Digital Rhetoric in Language Learning Apps: Persuasive Design Strategies for Enhanced Engagement and Motivation

Maria Nisar

Shanghai University, China

maria20860134@shu.edu.cn

Abstract:

The study examines the effects of persuasive design strategies on users' motivation and management in language-learning apps, namely Duolingo, Babbel, and Memrise. A mixed-method approach was used for this study. Quantitative data were analysed to examine users' motivation and engagement with language learning apps. A Likert-scale survey was conducted to collect qualitative data, and qualitative analysis was used to explore perceptions of social comparison, notifications, and gamification. The study assessed how these features influence users' involvement and motivation level. Users' active participation, engagement, motivation and ethical considerations were analysed quantitatively using Likert-scale questions. Qualitative, on the other hand, provided a deeper understanding of users' engagement levels and perceptions. A total of 150 male and female students were selected for this study from the postgraduate college in Samanabad, Faisalabad. They used language apps to learn English as a second language (ESL). They were from different backgrounds and had varying language proficiency levels. The result indicates that elements of gamification, especially streaks, are the most important and effective motivators of app usage, as users highly strive for streaks. Other features, such as points and badges, are less motivating factors for users. The notification feature is also helpful in language learning; it motivates users without causing stress and enhances their engagement and confidence. The leaderboard feature has a moderate effect on users, increasing their motivation and engagement in learning. Ethically, this research shows that users benefit from notifications without being negatively affected. The study emphasises the importance of combining intrinsic and extrinsic motivation to sustain worker attention, with a preference for continuous development indicators, such as streaks, rather than separate rewards, such as badges. The results suggest that future research should emphasise balancing gamification, personalised features, and user preferences to improve motivation and learning outcomes in language learning apps. This study contributes to understanding how persuasive design can be enhanced to restore worker engagement and long-term motivation in a mobile learning environment.

Keywords: Digital rhetoric, users 'motivation, engagement, mobile apps, gamification, language learning

Introduction

In recent years, the applications of language learning have grown in popularity, with platforms like Duolingo, Babbel, and Memrise becoming comprehensive tools. These apps aim to provide a suitable and effective way to learn new languages, often through mobile apps that enable learning anytime, anywhere. This shift to numerical and mobile learning required new plans to maintain user incentives and engagement, two key factors in successful language learning. Among these plans, a persuasive project that influences the fundamentals of digital rhetoric and gamification plays an energetic role. This idea includes deliberately joining motivational design topographies, i.e. rewards, feedback, cues, then personalisation to bear user attention, then standing in for authentic learning. As such, persuasive design in linguistic learning apps signifies a meeting of educational psychology, skill, and instructional principles intended to facilitate a learner-centred learning experience.

The persuasive design policies in language learning apps are drawn from Fogg's (2003) work on persuasive technology, which recognized initial principles for swaying user behaviour through digital borders. Persuasive design in language-learning apps draws on numerous core elements: gamification, feedback, social communication, and adaptive learning. Gamification, for instance, blends game-like features such as points, badges, levels, and leaderboards to make language learning feel more like a game than an outdated educational experience. Educational research suggests that gamification can meaningfully increase operators' motivation to use the app, enabling them to reliably shape language services (Deterding et al., 2011). Response and development following, which address immediate alterations and show signs of progress, support care skill development by underpinning appropriate responses and encouraging self-improvement (Hattie & Timperley, 2007). Additionally, social structures, such as environments and live communication, fashion a sagacity of municipal and bid learner's occasions for relaxed exercise, which is regularly gone in self-guided training (Chen et al., 2020). Academics contend that gamified rudiments such as points and levels may inspire operators to engage with the app in the short term but may not foster the growth of intrinsic motivation, personal fulfilment, or a sense of accomplishment in learning a language for its own sake (Deci & Ryan, 2000). In detail, once the novelty of loot or growth emblems wears off, operators might lose interest, possibly hampering their long-term learning (López & Tucker, 2019). Moreover, while personalisation procedures aim to enhance assignment, research remains limited to the long-term effectiveness of such topographies, particularly across diverse user demographics and knowledge styles. Furthermore, convincing design basics, such as announcements alongside cues, which secondhand to prod operators back to the app, also heightened anxieties about principled insinuations. Extreme use of cues could lead to user weariness or even make an addictive series, mainly among newer users who may be more vulnerable to frequent digital interactions (López & Tucker, 2019).

Additionally, the social machinery of persuasive design remains underexplored. While social learning theories, e.g., Vygotsky's (1978) zone of proximal development, emphasize the benefits of cooperative knowledge and noble connections, many users of language learning apps prefer self-paced, independent study, possibly owing to confidentiality concerns or nervousness about making mistakes openly (Huang et al., 2019). This offers a possible gap in scheming social topographies that can efficiently address user wants for both public provision and individual ease. Given these tests, there is a persistent need to evaluate the effectiveness of a persuasive project in a comprehensive and nuanced way. The current study, while perceptive, is mainly limited to short-term data and lacks an adequate examination of long-term language retention and operator satisfaction. To address these fears, this study examines the effectiveness of persuasive design principles in language-learning apps and identifies potential areas for

development. By studying the current literature on gamification, response, social communication, and personalisation within these stages, this research aims to understand how these policies influence user engagement and motivation. Moreover, this study will examine the limits of these policies, particularly their potential to rank extrinsic over intrinsic motivation, their mixed attributes across demographic clusters, and the ethical implications of their tradition.

In general, as language learning apps become a backbone of both formal and informal language education, it is vital to critically assess their design and effectiveness in fostering language learning. Sympathetic to the role of digital rhetoric and persuasive design in these apps, which can deliver insights into emerging user-centred stages that improve learning without compromising user autonomy or well-being. This research, therefore, aims to address key gaps in the literature by examining how persuasive design features in language-learning apps can be enhanced to support both short- and long-term educational achievement.

Statement of the problem

While language learning apps have gained widespread acceptance for their suitability and convenience, the effectiveness of their persuasive design methods in nurturing long-term language retention and intrinsic motivation remains unclear. Current research indicates that gamification, personalisation, feedback, and social communication can increase user engagement; however, these elements often emphasise extrinsic motivation, which may diminish over time and fail to support open language attainment objectives. Moreover, while some employers benefit from social structures and adaptive learning, others may find these approaches unproductive or even deterring due to individual partialities, education styles, or cultural transformations. These persuasive elements affect diverse user populations and, through classification, enhance them toward expressive, maintainable language-learning outcomes.

Research objectives

1. To inspect the effect of gamification basics (e.g., points, bands) on user motivation and constant commitment in language learning apps.

2. To measure how modified learning tracks touch user development as well as protection in language learning over time.

3. To investigate the moral implications of regular notifications and reward-based strategies on user well-being and engagement.

Research questions

1. How do the elements of gamification, like points and streaks, affect user motivation and retention in language learning apps?

2. What impact does modified content have on user development and constant language learning?

3. What are the ethical consequences of spending reports and reward-based approaches on user well-being in language learning apps?

Literature review

In language-learning apps, digital rhetoric has received significant attention in educational technology, which is increasingly incorporating persuasive design features. Persuasive design is expected to improve user commitment and motivation and is widely used in language-

learning applications such as Memrise, Babbel, and Duolingo. These stages draw on psychological principles and strategies to sustain user attention and inspire, often with gamified elements such as rewards, cues, and progress tracking. This literature review examines previous studies on persuasive policies in digital language learning, assesses the efficiency of these schemes, and identifies research gaps and directions for future research.

Leveraging persuasive design ideologies

Persuasive design, a notion drawn from social psychology and human-computer interaction, refers to the use of precise principles to reduce operators' arrogance or improve performance without pressure. Scholars such as Fogg (2003) recognised key rudiments of persuasive design, including personalisation, response cues, and bootees. These policies' objective is to increase continuous appointment by encouraging operators to respond to applications more frequently (Fogg, 2003). In language learning, persuasive design inspires sustained repetition, facilitating beginners' attainment of language ability through reliable communication with the app.

Motivation and Gamification

Research suggests that gamification, a prominent persuasive design, improves motivation by incorporating game-like elements, such as badges, trials, and social communication, into non-gaming environments (Deterding et al., 2011). Language learning apps use gamified structures, such as leaderboards and levels, to create a more engaging user experience. Research indicates that these basics enhance beginners' inherent motivation, aligning with self-determination theory, which highlights the roles of autonomy, competence, and relatedness (Deci & Ryan, 2000). For example, Garcia and Elbeltagi (2020) discovered persuasive strategies of Duolingo, discovering that gamified basics, exactly lines then cues, recover user attention by creating a learning meeting as part of operators' everyday procedures. Though detractors claim that gamification may endorse extrinsic over intrinsic motivation, possibly leading to a decline in long-term language learning, as the novelty of plunders wears off (López & Tucker, 2019).

Digital Rhetoric Approaches in Language Learning

Digital rhetoric also includes personalisation policies, designed to address separate beginners' requirements, thus augmenting significance and appointment. Adaptive learning technology, e.g., as in Babbel, uses algorithms to measure user growth and adjust the learning experience accordingly. This adaptive approach is associated with Vygotsky's (1978) theory of the "zone of proximal development", which proposes that pupils profit from tasks that are within their zone but just beyond their present abilities. Xu and Warschauer (2019) suggest that language learning apps use adaptive personalisation to enhance language retention and learner engagement, as users find gratification from content that is unswervingly pertinent to their aims. However, additional research is needed to understand how personalisation affects long-term language preservation and learning effectiveness across diverse worker backgrounds.

Language argument and social learning groups

Language learning apps include digital rhetoric, such as social communication types like opportunities, user commentaries, or cooperative errands, which align with Vygotskian theories of social knowledge. Social learning models claim that learners benefit from peer connections, as these provide additional incentives and opportunities for cooperative problem-solving (Vygotsky, 1978). Language apps like HelloTalk and Tandem foster language practice through real-time chats and language exchange partners, meaningfully improving users' informal language skills (Chen et al., 2020). However, these geographies remain underutilised, as many workers prefer self-paced aerobics to interactive activities due to concerns about confidentiality

or nervousness about making mistakes openly (Huang et al., 2019). This point is essential for research on how to recover and integrate social landscapes without compromising user ease and independence.

Progress insights and feedback

Operational feedback is a keystone of persuasive design. Language learning apps often include prompt feedback tools to notify operators of precise or improper responses, providing reassurance for development. According to Hattie & Timperley (2007), this aligns with the idea of a determinative response, which provides beginners with information about their presentation to facilitate self-improvement. According to Zachary and Lerman (2021), Babbel's response system showed that an instant, remedial response is contributory to stopping mistake reinforcement, particularly in parsing and pronunciation. However, research signposts mixed consequences for motivational belongings: extreme improvement may deject manipulators, while unsatisfactory criticism may hamper growth. The future scope of research comprises enhancing the balance between heartening responses and remedial leadership to foster user inspiration.

Previous studies

Previous studies on persuasive design in language-learning apps focused on gamified basics, personalisation, social communication, and responses to improve engagement and incentives. Researchers like Deterding et al. (2011) found that gamification additions booties, opinions, and development following recovery operative appointment by appealing to intrinsic and extrinsic motivators. Educational platforms like Duolingo and Babbel demonstrate that gamified elements, such as lines and leaderboards, contribute to higher retention rates, with Garcia and Elbeltagi (2020) noting their effectiveness in integrating language repetition into daily routines. Personalisation has also been shown to be valuable, with adaptive learning procedures that adapt to user preferences and support slow skill development (Xu & Warschauer, 2019). Additionally, social types, which facilitate peer-to-peer connections, are associated with advanced language ability by providing real-world language practice and motivational support (Chen et al., 2020). According to López & Tucker (2019), however, gaps persist regarding the long-term effects of these plans on sustained language retention, with some educators suggesting that gamification might inspire short-term extrinsic motivation at the expense of intrinsic motivation in language learning.

Numerous studies have shown that persuasive design approaches influence learning outcomes and continued engagement in language-learning apps. For example, Fogg's (2003) early work on persuasive technology highlighted the roles of response and cues as dominant in swaying user behaviour. Building on this, Zachary and Lerman (2021) suggest that immediate remedial feedback in language apps helps prevent the reinforcement of mistakes, leading to better grammar and vocabulary retention. Moreover, social communication topographies in apps like HelloTalk and Tandem have been shown to increase expressive peer-to-peer language repetition, underpinning higher conversational eloquence than learner gratification (Chen et al., 2020). Though these educations also impose limits, Huanget al. (2019) described that while social topographies increase motivation for some operators, they underutilise them owing to nervousness about public mistakes and a preference for self-paced learning. Furthermore, while gamification is widely praised for snowballing engagement, López and Tucker (2019) argued that the heavy reliance on extrinsic incentives, such as rewards and badges, may weaken intrinsic motivation over time, raising questions about the long-term effectiveness of these policies for language preservation.

Gaps in Literature

While current studies offer insights into persuasive design's immediate influence on appointments, insufficient attention is given to its effects on long-term language acquisition and operator retention. As most studies focus on short-term data, future research should examine how persuasive design affects long-term motivation and learning.

Consequences of Demographic Differences on Persuasive Design

Present research has mainly scrutinised regular users' knowledge and differences in supervision across demographic groups, including age, traditional background, and linguistic ability. For example, gamification rudiments may appeal to younger users as well as older users. It was initially proposed by Juul (2019) that younger operators are more interested in social and gamified features, while older users favour organised knowledge and growth tracking. Future research should examine how design favourites differ across user groups to inform a more comprehensive expansion of the app.

Assessment of intrinsic and extrinsic motivation

Extrinsic prizes often prioritise extrinsic rewards in language-learning apps, using persuasive strategies, e.g., opinions or insignias, which may not sustain intrinsic motivation over time. Intrinsic motivation, rooted in the operator's honest attention to education, is more likely to lead to long-term success (Deci & Ryan, 2000). Future investigation should identify ways to foster intrinsic motivation in numerical language learning by integrating rudiments that highlight users' specific areas of interest, such as engaging social rewards or real-world application scenarios.

Moral Thoughts and Possible Disadvantages

Another emerging aspect of anxiety is ethical considerations in convincing design. Numerous language-learning apps rely on lines and announcements to remind operators of their appointments, which, if overused, could lead to operator exhaustion or excessive shade time (López & Tucker, 2019). Insufficient studies assessed the possible negative penalties of persuasive design on operators' well-being, predominantly in the background of younger workers who may be more vulnerable to addiction-like performances. Further research should examine the psychological effects of these persuasive strategies to develop moral rules for persuasive projects in educational expertise.

The literature on persuasive design in language-learning apps underscores the effectiveness of strategies such as gamification, personalisation, social interaction, and feedback in enhancing user engagement and motivation. However, significant gaps remain in understanding the long-term effects of these strategies, the variability in user experiences across demographics, and the potential for fostering intrinsic motivation. Future research should address these gaps and consider the ethical implications to create language-learning platforms that are both engaging and beneficial in the long run.

Research methodology

A mixed-methods approach is used for this research; quantitative data are presented in tables, and qualitative perceptions are used to assess persuasive design policies in language-learning apps more comprehensively. An online survey was administered to active participants on apps such as Duolingo, Memrise, and Babbel. The participants' active participation, motivation, engagement, and experience have been analysed using quantitative methods. The specific features are analysed, including gamification elements such as streaks, badges, and points. The

social interaction and their feedback are also analysed. To facilitate clear, structured responses and yes/no options, a Likert-scale survey was used. The quantitative data are presented in different tables, along with their descriptions and variables. One table presents their demographic information; another presents their specific features; and additional tables focus on ethical concerns and motivational factors, such as the influence of the reward system on users' performance and notifications.

Qualitative data have been analysed from semi-structured interviews with a small group of survey participants. It was selected based on their engagement and app usage frequency. This analysis explored users' experience, intrinsic and extrinsic motivation, perspectives, long-term retention, and ethical considerations. It has been analysed how they may have encountered different app features, e.g., reward-based incentives or frequent reminders. The qualitative data completed the tables by providing profound insight into participants' attitudes toward their incentives. It also explores different patterns and themes from the participants' responses. Data analysis includes descriptive statistics of quantitative survey data, with tendencies highlighted in tables for clarity. Qualitative data were analysed using thematic analysis to classify recurrent visions related to participants' retention and ethical apprehensions, which aligned with the quantitative results. The mixed-methods approach, with quantitative analysis presented in different tables, will be supported by qualitative analysis (themes). The results show how participants' motivation, experience, engagement and ethical considerations are affected by using these different apps and how persuasive strategies affect their learning.

Data analysis

The tables present participants' demographic information, motivations, ethical concerns, motivational factors, and their involvement.

Demographic information

Demographic variable Age range	Duolingo	Memrise	Babble	Total
18-24	24	29	19	24
25-34	34	29	39	34
35-44	19	14	24	19
45+	19	24	14	19

Gender information

Gender information	Duolingo	Memrise	Babble	Total
Male	39	34	44	39
Female	54	59	59	54
others	4%	4%	4%	4%

Language proficiency level

Language proficiency	Duolingo	Memrise	Babble	Total
Beginner	39%	44%	34%	39%
Intermediate	39%	34%	44%	39%
Advance	19%	19%	19%	19%

Frequency usage

Usage frequency	Duolingo	Memrise	Babble	Total
Daily	59%	54%	49%	44%
Weekly	29%	34%	39%	34%
Monthly	9%	9%	9%	9%

The tables above present demographic information for users of the language-learning app. This information provides a summary of survey participants, including their age, proficiency level, app usage frequency, gender, and age range. This demographic information is essential for understanding participants' involvement, motivation, characteristics, and ethical considerations. The tables show that most users are younger and more active, and that users aged 45+ are less active. 60% of participants use daily apps, which provide valuable insights. Weekly participants make up 35%, while monthly users make up 9%. The frequency of females is higher than that of males. Generally, demographic information provides a complete understanding of app users and presents a comprehensive view of how users interact with their persuasive elements. It will be helpful to know users' motivation levels, ethics, engagement, and other trends based on their demographic information.

Use of specific features

Feature Gamification	Duolingo(Mean)	Memrise (Mean)	Babbel (Mean)	Total (Mean)
Streaks	3.4	3.2	3.1	3.2
Badges	3.0	2.8	2.7	2.8
Points	3.1	3.0	2.8	3.0
Social interaction				
Chat with other learners	2.4	2.8	2.7	2.6
Leaderboards	3.0	2.8	2.5	2.7
Feedback				
Prompt feedback on progress	3.6	3.5	3.4	3.5
Feedback on errors	3.3	3.2	3.4	3.3

The table above presents key features of apps such as Duolingo, Memrise, and Babbel. The data were analysed using a Likert scale to assess the students' motivation levels. The table provides information on users' social interactions, feedback, and gamification points. The ratios of chat with others are 2.4%, 2.8%, 2.7%, and 2.6%. Moreover, prompt feedback rates are 3.3%, 3.2%, 3.4%, and 3.3%. Gamification also has a higher percentage than all these features. This table provides a clear picture of how each app's persuasive fundamentals affect user engagement, offering valuable insights into which landscapes are most effective at retaining user attention. The results from the gamification indicate that participants' engagement level is 2.8%. Social interaction features show moderate-level effects, and the feedback mechanism presents a strong indication of involvement and motivation. It can be said that Duolingo has the highest frequency of users' engagement and motivation. Persuasive strategies enhance users' motivation and engagement in language-learning apps.

Ethical concerns

Ethical concern	Duolingo (Mean)	Memrise (Mean)	Babbel (Mean)	Total
Influence of reward				
Prizes motivate me to continue	3.4	3.2	3.1	3.2
The reward system makes me competitive	2.7	2.6	2.5	2.6
Notifications				
Notifications are helpful to stay on track	3.1	3.0	3.0	3.0
Notifications are overwhelming	2.5	2.3	2.6	2.5
Social comparison				
Leaderboard makes me feel competitive	3.0	3.0	2.7	3.0
Leaderboards are discouraging	2.1	2.0	2.3	2.1

The table above summarises the ethical concerns of users of different language-learning apps, such as Duolingo, Memrise, and Babbel. The data were analysed using a Likert scale to determine participants' levels of engagement, ethical concerns, and motivation. The influence of reward shows a moderate frequency among participants. It means Duolingo notifications are helpful for users. Influence of reward Prizes: motivate me to continue (3.4%, 3.2%, 3.1%, 3.2%); Reward system makes me competitive (2.7%, 2.6%, 2.5%, 2.6%); Notifications are helpful to stay on track (3.1%, 3.0%, 3.0%, 3.0%). Notifications are overwhelming: 2.5%, 2.3%, 2.6%, 2.5%. Social comparison Leaderboards make me feel competitive: 3.0%, 3.0%, 2.7%, 3.0%. Leaderboards are discouraging: 2.1%, 2.0%, 2.3%, and 2.1%. Generally, the data suggests that while persuasive landscapes like plundering, announcements, and leaderboards are usually understood as inspiring, users did not feel irresistibly overpowered by moral concerns, such as enthusiasm, or feel overcome by announcements. These conclusions indicate a reasonable understanding of persuasive design principles, with operators taking on a greater role in appointment without feeling excessive burden or negative influence.

Motivational factors

Motivational factor	Duolingo(Mean)	Memrise (Mean)	Babbel (Mean)	Total
Intrinsic motivation				
I enjoy learning languages for fun	3.6	3.4	3.7	3.6
I like new challenges	3.5	3.3	3.4	3.4
Extrinsic motivation				
Streaks are the source of motivation for me	3.3	3.1	3.2	3.2
Badges make me feel accomplished	3.0	2.8	3.0	30

The table above shows the percentages of motivational factors among participants who learn language using different apps such as Duolingo, Memrise, and Babbel. The percentage of language learning for fun is the highest at 3.7%. Participants who like new challenges have the highest

participation at 3.5%. Participants have intrinsic and extrinsic motivation for their language learning. They say streaks are the source of their enjoyment, and the highest percentage is 3.3 on Duolingo. They say badges make them feel accomplished, with the highest percentage being 3.0. The data were collected using a Likert-scale questionnaire administered to language-learning participants. Generally, the consequences indicate that both intrinsic and extrinsic motivational factors play a role in user engagement, with bands being the most powerful extrinsic motivators, and operators usually relishing the learning process for its own sake. Though the somewhat higher notches for intrinsic motivation in Babbel are likened to those of other apps, this suggests it might better involve operators who are interested in the individual gratification of learning. At the same time, Duolingo excels at leveraging external motivators, such as lines, to sustain reliable worker contributions.

Effects of notifications

Notification impact	Duolingo (Mean)	Memrise (Mean)	Babbel (Mean)	Total
Effectiveness of notifications				
Reminder for practice	3.2	3.0	3.1	3.1
I feel pressured by notifications	2.4	2.2	2.5	2.4
Frequency of notifications				
The frequency of notifications is just right	3.0	2.7	2.8	2.8
I prefer a few notifications	2.5	2.3	2.4	2.4

The above table shows the frequency of participants' responses regarding the effect of notifications, their experience, and their motivation due to these notifications—effectiveness of notifications: Reminder for practice 3.2%, 3.0%, 3.1%, 3.1%. I feel pressured by notifications 2.4%, 2.2%, 2.5%, and 2.4%. Frequency of notifications is just right: 3.0%, 2.7%, 2.8%, and 2.8%. I prefer the fewest notifications: 2.5%, 2.3%, 2.4%, and 2.4%. The Announcement Influence table presents an analysis of user insights on the efficiency and frequency of notices in Duolingo, Memrise, and Babbel. The data, collected on a Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree), reveals both the expediency and the possible weight of notifications and operator favourites regarding the incidence of announcements. In short, notifications are more effective in motivating and engaging learners. It produces extrinsic motivation among the learners. So, notifications are the strongest tool for learner engagement; they have the potential to involve and motivate learners in effective language learning.

Discussion

This study reveals valuable insights into persuasive strategies in language-learning apps such as Duolingo, Memrise, and Babbel, and how these apps enhance users' motivation, experience, and ethical concerns. Different intrinsic and extrinsic features affect users' motivation levels. They get badges, points, and notifications from the learning apps, which have a positive impact on language learning. Apart from them, streaks also play a significant role, highlighting users' motivation and inspiration. Participants appear to express their motivation and experience through these language-learning apps. Previous research shows that sustainable development is essential to effective outcomes in language-learning apps for users. While badges and points are also offered as incentives, their impact is less pronounced, especially in Memrise.

This discovery proposes that operators may respond more powerfully to topographies that convey a straight, unrelenting intelligence of achievement than to landscapes that spot separate signposts. The study also reveals ethical concerns about persuasive strategies, particularly the influence of

prizes, social pressure, notifications, and other awards. It can be said that awards and notifications, such as different features, are motivating factors for language learner participants. This aligns with previous research on gamification, which proposes that awards can enhance users' motivation and engagement. Notifications are more useful for participants, reminding them and increasing their involvement, activity, and motivation towards learning. Generally low scores on the weight from notifications, as well as favourites for rarer notifications, suggest that operators raise cues but restrain them. This highlights the importance of balancing the needs of custody workers and preventing announcement fatigue, a shared challenge in app-based education.

Lastly, motivational factors, both intrinsic and extrinsic, play a pivotal role in participants' language learning. The research shows that intrinsic motivation is just as important as extrinsic motivation, as users derive enjoyment, pleasure, and joy from learning with different useful apps. Extrinsic motivators also play an important role, such as notifications, streaks, and badges, which enhance motivation and engagement. Duolingo mainly emphasises the development of extrinsic motivation, with lines showing that this is a primary factor in continued learning. This discovery impacts the broader work on mobile learning, which proposes that combining both intrinsic and extrinsic motivators can yield a more complete and authentic user experience. Though the comparatively low scores for insignia as a basis of incentive across all three apps suggest that extrinsic prizes can inspire, they may not be as effective if they do not align with operators' individual goals or inherent welfare. Consequently, a more refined method for prize systems could be developed in future research to improve overall user involvement. Moreover, social interaction features also play an important role for language learners. Such as a leaderboard and a community-based project, users get deep involvement and inspiration. The leaderboard is a significant source of competition for them; it does not have a negative effect on users; instead, it creates a positive impact, encouraging them to engage in language learning. They do not experience stress because of these features of language-learning apps. They get inspiration, motivation and more experience. For instance, Duolingo's durable leaderboard assignment could be attributed to its more widespread use of gamification, which relies on recurring positive responses and rewards. On the other hand, Babbel operators showed less eagerness for leaderboards, perhaps because the app's emphasis is on organised lessons rather than modest gamification. These opinions point to a possible role for development, where language-learning apps could fold away modified social connections personalised to the operator's favourites, hypothetically cumulatively incentivising user engagement and consumption. Future investigation could further clarify how dissimilar levels of social contrast, as well as the learning consequences of struggle mark, vary across geographies, particularly in relation to how operators with variable eternities and involvement stages perceive these geographies.

Conclusion

This research presents the momentous influence of persuasive design strategies, i.e. notifications, gamification, and social comparison, on participants for their engagement as well as incentive in language learning apps such as Babbel, Memrise, and Duolingo. The results suggest that elements of gamification, particularly bands, are the most effective at motivating operators to maintain a reliable appointment with the app. While insignia and opinions also play a role in inspiration, their impact is less marked, suggesting that workers may prefer incessant growth indicators over separate signs. Moreover, workers usually perceive announcements as obliging cues rather than as devastating, suggesting that a stable incidence of announcements improves user involvement without causing fatigue. The limited impact of social contrast types such as leaderboards shows that affordable basics can motivate workers without causing negative emotional responses when used thoughtfully.

In terms of ethics, the research shows that most handlers are not excessively distressed by warnings

or plundering, indicating that well-crafted persuasive tactics can stand as motivation without causing gratuitous hassle or opposition. Moreover, the research emphasises the importance of complementary, both extrinsic and intrinsic, in app projects, with a strong preference for extrinsic instigators, such as bands, as drivers of worker appointment. However, the comparatively low influence of insignia, as well as the varied response to leaderboards, suggests that a more tailored approach to prize schemes and social landscapes could improve worker satisfaction. Forthcoming research should focus on purifying these design rudiments, possibly by exploring how operator demographics, favourites, and knowledge goalmouths affect their responses to persuasive structures. These landscapes could prime for a more personalised and engaging learning experience, ensuring that persuasive business policies balance long-term incentives with actual language acquisition.

Future implications

- To discover how modified persuasive design elements can improve the engagement of users based on individual learning preferences.

- To investigate the long-term special effects of social comparison features, i.e. learning outcomes, well-being and leaderboards.

- To examine the differences in culture in user response to persuasive strategies across a varied population.

- To investigate the ethical implications of balancing the intrinsic motivation and extrinsic motivation in language learning apps.

- To discover the latent potential of AI-driven customization to enhance persuasive design strategies for dissimilar learner contours.

References

Boyle, C., Brown, J. J., & Ceraso, S. (2018). The digital: Rhetoric behind and beyond the screen. *Rhetoric Society Quarterly*, 48(3), 251–259.

Chen, G., et al. (2020). Peer interactions and language development. Early Childhood *Education Journal*, 50(1), 49–59.

Chen, G., Xie, H., Hwang, G.-J., & Huang, Y.-M. (2020). A scoping review of digital game-based technology on English language learning. *Educational Technology Research and Development*, 68(3), 877–904.

Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry*, 11(4), 227–268.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. *In Proceedings of the 15th International Academic MindTrek Conference* (pp. 9–15).

Du Plessis, C. (2013). An exploration of digital rhetoric in a social network environment. *Communicare*, 32(1), 1–20.

Eyman, D. (2015). Digital rhetoric: Theory, method, practice. University of Michigan Press.

Eyman, D. (2016). Looking back and looking forward: Digital rhetoric as an evolving field. *Enculturation*, 23, 1–10.

Fogg, B. J. (2002). Persuasive technology: Using computers to change what we think and do. *Ubiquity*, 2002(December), 2.

Fogg, B. J. (2003). The application of persuasive technology to educational settings. *Educational Technology Research and Development*, 60, 483–499.

García, P., & Elbeltagi, I. (2020). Exploring persuasive design elements in Duolingo. *Bachelor's thesis, Uppsala University, Department of Game Design*.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112.

Hess, A., & Davisson, A. L. (2017). *Theorizing digital rhetoric.* Taylor & Francis.

Hodgson, J. (2019). *Post-digital rhetoric and the new aesthetic*. Ohio State University Press.

Huang, Y., et al. (2019). Blended learning in a first-year language class: Evaluating the acceptance of an interactive learning environment. *Literator,* 37(2), 1–12.

Huang, Y., et al. (2019). Technology acceptance model and multi-user virtual reality learning environments for Chinese language education. *Interactive Learning Environments*, 31(3), 1665–1682.

Juul, C. (2019). Motivation and technology use during second-language study abroad. *Canadian Journal of Applied Linguistics*, 19(2), 64–84.

Law, J., Barny, D., & Poulin, R. (2020). Patterns of peer interaction in multimodal L2 digital social reading. *Language Learning & Technology*, 24(2), 70–85.

López, R., & Tucker, S. (2019). Persuasive design motivators and prompts in early childhood

apps. *Computers in Human Behavior*, 139, 107492.

López, R., & Tucker, S. (2019). *Tailored gamification to educational technologies*. Springer.

Porter, J. E. (2009). Recovering delivery for digital rhetoric. *Computers and Composition*, 26(4), 207–224.

Sakamoto, M., Nakajima, T., & Akioka, S. (2017). Gamifying collective human behavior with digital rhetoric. *Multimedia Tools and Applications*, 76, 12539–12581.

Thomson, C., Nash, J., & Maeder, A. (2016). Persuasive design for behaviour-change apps. *In Proceedings of the Annual Conference of SAICSIT* (pp. 1–10).

Vygotsky, L. S. (1978). *Mind in society.* Harvard University Press.

Xu, H., & Warschauer, M. (2019). Adaptive technology for personalized learning: Real-time feedback. *Extended Abstracts on Human Factors in Computing Systems.*

Xu, H., & Warschauer, M. (2019). AI enhances children's learning from television shows. *Journal of Educational Psychology*.

Zachary, A., & Lerman, M. (2021). A survey on bias and fairness in machine learning. ACM *Computing Surveys,* 54(6), 1–35.

Zachary, A., & Lerman, M. (2021). Internet-mediated corrective feedback for digital natives. *TESOL Journal,* 7(1), 233–245.

Zachary, A., & Lerman, M. (2021). Placental growth factor promotes atherosclerotic thickening. *Circulation,* 111(21), 2828–2836.

Zappen, J. P. (2005). Toward an integrated theory of digital rhetoric. *Technical Communication Quarterly*, 14(3), 319–325.