulary, language learning platforms need to implement the use of a wide variety of words in their sentences in order to help the user enrich their vocabulary. Finally, for the coverage of speaking styles and the use of honorifics according to the situation, a language learning platform for the Korean language must teach the difference in speaking styles and how to conjugate sentences according to the situation correctly, the use of honorifics, and levels of formality. Table 1 shows the platforms and all the aspects that have been taken into account, indicating which ones meet these criteria. Each of these platforms has a free version and a premium version. The free version allows users to have access to the contents with some limitations, but it is still possible to learn important topics; the premium versions allow the user to have access to all the content without limitations on the number of lessons, which could help the user to have a faster improvement. In the comparison, it is deduced that Lingodeer meets the evaluated criteria, as it provides a complete Korean course with coverage of all the necessary and important topics to learn the language. Finally, a systematic search was carried out with the following algorithm (TITLE-ABS-KEY (drops AND Kahoot) OR TITLE-ABS-KEY (duolingo) OR TITLE-ABS-KEY (lingodeer)) in the SCOPUS database and using R language. On the Rstudio platform, the analysis of Co-Occurrences of KeywordsPlus was performed.
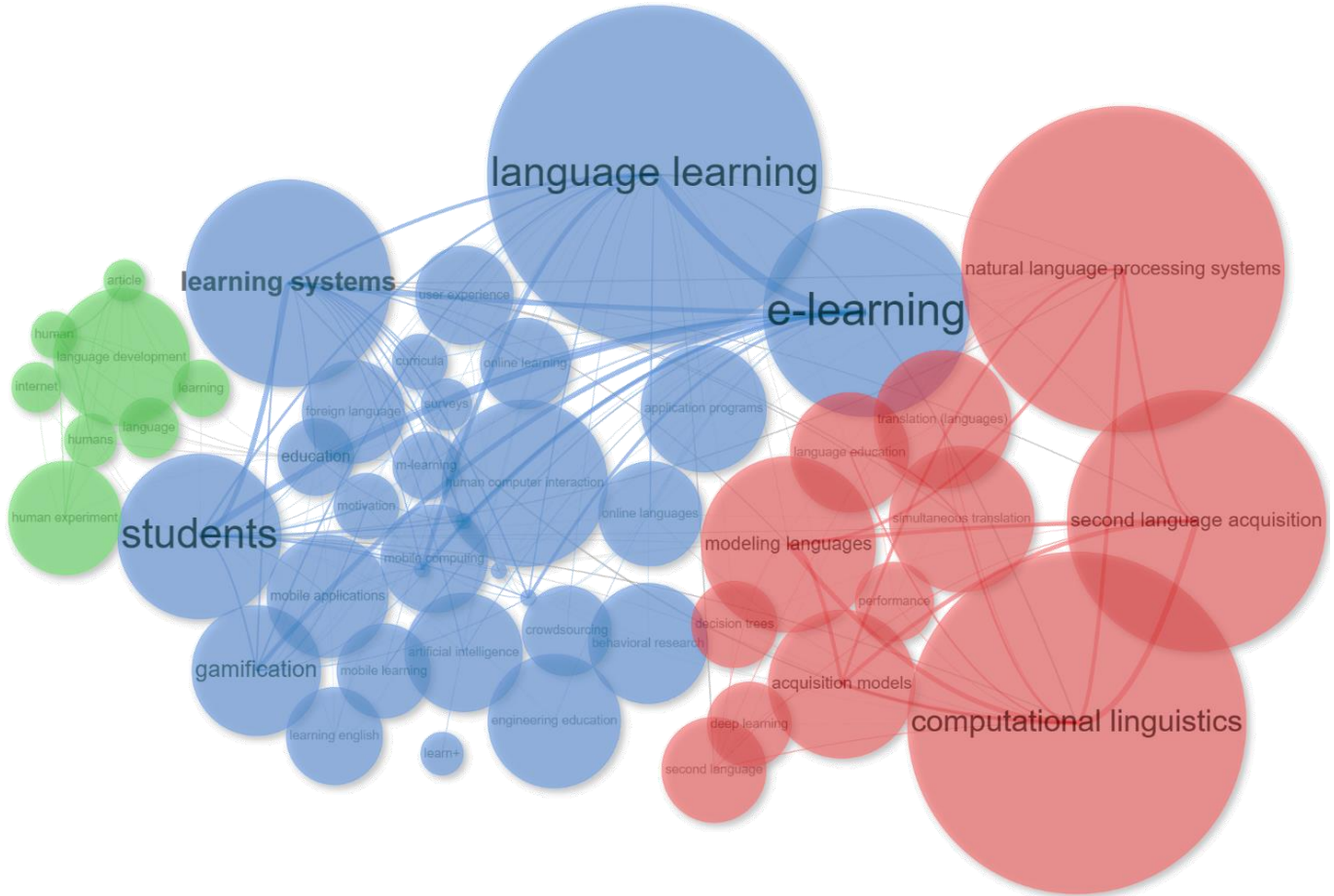
Fig. 7 Co-occurrence of keywords

5. Discussion and Conclusion

The central purpose of this study was to evaluate the functionality of the various language learning platforms presented. It is essential to consider that these platforms offer both a free version and a premium version, with the former being susceptible to certain limitations in terms of content and features. This aspect should be taken into account by users. In comparison with [33], which highlights Duolingo as a high-level language learning platform, such as Korean, we present a comparative assessment that includes platforms like Drops. These alternatives introduce innovative dynamics and interactions that stimulate the learning of new languages. Analogously to [37], which thoroughly analyzes the Duolingo mobile app and emphasizes the focus on repetitive learning to delve into a new language, we observe that these learning dynamics simultaneously highlight and reinforce the use of modal verbs in acquiring languages like Korean or English. Finally, [35] underscores the use of artificial intelligence and machine learning on platforms like Kahoot to enhance the learning of new languages. Our research contributes to and supports the notion that the level of formality and the progression of algorithms are crucial factors in the process of learning new languages While making decisions.

Since Korean uses speech styles for sentence construction, it is of utmost importance to ensure that the selected app addresses this aspect, as it forms the basis for sentence conjugation and effective communication. When comparing the three platforms analyzed, Lingodeer stands out in the first place, as it comprehensively addresses the aspects considered in the evaluation.

In addition, it was determined that the choice of a Korean learning platform should be based on the specific needs of the student and the particular skills that require strengthening in each case. Generally speaking, it is recommended to look for a platform that offers complete coverage of essential content to ensure effective and holistic learning.

As a future perspective, it is proposed to conduct a thorough review with a specific case study at a university in Peru, aiming to compare the obtained values with a validated population and instrument. This would open a new line of research focused on language learning through synchronous mobile platforms. The intention is to make all the gathered information available to the community, thus facilitating comparisons with data from other countries or contexts.

References

[1] Malika Tilavova, "The Importance of Learning a Second Language and its Benefits for the Individual," *Journal of Foreign Languages and Linguistics*, vol. 4, no. 9, pp. 1-7, 2021. [Google Scholar] [Publisher Link]

[2] Hye-Sook Wang, and Danielle O. Pyun, "Hallyu and Korean Language Learning: Gender and Ethnicity Factors," *The Korean Language in America*, vol. 24, no. 2, pp. 30-59, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[3] Michael H. Long, and Catherine J. Doughty, *The Handbook of Language Teaching*, Wiley, pp. 1-824, 2009. [CrossRef] [Google Scholar] [Publisher Link]

[4] Burr Settles, and Brendan Meeder, "A Trainable Spaced Repetition Model for Language Learning," *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics*, Berlin, Germany, vol. 4, pp. 1848-1858, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[5] Jason R. Rachels, and Amanda J. Rockinson-Szapkiw, "The Effects of a Mobile Gamification App on Elementary Students' Spanish Achievement and Self-Efficacy," *Computer Assisted Language Learning*, vol. 31, no. 1-2, pp. 72-89, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[6] Gustavo García Botero, Frederik Questier, and Chang Zhu, "Self-Directed Language Learning in a Mobile-Assisted, Out-of-Class Context: Do Students Walk the Talk?," *Computer Assisted Language Learning*, vol. 32, no. 1-2, pp. 71-97, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[7] Behzad Tabibian et al., "Enhancing Human Learning via Spaced Repetition Optimization," *Proceedings of the National Academy of Sciences*, vol. 116, no. 10, pp. 3988-3993, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[8] Burr Settles, Geoffrey T. LaFlair, and Masato Hagiwara, "Machine Learning-Driven Language Assessment," *Transactions of the Association for Computational Linguistics*, vol. 8, pp. 247-263, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[9] Gustavo García Botero et al., "Complementing In-Class Language Learning with Voluntary Out-of-Class MALL. Does Training in Self-Regulation and Scaffolding Make a Difference?," *Computer Assisted Language Learning*, vol. 34, no. 8, pp. 1013-1039, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[10] Terence Govender, and Joan Arnedo-Moreno, "An Analysis of Game Design Elements Used in Digital Game-Based Language Learning," *Sustainability*, vol. 13, no. 12, pp. 1-26, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[11] Yigal Attali et al., "The Interactive Reading Task: Transformer-Based Automatic Item Generation," *Frontiers in Artificial Intelligence*, vol. 5, pp. 1-13, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[12] Kenneth Heafield et al., "Findings of the Fourth Workshop on Neural Generation and Translation," *Proceedings of the Annual Meeting of the Association for Computational Linguistics*, pp. 1-9, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[13] Kelsey K. James, and Richard E. Mayer, "Learning a Second Language by Playing a Game," *Applied Cognitive Psychology*, vol. 33, no. 4, pp. 669-674, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[14] Pavel Brebera, "Microlearning in Foreign Language Courses: A Threat or a Promise?," *Proceedings of the European Conference on e-Learning*, pp. 85-93, 2017. [Google Scholar]

[15] Antonie Alm, and Larian M. Nkomo, "Chatbot Experiences of Informal Language Learners: A Sentiment Analysis," *International Journal of Computer-Assisted Language Learning and Teaching*, vol. 10, no. 4, pp. 1-15, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[16] Jed A. Meltzer et al., "Improvement in Executive Function for Older Adults through Smartphone Apps: A Randomized Clinical Trial Comparing Language Learning and Brain Training," *Aging*, *Neuropsychology*, *and Cognition*, vol. 30, no. 2, pp. 150-171, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[17] Arya D. McCarthy et al., "Jump-Starting Item Parameters for Adaptive Language Tests," *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*, *Association for Computational Linguistics*, Punta Cana, pp. 883-899, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[18] Gabriel Sebastián, Ricardo Tesoriero, and Jose A. Gallud, "Automatic Code Generation for Language-Learning Applications," *IEEE Latin America Transactions*, vol. 18, no. 8, pp. 1433-1440, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[19] Reza Hadi Mogavi et al., "When Gamification Spoils Your Learning: A Qualitative Case Study of Gamification Misuse in a Language-Learning App," *Proceedings of the 9th ACM Conference on Learning @ Scale*, New York City, USA pp. 175-188, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[20] André Barros de Sales, and João Gabriel Antune, "Evaluation of Educational Games Usage Satisfaction," *2021 16th Iberian Conference on Information Systems and Technologies*, Chaves, Portugal, pp. 1-6, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[21] Victoria Abou-Khalil, Brendan Flanagan, and Hiroaki Ogata, "Personal Vocabulary Recommendation to Support Real Life Needs," *Artificial Intelligence in Education*, *Lecture Notes in Computer Science*, vol. 12749, pp. 18-23, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[22] Rachel M. Roberts, Grace M. Neate, and Amanda Gierasch, "Implicit Attitudes Towards People with Visible Difference: Findings from an Implicit Association Test," *Psychology, Health & Medicine*, vol. 22, no. 3, pp. 352-358, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[23] Sergio A. Zabala-Vargas et al., "Strengthening Motivation in the Mathematical Engineering Teaching Processes – A Proposal from Gamification and Game-Based Learning," *International Journal of Emerging Technologies in Learning*, vol. 16, no. 6, pp. 4-19, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[24] Ido Roll et al., "Understanding the Impact of Guiding Inquiry: The Relationship between Directive Support, Student Attributes, and Transfer of Knowledge, Attitudes, and Behaviours in Inquiry Learning," *Instructional Science*, vol. 46, pp. 77-104, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[25] Filipe Portela, "TechTeach—An Innovative Method to Increase the Students Engagement at Classrooms," *Information*, vol. 11, no. 10, pp. 1-32, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[26] Mesut Alptekin, and Katrin Temmen, "Gamification in an Augmented Reality Based Virtual Preparation Laboratory Training," *The Challenges of the Digital Transformation in Education, Advances in Intelligent Systems and Computing*, vol. 916, pp. 567-578, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[27] Shawn Loewen et al., "Mobile-Assisted Language Learning: A Duolingo Case Study," *ReCALL*, vol. 31, no. 3, pp. 293-311, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[28] Nisfulaila Nursaqian, "*The Effectiveness of Lingodeer Application Toward Students*," Tarbiyah And Teacher Faculty Islamic State University of Raden Intan Lampung, pp. 1-57, 2023. [Google Scholar] [Publisher Link]

[29] Nathaniel Lotze, "Duolingo: Motivating Students via m-Homework," *Tesol Journal*, vol. 11, no. 1, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[30] Mahyudin Ritonga et al., "Duolingo: An Arabic Speaking Skills' Learning Platform for Andragogy Education," *Education Research International*, vol. 2022, pp. 1-9, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[31] Elvis Wagner, "Duolingo English Test, Revised Version July 2019," *Language Assessment Quarterly*, vol. 17, no. 3, pp. 300-315, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[32] Stamatia Savvani, *State-of-the-Art Duolingo Features and Applications*, The Challenges of the Digital Transformation in Education, Advances in Intelligent Systems and Computing, Springer, Cham, vol. 917, pp. 139-148, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[33] Duy Huynh, Long Zuo, and Hiroyuki Iida, "An Assessment of Game Elements in Language-Learning Platform Duolingo," *2018 4th International Conference on Computer and Information Sciences*, Kuala Lumpur, Malaysia, pp. 1-4, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[34] Talia Isaacs et al., "Examining the Predictive Validity of the Duolingo English Test: Evidence from a Major UK University," *Language Testing*, vol. 40, no. 3, pp. 748-770, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[35] Matt Kessler, "Supplementing Mobile-Assisted Language Learning with Reflective Journal Writing: A Case Study of Duolingo Users' Metacognitive Awareness," *Computer Assisted Language Learning*, vol. 36, no. 5-6, pp. 1040-1063, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[36] Mitchell Shortt et al., "Gamification in Mobile-Assisted Language Learning: A Systematic Review of Duolingo Literature from Public Release of 2012 to Early 2020," *Computer Assisted Language Learning*, vol. 36, no. 3, pp. 517-554, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[37] Gustavo Willians Soad, Nemésio F. Duarte Filho, and Ellen Francine Barbosa, "Quality Evaluation of Mobile Learning Applications," *2016 IEEE Frontiers in Education Conference (FIE)*, Erie, PA, USA, pp. 1-8, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[38] Mehran Gholizadeh et al., "Emergent Affordances and Potential Challenges of Mobile Learning Apps: Insights from Online Reviews," *Information Technology and People*, vol. 35, no. 7, pp. 2500-2517, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[39] Weni Dwi Kuncaring Madya Susila, "The Lingodeer Mobile Application To Learn Mandarin," *Proceedings of the 2nd International Conference on Social Sciences*, Purwokerto, Central Java, Indonesia, pp. 1-17, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[40] Tong Li et al., "What Apps Did You Use?: Understanding the Long-Term Evolution of Mobile App Usage," *Proceedings of the Web Conference 2020*, Taipei, Taiwan, pp. 66-76, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[41] M.E. Ismail et al., "Implementation of the Gamification Concept Using KAHOOT! among TVET Students: An Observation," *Journal of Physics: Conference Series*, vol. 1140, pp. 1-8, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[42] Ruti Gafni, Dafni Biran Achituv, and Gila Joyce Rachmani, "Learning Foreign Languages Using Mobile Applications," *Journal of Information Technology Education: Research*, vol. 16, pp. 301-317, 2017. [CrossRef] [Google Scholar] [Publisher Link]