“I found the fish in Pronunciation Quiz #3!” Examining the effect of a game-informed site on young learners’ L2 pronunciation

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Abstract. This paper examines the impact that a game-informed pronunciation site has on the acquisition of English /r/-/l/. Twenty-three Japanese-speaking English learners completed a series of pronunciation activities directed at improving their phonological awareness and oral production of the /r/-/l/ contrast. The activities included game-informed tasks that rewarded learners with points, badges, and scavenger hunt items. For control, eight students completed the same activities without game-informed affordances. The study followed a mixed-methods approach with a pre-, post-, and delayed post-test design. Qualitative results indicate that learners in the game-informed group developed metaphonological awareness and perceived the proposed learning environment positively. For production, the quantitative results indicate that participants in the game-informed group improved their pronunciation of /r/-/l/ items. Pedagogical implications for the use of game-informed environments for L2 pronunciation instruction are discussed.

Keywords: game-informed design, gamification, L2 pronunciation, metaphonological awareness.

1. Introduction

The use of game-informed pedagogical materials (gamification) offers cognitive, social, and emotional benefits in L2 learning (Reinhardt, 2019), making learning more enjoyable (e.g. via the inclusion of experience points) and potentially

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enabling learners to become motivated by their efforts. Of interest to this study is that the affordances of game-informed CALL systems have shown promise in L2 pronunciation instruction. Following Reinhardt's (2019) call for game-informed systems to support autonomous learning and to target measurable outcomes, Barcomb and Cardoso (2020) developed a game-informed course management system that aided learners in the acquisition of L2 pronunciation. Young Japanese-speaking participants improved their production of /r/-/l/ and developed their metalinguistic awareness of the target segments. However, Barcomb and Cardoso's (2020) study was short (two weeks), and it did not include a comparable control group. The current study addresses these limitations.

To examine a game-informed pronunciation site designed to support autonomous L2 pronunciation practice (e.g. via instructional videos, listening quizzes, and pronunciation activities using Automated Speech Recognition – ASR), we focused on the acquisition of the English /r/-/l/ contrast, a feature not differentiated in perception or production by Japanese speakers. For control, eight students completed the activities in a course without game-informed elements. To this end, this mixed-method study addressed the following research question and sub-components: What effect does a game-informed course have on the acquisition of /r/-/l/ in terms of learners' (RQ1) metaphonological awareness, (RQ2) oral production (pronunciation), and (RQ3) perceptions of the proposed game-informed environment?

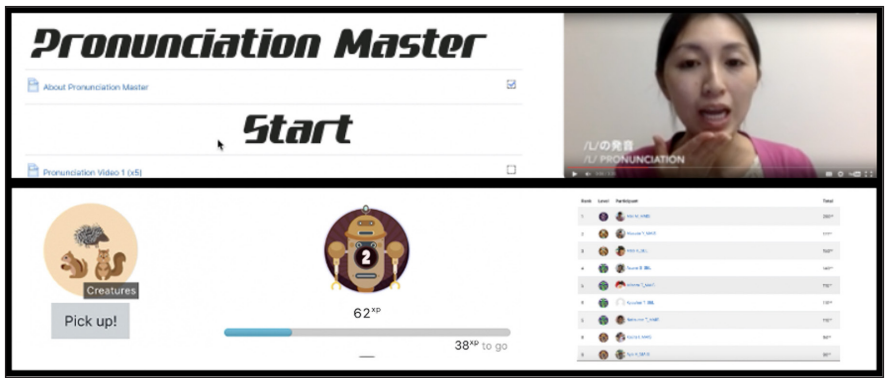
2. Method

Study Design and Sample. Thirty-one young L2 Japanese learners (CEFR A-1) from an online school participated in the study, with 23 learners in the game-informed group (experiment group) and eight in the control group. All learners were accustomed to completing game-informed pronunciation activities as part of their homework; however, only the activities for the game-informed group included rewards. The proposed pedagogical intervention lasted six weeks. The control group had a different teacher, but the curriculum and lessons were otherwise identical.

Procedure. Adopting Celce-Murcia, Brinton, and Goodwin's (2010) communicative framework to L2 pronunciation instruction, the game-informed *Moodle* site was designed to raise awareness about the /r/-/l/ contrast before providing opportunities for listening discrimination and guided pronunciation practice. The activities included two instructional videos about

/r/-/l/ pronunciation, four minimal-pair listening quizzes, six ASR pronunciation activities with immediate feedback, and an activity where learners drew what their mouth looked like when pronouncing the target features. The videos emphasized placing the tongue on the alveolar ridge to produce /l/ and lip rounding to produce /r/. Each activity instantly rewarded learners with five points, which were added to a leaderboard. Students were encouraged to repeat activities to gain points and find hidden items they could add to a digital stash. See Figure 1 for a screenshot of an activity and the rewards.

Figure 1. Features of *Pronunciation Master* module



Instruments, Data Collection, and Analysis. A post-test questionnaire with open-ended responses aimed to understand if the proposed game-informed environment contributed to learners' metaphonological awareness (RQ1); e.g. *What do you know about the pronunciation of /r/ and /l/? Please explain*. In line with Celce-Murcia et al. (2010), metaphonological awareness was operationalized as being able to articulate the difference/s between the pronunciation of /r/ and /l/. A pre-test, immediate post-test at six weeks, and delayed post-test at ten weeks with controlled aural elicitation tasks were administered to measure the effect that the proposed game-informed activities had on the participants' production of /r/ and /l/ (RQ2). Participants would play a video of a teacher saying a word or statement before recording themselves repeating what they heard. The test included 32 /r/ and /l/ singletons that were evenly distributed to onset (e.g. *rice*) and coda position (e.g. *tar*). To understand learners' perceptions of the proposed learning environment (RQ3), two written questionnaire items asked learners what they perceived to be the strengths and weaknesses of the game-informed learning environment. The questionnaire and pronunciation test were available on *Moodle* as an assignment and quiz, respectively.

3. Results

Metaphonological Awareness. An analysis of the written questionnaire data indicates that, overall, participants developed metaphonological awareness; i.e. an ability to articulate their knowledge about the production of English /r/ and /l/. Twenty-one participants in the game-informed group were able to describe how to pronounce the target segments; e.g. *I remember about putting my tongue behind my front tooth for /l/ and not putting my tongue behind the teeth for the /r/ sound.* Awareness was also evident in the drawing activity, which was completed by all the participants in the game-informed group (see Figure 2 for an example). Two students in the control group noted that they knew where to place their tongue to produce /l/, though none reported how to move their mouth to produce /r/.

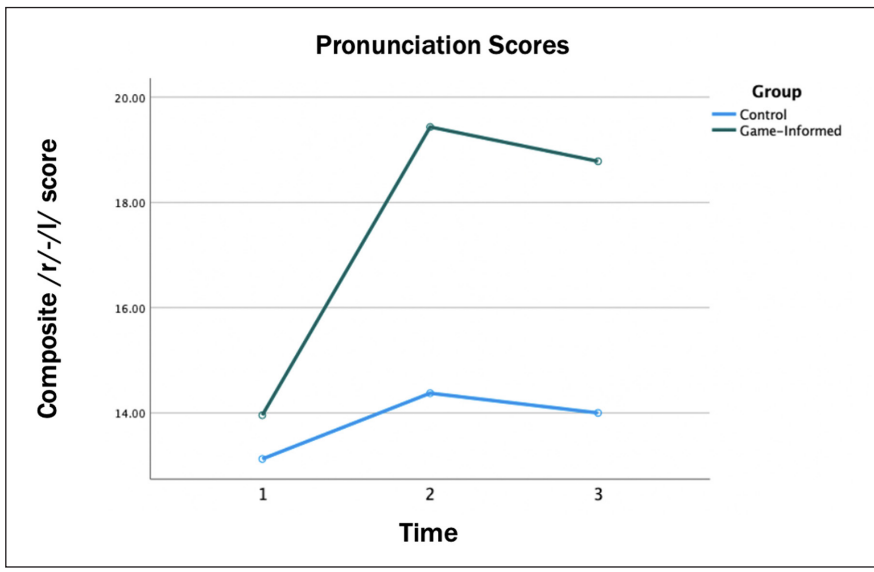
Figure 2. Sample of student drawing

Oral Production. Results from a two-way mixed ANOVA revealed a statistically significant effect of time on pronunciation scores for the game-informed group, $F(1.74, 38.25)=149.16$, $p<.001$, partial $\eta^2=.87$. Post-hoc analyses with a Bonferroni adjustment were conducted, revealing that the pronunciation scores in the game-informed group were significantly different between the pre- and post-test ($M=5.48$, $SE=.38$, $p<.001$), in addition to being significantly higher on the delayed post-test when compared to the pre-test ($M=4.83$, $SE=.38$, $p<.001$). There was not a statistically significant difference between pronunciation scores on the post-test and delayed post-test ($M=.65$, $SE=.27$, $p>.05$). No significant effects of time on the production of /r/ and /l/ scores were observed in the control group. Table 1 reports the test scores between the pre-test, post-test, and delayed post-test while Figure 3 provides a visual representation of pronunciation scores for each group.

Table 1. Pronunciation scores

	Pre-test		Post-test		Delayed Post-test	
	M	SD	M	SD	M	SD
Game-informed group	13.96	2.36	19.43	2.06	18.78	2.35
Control group	13.13	1.73	14.38	2.77	14.00	3.16

Figure 3. Composite oral production scores



Users' Perceptions. An analysis of the written questionnaire data indicates that, overall, participants in the game-informed group perceived the experience positively. Eighteen students enjoyed competition (e.g. *I like competing and collecting experience points*). Twenty-two students reported that the elements motivated them to review materials (e.g. *Stash items motivated me to study more because I went back to study to find the stash items*). These responses also shed light on why the pronunciation results may differ between the groups, as the experiment group completed an average of 17.13 activities while the control group completed an average of only 6.50 activities.

4. Discussion and conclusions

This study provides evidence for the potential of game-informed pedagogy in L2 pronunciation instruction. While the game-informed group showed a statistically

significant improvement of /r/-/l/ production on the two post-tests, the control group did not show any improvements. This finding is likely due to the game-informed elements, which encouraged participants in the experimental group to use the materials repeatedly (almost three times more frequently than participants in the control group). These results also align with the predictions of Celce-Murcia et al.’s (2010) framework, as an instructional focus on metaphonological awareness and controlled practice resulted in production accuracy. These types of practices increase learners’ ability to process the target feature in short-term memory (Celce-Murcia et al., 2010), subsequently transferring that knowledge to oral production, as observed in this study.

Due to working with students in a pre-existing online school, the sample size for this study was relatively small and may affect the generalizability of the findings. Despite this limitation, the participants were accustomed to using game-informed materials, thus reducing the novelty effect seen with game-informed materials. This study also embodied a praxis perspective to game-informed second language teaching and learning, which assumes that theory, research, and practice contribute equally to developing and testing resources in a shared gameful experience between teachers and students (Reinhardt, 2019). Future studies should examine the impact of game-informed pronunciation practice on the development of different phonological features of English (e.g. rhythm, stress) and implement more conversational aspects of pronunciation practice.

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