A Gamified System for Learning Mandarin Chinese as a Second Language

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Abstract— **In this paper we discuss the use of gamification in second-language learning systems. We explore various types of gamification elements, each of which seeks to increase intrinsic and/or extrinsic motivation to progress with a programme of learning. We introduce Newby Chinese, which is an in-development gamified system for learning Mandarin Chinese, and explain its core concepts which include audio icons, mnemonics, minigames and an overarching narrative story.**

Keywords— gamification; second language learning; student engagement

I. INTRODUCTION

Typically, a key goal of second-language instruction is to formally teach the elements of language that have previously been learned informally in the students' native language [1]. The nature of Chinese, which is a pictographic language with few grammatical rules, has contributed to poor outcomes in teaching Chinese as a second language. Generally, Chinese language learners are made to feel "that Chinese is inaccessible and impossible to learn" [2, p.93] and that "the writing system, essentially a memory game, is utterly bewildering. It's difficult to learn, partly because it lacks any system of phonetic recognition — you can't spell out words using different combinations of letters. Instead, you learn to draw each separate "hanzi'" or character." [3, 4]

In Australia, where Mandarin Chinese acquisition is seen as vitally important for the next generation, "there is an evident attrition rate of some 94% of learners before the senior years … and beginners at university drop out at rates close to 75%" [5, p.7]. These numbers are similar to rates in the US and UK [6]. However:

"what most non-Chinese do not realize is that the language boasts one of the easiest grammars in the world. Sentence structure largely mirrors that of English (subject + verb + object). Verbs exist in a single form, with no conjugations whatsoever. There is no gender, no plural nouns, and while mechanisms do exist to express tense (e.g. past/present/future), they are much simpler than those of any Western language". [7]

Newby Chinese [8] is an in-development cloud-based educational system, for teaching Mandarin Chinese as a second language. A number of elements of the system incorporate gamification techniques, in order to maximise the intrinsic and extrinsic motivation of students, especially those within our core K-12 demographic. Our approach is to teach Chinese in a less formal way than in most second language systems, since we believe it doesn't well suit an overly logical, formal approach.

II. SECOND LANGUAGE LEARNING AND EDUCATIONAL GAMIFICATION

Approaches to teaching a second language have evolved from (i) a focus on "teaching in the mother tongue with little active use of the target language, vocabulary lists, long and elaborate grammar explanations, little attention to the context of text, no attention to pronunciation … plenty of memorization" [9, p.36], to (ii) a focus on audiolingual repetition drills and the scaffolding of grammar through inductive analogy, to (iii) a focus on communication through interaction in the target language and authentic texts. Yet none of these strategies have worked directly with the psychological aspect of motivation [9], nor have they often promoted a relaxed/fun learning environment which is important to second language learning [10]. Among the many languages to choose as a second language, Mandarin Chinese suffers particularly heavily from a lack of evolution in its teaching methodology.

Gamification is the use of game elements and design techniques in non-game contexts [11] – and it has the potential to explicitly engage with both intrinsic and extrinsic motivation. Intrinsic motivation can be described as internal motivation: the desire to improve and improve on your own previous attempts, while extrinsic motivation can be described as external motivation: the desire to out-perform other people and to have your achievements visible to others. While the term "gamification" was coined in 2002, its use in education first started to appear in the literature in 2011 [12]. It has been well established that "the gamification of education is gaining support among educators who recognize that effectively designed games can stimulate large gains in productivity and creativity among learners" [13]. It is interesting to note that, of the academic papers on educational gamification published between 2011 and 2014, 43% targeted University-level education while only 9% targeted a K-12 demographic [12].

The main objective of gamification is to increase participation and motivate users through the use of personal and social game elements such as points, leaderboards, social badges, and immediate audiovisual feedback [9]. It seeks to engage and empower the user as they work their way through challenges and tasks.

A practical five-step model for educational gamification is proposed in [14]:

1. Understand the target audience and the "pain points" which thwart their progress;

2. Define the learning objectives, including instructional and learning goals;

3. Structure the experience in a way that engages with material in an appropriate sequence ;

4. Identify gamification artefacts which can be applied, and the appropriate opportunities for doing so during the experience;

5. Develop 'self' and 'social' gamification elements which focus on encouraging the student to compete with themselves via elements such as levels, points, and time restrictions, or compete with other learners via elements such as leaderboards, badges, or interactive competitions.

III. AUDIO ICONS AND MNEMONICS

Language teaching should, among other things, be cognizant of the fact that language is inherently systematic, symbolic, and primarily vocal but also visual [10]. The most fundamental learning objects in the Newby Chinese system leverage these facts. We present the learner with a series of interlinked narrative scenes, in which game characters perform visually memorable actions, accompanied by a soundtrack dominated by appropriate use of the sound of the Chinese word being learned in the scene. Some prominent object in the scene forms the basic physical shape for the Chinese letter which is being learned.

Our system makes constant use of the Chinese sound of words, using them as audio icons which play whenever the word is encountered in the various tasks and minigames presented to the learner. The narrative scenes also act as additional mnemonics (i.e. devices which assist memory). For example, see Figs 1 and 2 which illustrate the use of audio icons and mnemonics for the words "Bu" and "Ren". Each word in the system is also colour-coded, with the colour acting as a pronunciation mnemonic – for example, yellow indicates a falling intonation, which we describe to the learners as being similar to falling yellow autumn leaves.

Learning Chinese characters (letters/words) has long been noted as an impediment to learning the language, as it is generally perceived that "teaching and learning Chinese characters might be two of the most challenging tasks in the acquisition of Chinese language proficiency."[15, p.105] Since the language is pictographic, it has a large number of often complex characters which represent entire words or concepts. Our system places a heavy emphasis on learning to write words on screen with mouse or touch, by tracing them within an outline which gradually disappears after the word has been seen a number of times (we refer to this as a 'training wheels' approach).
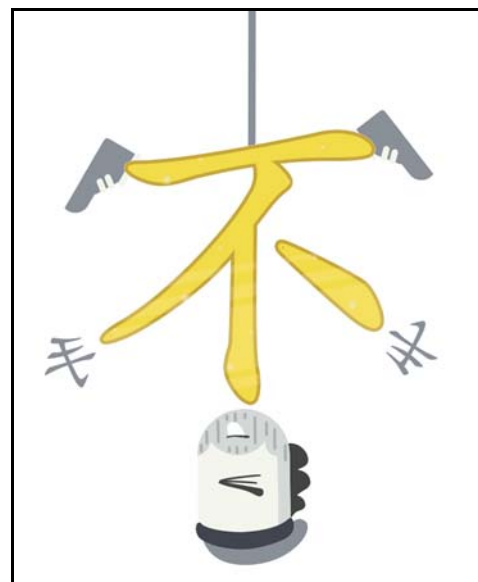

Fig. 1. The word "Bu" (meaning "Not" or "No"). The word takes the visual form of a cheeky character who bungee-jumps onscreen while shouting "Boo….no it's NOT!" ("Bu"). This character also appears at various times when the learner makes a mistake.
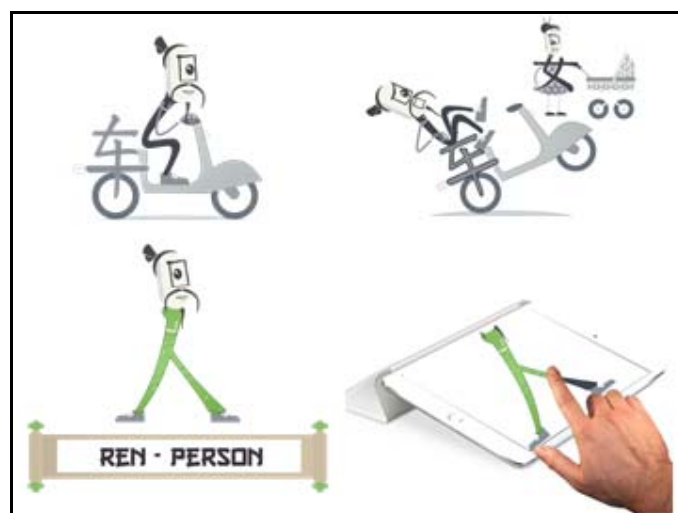

Fig. 2. The word "Ren" (meaning "Person" or "Someone"). The word takes the form of a person on a motorcycle, who surprises a mother and baby by revving their engine to the sound "REN REN REN" or (ren) before driving offscreen at a high speed and crashing.

IV. NARRATIVE ADVENTURE

Newby Chinese is a product in-development; eventually it will provide a journey through the 100 most common Chinese "super words" which together form almost 50% of the language. The journey involves a fantastical adventure through overground and underground kingdoms, in which a cast of characters interact with the main hero as he seeks to find a baby stolen by the evil robots. The goal of the narrative adventure is to keep learners engaged and to motivate them to continue using the system in order to reveal the story. Some aspects of the narrative adventure are illustrated and described in Figs 3, 4, 5, and 6.
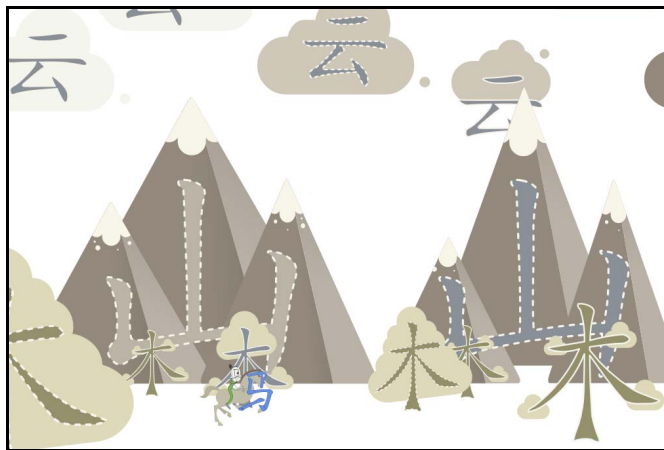
Fig. 3. A person rides a Horse ("On a horse" meaning "as quickly as possible") through a scene involving Mountains, Trees, and Clouds.

Fig. 4. The main narrative involves a child kidnapped by a gang of rogue robots, in order to become their new prince, and the rescue quest that ensues.
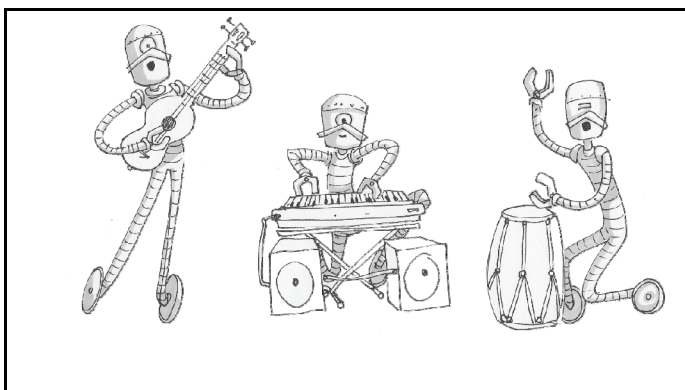
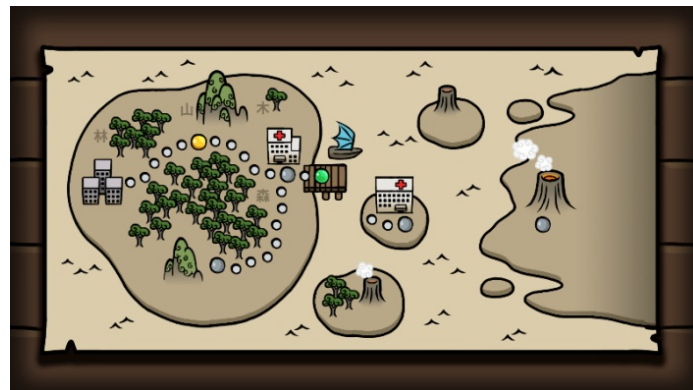

Fig. 5. Attention is given to good-natured humour.

Fig. 6. An adventure map/world-overview allows for spaced-learning, throughout the narrative adventure. Thus the learner encounters several new Chinese characters in each geographic location, and strives to experience the whole story.

V. MINIGAMES

We have developed a number of minigames which challenge the learner to identify words or specific sentences on a page, or from a formation of 'space invaders'. These minigames motivate the learner through points and time-limits. Each identification of a word or sentence is rewarded by a small animation and repetition of the Chinese sound / audio icon. Various minigames are illustrated in Figs 7, 8, and 9.
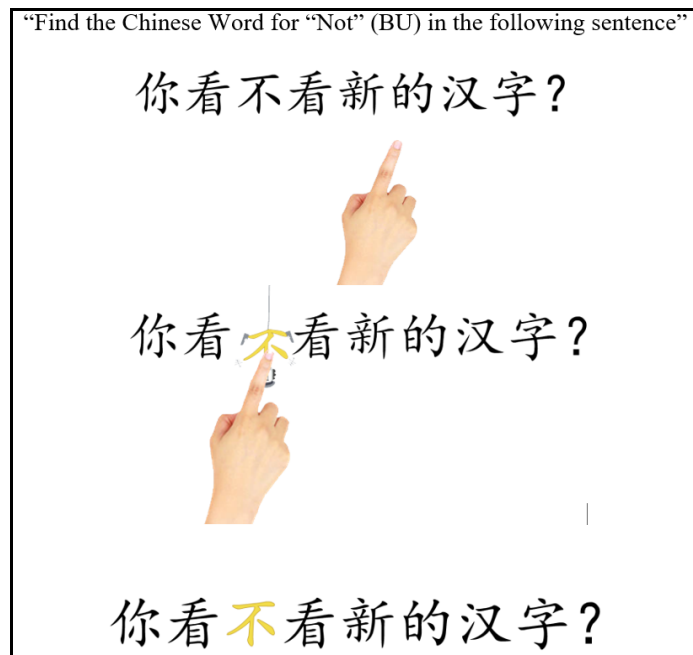

Fig. 7. Identifying individual words within a sentence, towards complete translation.
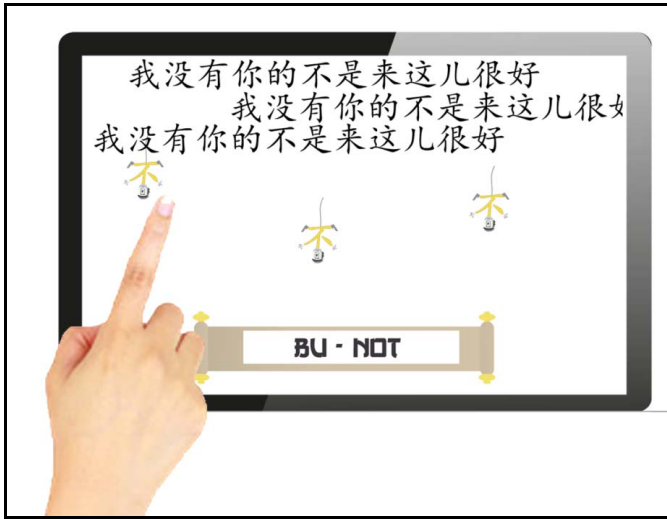
Fig. 8. Find the required words before the black text reaches the bottom of the screen

Fig. 9. Find as many of the target word or phrase as possible in a given time limit.

Another of our minigames presents the learner with scrolls containing words; the learner must swipe the scrolls in order to line up the words in the correct sequence for the target sentence (Fig 10). This minigame also provides an opportunity to repeat word sounds and for the learner to perform word tracing/writing (Fig 11).
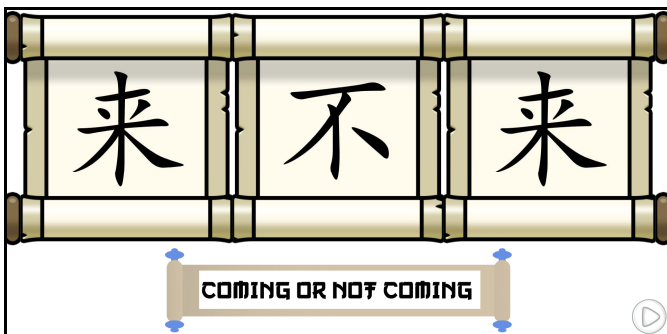

Fig. 10. Using the Sentence Builder minigame, learners must select the correct sequence of words to form a target sentence.
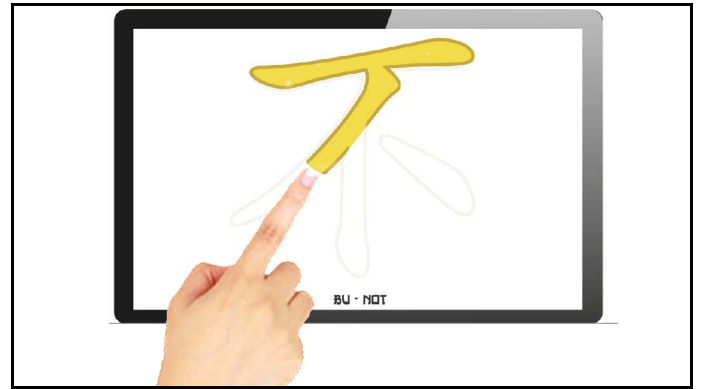

Fig. 11. The user must then write the Chinese characters in the correct sequence. As the trace outline disappears over repetitions of the same word, a learner quickly learns to move away from visual aids for writing Chinese characters.

VI. DISCUSSION AND FUTURE WORK

The Newby Chinese system is still in development, and planned future elements include several social features such as online leaderboards for the minigames, and badges for specific achievements. Players will also be able to choose from a range of social avatars which will represent them on public leaderboards and social spaces. We also aim to include spoken user input. Further into the future, we aim to add a paragraph comprehension component, whereby a Chinese paragraph is presented, and a number of simple questions asked about it. Learners will give their answers in Chinese, and correct/incorrect results will be (initially) manually identified and submitted to a database of labelled answers, which will then support automatic grading.

One approach we have used to ensure that Newby Chinese appeals to a wide range of players is to consider it according to the Bartle taxonomy of player types. This well-known taxonomy labels players according to their primary gaming motivations [16]:

- **Achievers** seek direct game-related goals, such as high scores: they are facilitated through many of our minigames;

- **Explorers** wish to discover as much as possible of the game world: the overarching narrative story in Newby Chinese motivates this type of player to advance through the game;

- **Killers** seek to impose themselves on other players, and generally to be the best at a game, as viewed in a social/competitive context. Our extrinsic-motivation focused gamification features such as leaderboards and badges will support this;

- **Socialisers** enjoy social contact within a game. We plan to support this in the future through a monitored bulletin board for school users (not for anonymous public users), with essay competitions and feedback between students.

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