A world of differences: the role of individual differences in L2 vocabulary learning with clickers

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Abstract. This study examined the acquisition of L2 English vocabulary with clickers, focusing on the role of individual differences. Following a pretest-posttest design, we measured perception and performance among 61 English learners who took part in a vocabulary acquisition treatment, in which they answered Multiple-Choice Questions (MCQs) via clickers (experimental group) or hand-raising (control group). Findings show that students have positive perceptions of clickers across all analytical measures adopted and that clickers promote vocabulary learning. However, the differences in learning gains between the two groups were not significant, indicating individual differences among learners. Four of the learners who exhibited 'extreme' (lowest/highest) perception and performance scores were selected for further analyses. The presence of individual differences in clicker-enhanced learning suggests the technology should be carefully implemented to accommodate learners' individual differences.

Keywords: learner response systems, clickers, L2 pedagogy, individual differences.

1. Introduction

Clickers are handheld devices that wirelessly collect and transmit student input to a computer. During a lesson, instructors can display MCQs on a projector and open a polling session, during which student answers are computed. When the polling is closed, an answer distribution graphic is displayed on the board. This visual feedback informs the instructor of the students' understanding and gives students a sense of how they are performing in comparison with their peers. Other pedagogical affordances of clickers include the promotion of collaborative learning (via peer

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instruction), immediate feedback, and user anonymity (to increase participation) (Cardoso, 2011).

There is a general agreement in the literature that students have positive perceptions of the use of clickers across the four measures predominantly explored: learning, self-assessment, engagement, and interactivity (e.g. Song, Oh, & Glazewski, 2017). In terms of learning gains, the consensus is not as clear-cut. The literature agrees that clickers promote learning but is not definitive when comparing gains between groups: while some reveal a superiority for clickers (e.g. Agbatogun, 2014), others show comparable gains between the instructional approaches considered (e.g. Mays, Yeh, & Chen, 2020). The literature suggests that these comparable gains may be associated with the role of individual differences (e.g. Landrum, 2015), an under-investigated phenomenon in CALL research (Foroozesh-nia, 2015).

The goal of this study is to examine L2 learners' perceptions of clickers and how the technology can affect their performance when learning vocabulary. In addition, it aims to explore the role of individual differences in the learning process. The following research questions were adopted.

- Perception: what are students' perceptions of the pedagogical potential of clickers?
- Performance: is the pedagogical use of clickers beneficial for the acquisition of L2 vocabulary?
- Individual differences: what is the role of individual differences (in perception and performance) in clicker-enhanced vocabulary learning?

2. Method

Sixty-one Grade 8 students (13-14 years old) in two intact groups were recruited to participate. The groups were randomly assigned to a treatment, in which MCQs were answered via clickers (Clicker Group, CG, *n*=31) or via hand-raising (Non-Clicker Group, NCG, *n*=30).

A six-week vocabulary instruction treatment targeted 30 low-frequency words (to minimize previous exposure to the words), extracted from Roald Dahl's novel *James and the Giant Peach*. The treatment was preceded by a pretest and followed by an immediate posttest, all measuring the students' knowledge of the 30 target

words. In the tests, students were asked to demonstrate their understanding of the words by either defining them, creating a sentence using the word, drawing a picture representing the word, or translating the word into their first language, French. The data collected included the answers to the 30 words on each test, which were coded as either correct (1) or incorrect (0). An independent-samples *t*-test as well as mixed-model ANOVAs were run to analyze the data.

To measure learners' perceptions of clickers (CG only), surveys were administered after the treatment (CG: *n*=29). The five item Likert scale survey (adapted from Cardoso, 2011) included 13 statements related to four perception measures: learning, self-assessment, engagement, and interactivity. Internal reliability of the survey was confirmed via Cronbach's Alpha and further analyzed by a panel. Via descriptive statistics, the means and standard deviations for each survey item was calculated.

To explore individual differences, four participants from the CG were selected to represent deviations among the participants. They were selected because their perception and performance deviated from the mean in an extreme manner (i.e. they were considerably higher or lower). Perception and performance data were plotted on a graph (see forthcoming Figure 1) to visually represent the result deviations between the four participants.

3. Results and discussion

In Table 1, the results reveal that students in the CG had positive perceptions of clickers, as their perceptions were above the level of neutrality (≥3) on all measures, particularly for engagement (*M*=4.15, *SD*=0.65).

Table 1. Student perceptions of clicker technology

Measures of perception	**CG (n=29)**	
	M/5	**SD**
Learning	3.78	.84
Self-assessment	3.91	.59
Engagement	4.15	.65
Interactivity	3.14	.88

Table 2 illustrates the results for student performance, showing that both the CG and NCG improved in vocabulary learning between the pretest and posttest. An independent-samples *t*-test was run to compare the participants' level of vocabulary before the treatment in the CG (*M*=1.29; *SD*=1.77) and NCG (*M*=.93; *SD*=1.38),

which revealed to be comparable, $t(59)=0.87$, $p=.39$. When looking at the learning gains, there was a significant improvement between the pretest and posttest results in the CG ($M=6.61$; $SD=3.81$) and the NCG ($M=4.97$; $SD=2.31$), $F(1.771, 104.5)=159.53$, $p<.001$. However, when comparing the improvement between the groups, there was not a significant difference, $F(1.771, 104.5)=3.031$, $p>.05$.

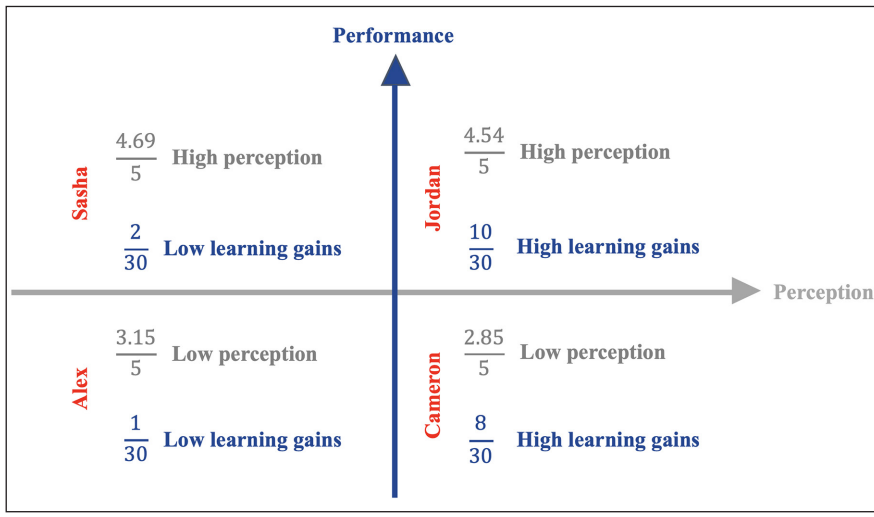
Table 2. Performance on vocabulary assessment tests

Test	CG (n=31)		NCG (n=30)	
	M/30	SD	M/30	SD
Pretest	1.29	1.77	.93	1.38
Immediate posttest	6.61	3.81	4.97	2.31

Overall, the findings revealed that students have positive perceptions of clickers. These results corroborate the literature that shows similar evidence (e.g. Song et al., 2017). For performance, the learning gains shown in the CG support findings in the literature that indicate that the pedagogical use of clickers promotes learning (e.g. Agbatogun, 2014). The results also reveal that the improvements in the CG were not significantly higher than those in the control group. While this finding corroborates previous studies who found comparable learning gains (e.g. Mays et al., 2020), it contradicts others who found clicker-enhanced learning outperformed other instructional approaches (e.g. Agbatogun, 2014). The absence of significantly higher improvement in the CG may be explained by the interaction of individual differences in performance, which is highlighted by the high levels of standard deviation in the CG on the posttest ($M=6.61$, $SD=3.81$).

The results of the four participants selected, shown in Figure 1, highlight 'extreme' scores (highest standard deviations). For one participant, Jordan, clicker-enhanced learning was particularly successful as he received one of the highest scores for perception (4.54/5) and vocabulary acquisition (10/30). On the opposite end of the spectrum, Alex did not greatly benefit from clickers as he scored among the five lowest in both measures (perception: 3.15/5; learning gains: 1/30). For other students, a discrepancy between measures was observed (e.g. high perception and low performance). For example, Sasha rated high perceptions (4.69/5) but scored among the five lowest participants for learning gains (2/30), indicating that high perceptions did not project to acquisition. Contrarily, while Cameron had lower perceptions (2.85/5), she still benefited from the clicker-based treatment as she had high vocabulary acquisition (8/30). In sum, the presence of extremes in these results highlights the effects of individual differences (see also Landrum, 2015), indicating that the proposed clicker-enhanced learning was more beneficial for some students than others.

Figure 1. Four potential scenarios: perception and performance quadrant



4. Conclusions

In conclusion, this project has shown that L2 students hold positive perceptions of the use of clickers and that the technology has the potential to aid vocabulary learning. However, the individual differences observed show that clickers are not a pedagogical panacea, and that the technology should be implemented in conjunction with other instructional approaches to accommodate the students' needs, interests, and individual differences.

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