

Chinese Second Language Learners' Perceptions of Gamification in an Informal Learning Environment: Duolingo as a Case Study



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Abstract In recent years, Mobile-Assisted Language Learning (MALL) and gamification have gained much attention around the world. Both learning strategies are appealing because the MALL offer learners easy and convenient access to language learning, i.e. learning resources are available anywhere and anytime via mobile devices, while gamification has been demonstrated in numerous empirical studies to be beneficial in increasing learners' motivation and engagement. However, efforts to examine gamification in Chinese as a second language (CSL) learning are still lacking, especially with regard to how CSL informal learners perceive the impact of individual game elements. The aim of this study was therefore to investigate Second Language (L2) adult learners' perceptions of a gamified MALL application and their perceptions of five typical game elements (storyline, challenge, progress bars, rewards and leaderboard) used in a typical gamified MALL application, Duolingo. The results found that storyline and rewards acted as external motivators that contributed to participants' learning motivation, while challenges, progress bars and competition acted as internal motivators that enhanced learners' persistence and developed their self-directed learning ability. In addition, for Chinese learners, the storyline facilitated their understanding and mastery of Chinese characters or words. The findings enhance our understanding of L2 Chinese learning in a gamified MALL setting. We propose several recommendations for future research.

Keywords Gamification · MALL · Chinese as a second language · Motivation · Duolingo

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1 Introduction

In recent years, the number of Chinese language learners has increased as China's economic status has grown globally. Many countries have adopted Chinese as an official foreign language subject, such as Germany and Ireland (Chinadaily, 2019). However, many adult learners are unable to attend formal Chinese language courses due to their full-time or part-time jobs, which leaves them with limited and sporadic time to learn Chinese (Glogowska et al., 2007). MALL, however, offers an informal, low-cost and portable way for adult learners to learn Chinese without the constraints of time and place (Acquah & Katz, 2020; Lam et al., 2018; Poole & Clarke-Midura, 2020).

However, a successful adult learner needs to have good self-directed learning skills and motivation in order to achieve a positive learning experience (Knowles, 1975). Yet, a majority of adult learners report that they are not interested in self-directed learning (Robinson, 1992). However, in order to have a positive learning experience, adult learners need to learn how to engage in self-directed learning. The reason for this is that they choose to use mobile devices to learn Chinese on their own without the guidance and control of an educational institution due to many unavoidable external factors, such as work (Greenhow & Lewin, 2016). At the same time, learning Chinese characters is one of the greatest obstacles for CSL learners (Gong et al., 2020; Hao, 2018), especially for Western learners, such as native English speakers, for whom Chinese is a completely foreign language, both in terms of writing and pronunciation. At the same time, due to the lack of interaction with other CSL learners, the long-term informal self-learning mode can lead to CSL learners feeling isolated and anxious (Hurd, 2005), which can lead to CSL learners gradually losing motivation and even giving up learning Chinese.

So, how can we reduce the dropout rate and increase the motivation of L2 learners who use MALL to learn their target language? Some researchers have used gamified MALL applications to explore their applicability for L2 learners. For example, Redjeki and Muhaji (2021) used Duolingo to teach English grammar in their study and found a significant positive impact on students' motivation and self-directed learning. Empirical studies on the applicability of gamified MALL to L2 learners have been numerous over the past few years, with most demonstrating that this method retains the portability features of the MALL method while using gamification settings to reduce stress and increase motivation and self-directed learning ability for language learners (García Botero et al., 2019). However, these studies have been conducted mainly in the context of Western languages, such as English, Spanish, and Dutch (García Botero et al., 2019; Loewen et al., 2019; Rachels & Rockinson-Szapkiw, 2018), and more evidence is still needed on how informal CSL learners perceive the gamified MALL and how it affects CSL learners' motivation to learn.

In this study, we examine how CSL learners perceive gamified MALL approaches and how gamification is helping to increase their motivation. We examined Duolingo,

a typical gamified MALL application, as a platform and formulated research questions based on the Goal-setting theory and social comparison and sought to analyse changes in respondents' perceptions of the gamification setting during the observation. The results showed that CSL learners found the gamified MALL to be novel and conducive to their motivation in learning.

The rest of the paper is organised as follows. First, we briefly introduce the concept of gamification and MALL. Second, we briefly describe the theoretical rationale for the design of this study. We then report and discuss the results of the quantitative and qualitative data. Finally, we discuss the limitations of the paper and make several suggestions for future research.

2 Literature Review

2.1 Gamification

Gamification refers to 'gamified experiences' (Deterding et al., 2011) designed using game elements in a non-game context, with the aim of increasing user motivation and thus boosting high engagement (Huang et al., 2019). While game elements are an essential component of the gamification process, the emphasis of gamification is on non-game contexts and non-entertainment, which helps to separate gamification from game-based and serious games. Although all three patterns are often used in instructional settings to increase learner engagement and motivation (Flores, 2015; Lam et al., 2018), game elements are only used as supporting elements in gamified settings to increase learner engagement and motivation (Huang et al., 2019) and to help learners develop their self-directed learning skills (Pacheco et al., 2020).

How does gamification affect human behaviour? In Bunchball's (2010) study, he divided the process of how gamification affects human behaviour into two terms, game mechanics and game dynamics. Game mechanics include control mechanisms such as points, challenges, levels and leaderboards, which are used to design gamification experiences to control user actions and behaviours; while the attraction and motivation that game mechanics generate for learners during the gamification experience are referred to as game dynamics, such as rewards, achievements and competition. Although we do not deliver a new model of gamification design in this study, we delineate the gamification elements in a typical gamified language learning platform based on the game mechanics and game dynamics proposed by Bunchball and select the five most commonly used gamification elements to explore informal CSL learners' perceptions towards them. The game mechanics we discuss include storyline, challenge and progress bar, while the game dynamics include reward systems and competition systems.

2.2 *MALL and Gamified MALL*

Mobile-Assisted Language Learning (MALL) is an evolution of mobile learning (m-learning), which is a language learning approach that allows language learners to learn and communicate with any type of mobile device (e.g., smartphone or pad) at any time and in any environment (Kukulska-Hulme & Shield, 2008). It emphasises the use of mobile devices to support language learning, with the advantages of providing language learners with flexibility in time and place, continuity of learning across devices, user-friendliness and cost-effectiveness (Loewen et al., 2019; Trifonova et al., 2004). Moreover, as smartphones are now increasingly common, both formal and informal language learners (Trifonova et al., 2004) have instant access to a wide range of free and up-to-date language learning materials via smartphones and the flexibility to schedule their learning according to their study habits and time. MALL also offers a virtual communicative environment that is more comfortable and relaxed for both learners and teachers than conventional face-to-face language courses, which helps to reduce learning stress (Trifonova et al., 2004). Several empirical studies have also shown that language learners are attracted to MALL, and that it has a positive effect in terms of increasing learners' motivation and knowledge of the grammar of their target language (e.g., Redjeki & Muhajir, 2021).

However, MALL also has some limitations. As MALL is a student-centred model of language learning, unlike the traditional teacher-centred approach to language education, it requires L2 learners to have self-directed learning skills (e.g., self-management and self-control) and sufficient motivation to proceed with their target language learning (Lee et al., 2017). Since most of the language resources available in MALL are web-based (Viberg & Grönlund, 2012), it means that learners will inevitably be exposed to irrelevant information for language learning. If learners lack self-management and self-control, they are likely to be distracted by irrelevant information.

For CSL learners, in particular, learning motivation is essential for them to continue learning Chinese. As empirical studies have shown, the acquisition of Chinese language (words and characters) is one of the challenges faced by CSL learners (e.g. (Hao, 2018)). For example, there are multiple meanings of one word and similar forms of Chinese characters (Gong et al., 2020). Multiple meanings of one character mean that the same character has completely different meanings or idioms in different contexts, e.g., '了'; and similar forms of Chinese characters, e.g., '王' and '玉', have completely different pronunciations and meanings despite their similar forms. These are inevitable challenges for CSL learners and they may lose learning motivation over time, especially those who are informal learners and are at higher risk of dropping out due to the lack of systematic guidance (e.g., goal setting).

Therefore, in order to help L2 learners increase their motivation to learn and thus reduce the dropout rate, Flores (Flores, 2015) suggested using gamification to help L2 learners and stated that gamification has a positive effect on learners' learning experience, which helps to increase learners' self-confidence and improve their learning performance, also enhances the sense of cooperation among learners. In addition,

several researchers have tested the effectiveness of Duolingo as a gamified MALL application in L2 classrooms, and have demonstrated that gamified MALL applications have a positive impact on L2 learners' learning attitudes (Loewen et al., 2019; Rachels & Rockinson-Szapkiw, 2018; Redjeki & Muhajir, 2021). However, more exploration is needed on the impact of gamified MALL approaches on CSL, especially for informal CSL learners. For instance, more exploration is needed on whether the use of gamification in MALL can help informal CSL learners to improve their skills in self-control and self-management, and whether it can reduce their stress in learning Chinese and increase their motivation to learn.

3 Theoretical Framework

Gamification has been widely used in second language education to stimulate learners' engagement and increase their motivation in recent years (Huang et al., 2019). The most commonly used theories in discussing how gamification motivates learners are goal-setting theory and social comparison theory. This study is a case study based on these two theories and competency-based motivation theory, and aims to investigate CSL learners' perceptions of gamification MALL and explore whether it helps to increase informal adult learners' motivation to learn Chinese. In what follows, we first briefly review the definitions of the three theories used to explain learners' motivational needs, namely goal-setting theory, social comparison theory, and competence motivation theory, and briefly analyse how these three theories support CSL learning through the five-game elements we selected in Duolingo.

3.1 *Goal-Setting Theory*

Goal-setting theory refers to the concept that learners consciously set and work towards one or multiple goals and that the goals influence the learner's motivation and academic achievement (Locke & Latham, 2002). Simply put, goal setting is the process by which learners focus their attention on activities related to a goal and then make a sustained effort. For Western learners, Chinese language learning is an easily tedious process that requires them to be able to persist over time, especially for informal learners. Therefore, setting a specific and appropriate goal for CSL learners helps them to focus on learning activities in an informal learning environment (Flores, 2015) and helps learners to assess their learning achievements and adjust their learning plans. Reward systems for game dynamics (i.e., badges) can be set as a specific performance goal (Huang et al., 2019). Badges offer learners a goal and require learners to complete a specified task in order to be awarded the corresponding badge. This facilitates learners to focus on the target learning task associated with the badge. The leaderboard is an element of the game mechanics that also helps learners to set goals and work towards them. Empirical research has demonstrated that reward

systems and competition systems can help promote learner motivation, which leads to increased task completion and engagement (Flores, 2015; Huang et al., 2019).

3.2 Social Comparison Theory

Human beings have an innate desire to compare themselves with others (Festinger, 1954). This desire to compare and compete has both pros and cons. For example, public rankings and visible badges displayed on individual pages are often used as social markers for learners to compare and compete with each other (Hamari, 2017). While this competition is beneficial to increase learner motivation, it can also lead to destructive competition (Gentzkow et al., 2014), for example, competition may negatively affect learner interactions and emotions. Hanush and Fox's (2015) study proved that inappropriate use of competitive elements can lead to negative emotions in learners. This is because learners feel restricted and forced to participate, while they also find it difficult to build interactions with other learners.

3.3 Competence Motivation Theory

The theory of competence motivation refers to the theory of achievement motivation, which is a person's perception and assessment of his or her own competence during an interaction (Harter, 1978). When learners perceive that they are capable of completing a task, their intrinsic motivation increases (Deci & Ryan, 2000) and they are thus motivated to engage in activities that demonstrate their competence. The focus of the theory is on learners' assessment of their own competence and the competencies required for the interactive activity, which influences their motivation to perform. Reward systems such as badges and points are awarded to learners for completing tasks that demonstrate learner competence. In other words, when learners are rewarded for their competence, it increases their intrinsic satisfaction, which positively influences their intrinsic motivation and continued engagement in the interaction to demonstrate their competence (Deci & Ryan, 2000; Harter, 1981).

4 Methods

4.1 Research Questions

The aim of this study was to investigate CSL informal learners' perceptions of the gamified application and the five typical game elements which have been used in Duolingo. The following research questions are thus posed.

- (1) *What are the CSL adult learners' perceptions towards using a typical gamified MALL approach to learning Chinese?*
- (2) *How the gamified MALL affects CSL informal learners' motivation in learning Chinese?*

4.2 Research Design

The purpose of this study was to examine CSL informal learners' perceptions of the gamified MALL approach and to explore which game elements might be beneficial in helping CSL informal learners to become more motivated to learn. A case study was conducted in this study using a gamified MALL platform. The research phase consisted of three stages, namely the planning stage, the action stage, and the analysis and evaluation stage. The planning phase involved identifying the research questions and establishing the theoretical basis for the study. The action phase involved the collection of quantitative and qualitative data. Quantitative data was collected in the first stage using an online questionnaire to understand the learners' perception of MALL and gamification. Six self-developed questions were included (see Fig. 1) and the internal reliability of the scale was tested by Cronbach's alpha with a reliability value of 0.891, much greater than the desirable value of 0.7 (Nunnally, 1994). We distributed the questionnaire in the L2 group on WeChat and the Duolingo learning group on Facebook. A total of 103 valid responses were obtained for the quantitative data study. The second stage was a 4-week in-depth qualitative data collection process, which was designed to gain a deeper insight into the variations of motivation and perceptions of different game elements among adult learners. A total of seven participants who completed the first stage questionnaire volunteered to participate in the second stage interviews, but only six completed the four-week Chinese learning using Duolingo and the weekly semi-structured interviews. Each interview was conducted approximately 10–15 min. The purpose of the weekly interviews was to further explore the participants' learning experiences of gamified MALL. These interviews were conducted in person ($n = 1$) and online, including via email ($n = 1$), Skype ($n = 3$), and Whatsapp ($n = 1$). Five of the participants were interviewed online, as they were in other countries. Sample interview questions are listed in Table 1.

The grounded approach was used to inductively analyse the interview data, allowing the data to generate major themes (Braun & Clarke, 2006). The first author read each interviewee's responses and categorised them into thematic units. Similar units were then categorised into potential thematic groups.



Fig. 1 Perception with gamified MALL Apps (Duolingo)

Table 1 Sample questions used in semi-structured interviews

<ul style="list-style-type: none"> • General questions: <ul style="list-style-type: none"> – How do you first start using Duolingo? Why you choose it? – How do you feel about learning a language through the gamification application by yourself?
<hr/> <ul style="list-style-type: none"> • Impact and perceived deeply influential game elements <ul style="list-style-type: none"> – Do you think of Duolingo is useful for your target language learning? How did it influence your opinion or view about language learning? – Which part in Duolingo you think is the most helpful for your language learning process? – Do you feel able to be familiar using with Chinese through Duolingo? Why or why not?

4.3 Gamified MALL Platform: Duolingo

Duolingo is one of the most downloaded free language learning apps on the app shop for mobile devices, offering 39 language courses for language learners. Originally created in 2011 by Professor Luis Von Ahn and his graduate student Severin Hacker, it aims to be a personal tutor that learners can call on anytime and anywhere, providing personalised language learning guidance and reducing their learning stress through gamified settings (Duolingo, 2020).

According to the official report from Duolingo (Duolingo, 2020), CSL learners are one of the fastest-growing clusters of learners on the platform in terms of the number of users worldwide. However, why CSL learners choose to use Duolingo to learn Chinese, what their perceptions are regarding the setting of using game elements in Duolingo to enhance learner motivation, and whether the gamified elements are conducive to enhancing their motivation are the main reasons why we chose Duolingo as the exploration instrument for this study. In this study, we divided the gamified elements in Duolingo into game mechanics (i.e., storyline, challenge and progress bar) and game dynamics (i.e., reward system and competition), based on the concepts proposed by Bunchball.

Storyline, is mainly reflected in the design of Duolingo's language courses. Duolingo designs different themes based on some common life scenarios to provide CSL learners with an immersive learning experience and facilitate a better understanding of the meaning of Chinese characters and words.

Challenge, as reflected in Duolingo's skill tree system, is a gradual process of progressive challenge. In other words, learners must overcome progressive barriers before they can move on to the next task challenge. In addition, successful challenges give L2 learners a sense of achievement, which in turn has a positive impact on learner engagement.

Progress bars, also known as the experience value, is used to show the learner's current achievement and to help visualise their completion, and it is useful to help learners with self-evaluation and self-reflection.

Rewards, there are two reward mechanisms in Duolingo, namely gold coins and badges. Once L2 learners complete a task, they are automatically awarded different amounts of gold coins depending on the difficulty of the task, which they can use

to unlock tasks on other topics or to buy other language courses on the Duolingo marketplace. The badge is a special type of performance goal setting that asks learners to think about how to complete specific tasks effectively in order to earn different meaningful badges.

Competition, which in this study refers specifically to the leaderboard, is a mode of competition designed to stimulate and increase learner engagement through social pressure.

5 Finding

5.1 *Descriptive Statistics of Respondents and Variables*

There were two phases of data collection in this study, quantitative data (questionnaires) and qualitative data (observations and interviews). The main purpose of the first phase using questionnaires was to discover some basic information about L2 learners using technology (gender and age) and their general perceptions of the gamified MALL application, and to identify potential respondents for the second phase of qualitative data collection. A total of 103 valid responses were obtained during this phase.

In our survey, we used six items to examine learners' attitudes towards technology-assisted L2 learning and their perceptions of the use of gamified MALL applications. The main aim was to investigate L2 learners' perceptions of gamification and game elements by examining the impact of Duolingo on their learning interests, motivation and perception. The overall results were positive, with over half of the participants having a positive view of the use of the gamified MALL approach. 90.29% ($n = 93$) of the participants agreed or strongly agreed that the technology-assisted L2 learning experience was comfortable, 82.52% ($n = 85$) agreed or strongly agreed that the gamified MALL approach was enjoyable for them, and 69.90% ($n = 72$) of participants felt that the gamified learning approach was more effective than the conventional approach. Regarding the gamification setting in Duolingo, 71.84% ($n = 74$) of the participants were confident that they would be able to unlock the next level of Duolingo and 63.11% ($n = 55$) felt that they would be able to successfully challenge all language levels. In addition, 74.76% ($n = 77$) of participants felt that the game element was beneficial in increasing their learning motivation.

Overall, in the first phase of quantitative data collection we found that users of technology-assisted L2 learning were mostly younger adult learners, while the participants' perceptions towards the gamified language learning pattern were positive, similar to the findings in many studies (Flores, 2015; García Botero et al., 2019; Rachels & Rockinson-Szapkiw, 2018).

5.2 *Participation Perception Towards Duolingo*

Based on the above findings, it is evident that L2 learners are interested in the general gamified MALL approach, but their perceptions of the different game elements need to be further explored. To address this, potential respondents (informal CSL learners) were screened based on the survey and emailed to ask if they would be willing to participate in the second phase of the observational study. Four criteria were used to screen potential respondents namely, (1) adult learners with full-time employment; (2) non-native Chinese learners; (3) ability to understand English; and (4) willingness and ability to use mobile devices to download and use Duolingo. A total of seven respondents volunteered to participate in the second phase of the study and six completed all interviews. The textual data for the second phase was mainly sourced from semi-structured interviews conducted once a week. The semi-structured interviews focussed on three main themes, namely overall review, impact and perceived deeply influential game elements, and these are listed in Table 2.

The grounded approach (Braun & Clarke, 2006) was used to analyse the semi-structured interviews. First, the first author read through all the interview data to obtain an overall picture of the responses and coded the data. Then, data with similar coding were grouped to form themes. Finally, we randomly selected 50% of the student interview responses and an independent researcher was included to code the responses. The inter-coder agreement were 94%. Disagreement were discussed by the two coders.

At the beginning of the interview, three of the six interviewees stated that they learnt Chinese as their partner was Chinese and they were motivated by the desire to be able to communicate with their partner's family on a daily basis in the future. Three respondents were motivated by an interest in Chinese culture because they had lived in China. All six respondents said that none of them could attend a structured language course because they had full-time jobs. They wanted a more relaxed learning environment and flexible study time because they were interested in learning Chinese and not for academic achievement. At the same time, they did not want to pay a lot of money. For the gamified MALL application, all interviewees felt that this learning approach provided them with flexibility in terms of time and place, and reduced their stress in terms of learning and money.

However, during the four-week short study period, all learners felt that the game elements enhanced their learning motivation. In particular, storyline and rewards acted as external motivators, promoting learners' learning motivation and concentration. The leaderboard, as a game element that learners used to compare themselves with others, stimulated their sense of competition, thus promoting completion and persistence.

For the CSL learning experience, as we mentioned earlier, one of the inevitable issues in CSL learning is the problem of learning Chinese characters (words with multiple meanings). All six interviewees said that Duolingo was beneficial in helping them improve their understanding and use of Chinese characters. This is because Duolingo provides learners with learning blocks on relevant topics based on the

Table 2. Summary of interviewees' perceptions of gamified MALL

Major themes	Representative quotations	No
<i>General perception</i>		
<ul style="list-style-type: none"> • Learning motivation <ul style="list-style-type: none"> – Influence from partners – Interest in Chinese culture 	<p>'I am learning Chinese based on interest and I hope to be able to chat with my girlfriend's family in the future... A formal Chinese course is a big expense and I prefer the free option because I only need to learn the vocabulary and then I can practice with my girlfriend.' (Interviewee 1)</p> <p>'It almost from the exotic interest and cultural relevance. I lived in China before, and I was interested in the culture.' (Interviewee 4)</p>	3
<ul style="list-style-type: none"> • Reasons for choosing Duolingo <ul style="list-style-type: none"> – Relaxed learning environment – Flexible schedule 	<p>'I prefer to learn the language in a completely relaxed environment because I'm already busy every day and I don't want to be forced to do something after work.' (Interviewee 3)</p> <p>'I think I more prefer learning language in a more confident environment, and Duolingo is an application I can use whenever and wherever ... I think the game element makes the Chinese learning process very enjoyable.' (Interviewee 4)</p>	6
<i>Impact of game elements</i>		
<ul style="list-style-type: none"> • Instant feedback <ul style="list-style-type: none"> – Becomes more concentrated 	<p>'Points and badges act as a form of feedback that you get immediately when you complete a task. It will tell you what you did well and where you should pay more attention The leaderboard is useful to push me to learn more and get more points because I want to be top 1.' (Interviewee 3)</p> <p>'I am very excited to be able to learn and use the language in different virtual environments... when I receive badges or points, it is shown that I achieve something with small steps, it helps me to stay motivated and keep learning.' (Interviewee 5)</p>	5
<ul style="list-style-type: none"> • A sense of achievement <ul style="list-style-type: none"> – Reduces the potential for dropout 	<p>'It's like you're challenging yourself all the time. When you complete a level, the system gives you some points and gives another challenge.' (Interviewee 3)</p> <p>'Earning points and badges dose encourage me to study the language more. Because I want to get a higher point and more badges.' (Interviewee 4)</p>	5
<ul style="list-style-type: none"> • Life-related learning scenarios <ul style="list-style-type: none"> – Improve understanding of Chinese characters 	<p>'I can choose the topic I want to learn about, for example 'culture', and then I will learn vocabulary related to 'culture' while the system tests me repeatedly. When I can fully understand the vocabulary, I can be challenged to learn more vocabulary about 'culture' Although I only use it for 5 or 10 min a day, I really think it helps me to recognise and become familiar with Chinese vocabulary.' (Interviewee 1)</p>	4

(continued)

Table 2 (continued)

Major themes	Representative quotations	No
<ul style="list-style-type: none"> A specific and clear learning goal 	<p>'I really like the way that Duolingo keeps track of how many days you've studied in a row... more the longer I study, the more motivated I become to keep my streak. So the streak system is very good for motivating you to maintain it. (Interviewee 2)' 'I keep using Duolingo every day to make sure I can achieve my goal of a winning streak. (Interviewee 5)'</p>	5
<ul style="list-style-type: none"> Self-monitoring 	<p>'The points and badges are an achievement as you only receive rewards for completing challenges and it helps me to stay motivated and keep learning. As I can see my grade always. Obviously, everybody always wants to get a better grade.' (Interviewee 1)</p>	3
<i>Negative perceptions</i>		
<p>Unable to correct pronunciation</p>	<p>'I admit that it can help me understand better what Chinese means and how to write, but it cannot replace the traditional face-to-face teaching method. Because we have to practice pronunciation more, which Duolingo cannot provide.' (Interviewee 1) 'Chinese is really hard for me to pronounce. But the pronunciation system on Duolingo cannot correct my pronunciation. Even if I could practice on my own, I can't correct my pronunciation on my own because I know my pronunciation is always wrong... I don't really care about the leaderboard rankings as I don't have many study partners on Duolingo.' (Interviewee 5)</p>	2
<p>Competitive pressures may reduce learning motivation</p>	<p>'I chose Duolingo because it's like a game and I can learn in a relaxed environment after work. But if I have to compete with others, I may have to spend more time and feel more stressed.' (Interviewee 4)</p>	5

Note No. indicates the number of students who made a comment on each theme

common life scenarios, such as culture, food, colours, animals and so on. This means that learners are provided with a virtual learning environment on the topic, which is what we term the 'storyline' mechanism. Meanwhile, the challenge questions are not only based on new knowledge but also on what has already been learned, which neutralises the difficulty of the challenges. Learners can choose content based on their interests first, which helps to increase their learning motivation and thus their learning persistence. In addition, the virtual learning context of the storyline provides an immersive atmosphere for Chinese learners, which helps them to better grasp the meaning of Chinese vocabulary. In addition, a moderate level of challenge helps to increase learners' self-confidence while promoting their engagement (Flores, 2015).

Alongside language skills, interviewees felt that the game element helped them to set a goal and to develop self-directed learning skills. An example of this is the winning streak in Duolingo, which is both a challenge and a process tracker and a reward game element. Once a learner wants to start a winning streak challenge, the learner must set a goal (points) for themselves, but the number of points will increase over time. Learners need to earn their target points every day through learning and challenges, and if they don't reach it one day then the points they have accumulated will go to zero. Learners therefore need to plan their learning goals and schedule their study time each day before deciding to start a winning streak. In addition, when a learner starts a winning streak, the winning streak badge will be highlighted on their profile and the points earned will be used to rank on the leaderboard. This allows learners to check whether they are achieving their learning goals by having their badge lit up at any time, which helps them to self-management and controls their learning progress.

However, during the interviews we also found that informal CSL learners' perceptions of gamified MALL were not entirely positive and that gamification was not a panacea for increasing their motivation. Two interviewees felt that a gamified MALL approach was beneficial to facilitate their motivation, but that it could not replace traditional language education. This is because for Western language learners, learning Chinese is a challenge, not only in terms of understanding the meaning of words, but also in terms of mastering pronunciation. The gamified MALL approach helped them to understand the meaning of Chinese characters and how to write it, but they did not perceive it to be able to improve their pronunciation. Also, only one respondent found the leaderboard to be helpful in his learning motivation, but not in a competitive way; he simply perceived the top ranking as proof of his learning achievement. Other respondents felt that the ranking was not motivating for them because they did not have many study partners and they studied Chinese because they were interested. One respondent even said that he did not want to use the leaderboard because it would put him under pressure to learn.

'The leaderboard is useful to push me to learn more and get more points because I want to be top 1.' (Respondent 3)

Overall, we found from the respondents' responses that game mechanics (e.g., storylines) facilitated CSL informal learners' acquisition of Chinese characters, and that the game dynamics (e.g., rewards) motivated them, as well as fostering their

independent learning skills (e.g., challenge and progress bar), thus reducing the risk of abandoning their Chinese learning. However, gamification is not a panacea; for example, competition may have a negative impact on their learning motivation.

6 Discussion

In general, the quantitative data results indicate that CSL adult language learners have a positive attitude towards the gamified approach to MALL, which is similar to the findings of gamification studies in other languages (Flores, 2015; García Botero et al., 2019; Loewen et al., 2019). Further interviews revealed that all six informal CSL adult learners found the game mechanics in Duolingo (i.e., challenges, rewards, progress bars and leaderboards) to be beneficial in increasing their motivation and helping them to develop their self-directed learning skills. However, we also found that although each participant's initial intrinsic motivation was almost identical, their learning motivation evolved as different game elements were introduced, such as for the sense of achievement (rewards) and the game experience of upgrading and fighting (challenges). Furthermore, although six respondents improved their motivation through the gamified setting, half of them said that they did not perceive a significant improvement in Chinese pronunciation and did not perceive that the gamified MALL mode had a significant impact on performance improvement.

This study found that gamification helped informal CSL learners to be motivated to learn Chinese using the MALL approach and helped them to develop goal setting, self-directed learning skills. Several reasons contributed to this positive effect.

Firstly, challenges in the game mechanics, such as the winning streak challenge, act as a goal marker to help learners set a clear and specific goal and increase their persistence by reminding them to complete their daily learning tasks. The reward badge for a winning streak is also a form of positive feedback that validates the learner's achievement as it is awarded to the learner for consistently completing the daily goal (Antin & Churchill, 2011). This positive feedback helps to reinforce the learner's self-confidence, thus increasing the probability of that behaviour occurring again (Skinner, 1989). Because the learner has a sense of achievement and their intrinsic needs are met, this promotes intrinsic motivation, which triggers the occurrence of the learning behaviour and higher levels of engagement (Deci & Ryan, 2000). That is, learners are likely to take the initiative to engage in more activities and complete more difficult challenges. Also, progress bars provide learners with the opportunity to self-monitor their progress, which helps learners to self-control their learning progress (Zhu & Bonk, 2019). This is because progress bars allow learners to check their progress at any time to assess their current achievements and how close they are to reaching their goals, thus enabling them to adjust their learning plans and refine their learning goals.

Secondly, the storyline in this gamified L2 application provides learners with different virtual scenarios, while learners can select learning topics through their own preferences. This facilitates increased intrinsic motivation as learners have the

opportunity to exercise their sense of autonomy (Sailer et al., 2017). And although there is extensive empirical evidence that rewards are beneficial for learners, when learners feel forced to engage in learning activities, they feel a lack of competence and control and their intrinsic motivation decreases (Hanus & Fox, 2015). Furthermore, Koivisto and Hamari (2014) found that learners' motivation decreases over time. In contrast, the storyline setting provided learners with life-relevant learning scenarios and allowed learners to use experience points to unlock multiple learning topics once they had gained a certain number of experience points. In other words, when CSL learners become bored with the topic they are studying, they can use the experience points they have gained to unlock another interested topic, which helps to keep learners motivated. However, if learners do not have enough experience value to open a new topic, they will target the number of experience points required to open the new topic as their new goal.

Thirdly, the challenge mechanism in this gamified app has different levels, and learners can choose the level of effort they are willing to put in depending on their circumstances. For example, when CSL learners choose to start a winning streak, they can set a learning goal (experience point) that they feel is achievable based on their assessed competence. This has the opportunity to develop learners' sense of self-management and self-control. Meanwhile, when learners have the opportunity to exercise a sense of autonomy, correctly assess their competence and be rewarded for it, they feel that they are being recognised for their competence, which motivates them to perform (Deci & Ryan, 2000).

Finally, although empirical evidence supports that the use of competitive game elements (leaderboards) may influence learners' intrinsic motivation (e.g., (Christy & Fox, 2014), in the present study, the role of leaderboards did not seem to provoke a process of social comparison and even led to a negative effect on learner motivation (Christy & Fox, 2014; Hanus & Fox, 2015). Because interviewees indicated that they were motivated to learn Chinese primarily by their interest in the language and that they did not have enough study partners, the leaderboard was perceived more as an endorsement of their achievement. Also, adult learners use the informal language learning approach because they want to learn in a relaxed and enjoyable learning environment, and excessive comparisons can increase their learning stress and thus reduce intrinsic motivation.

7 Conclusion and Limitation

Quantitative survey data show that L2 learners have significantly positive perceptions towards the use of gamified MALL approaches. Qualitative textual data also show that for informal CSL learners, the game elements are beneficial in encouraging active participation in Chinese learning and developing their self-directed skills. It also helps informal CSL learners to deepen their understanding of Chinese vocabulary. However, in terms of language skills, most learners felt that Duolingo could not help

them to fully master Chinese and that they needed more practice with native Chinese speakers. However, the results were mostly positive regarding the game elements.

Limitations of this study include the small sample size, the short study duration and the restricted subjects - informal CSL learners, which reduces the generalisability of the findings. In addition, the six respondents who completed further research were all male between the ages of 25 and 35, which limited the investigation of gender and age in the study. In particular, gamification may have a more positive impact on male learners in terms of gender, as most men enjoy playing games. A future research question may be the perception of female participants on the game element of the gamified MALL application.

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