



Technique efficacy when using a student response system in the reading classroom

David Kent, Woosong University

Abstract

Although studies using student response systems (SRSs) within the English as a foreign language (EFL) classroom are relatively rare, there is increasing evidence from a range of disciplines to highlight the potential behind application of these systems for student learning. Consequently, this study contributes to filling this gap by demonstrating the efficacy of SRS-integration in the EFL reading classroom for formative assessment when supported by teacher-interaction and peer-interaction utilization techniques. Relying on a quasi-experimental design, results suggest that a Plickers SRS-integrated classroom can provide a digitally interactive learning environment and active learning opportunities, particularly when coupled with a peer-interaction technique. It also enhances Korean EFL learner engagement with content while supporting the development of reading comprehension skills. Further, findings indicate that learners are receptive to ongoing SRS utilization as an alternative to traditional methods, viewing it as useful for highlighting their knowledge gaps, focusing their attention, and stimulating their engagement.

Keywords: *Active Learning, Formative Assessment, Reading Comprehension*

Language(s) Learned in This Study: *English*

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Introduction

In the English as a foreign language (EFL) classroom, active learning, as part of summative and formative assessments, can help engage students in the learning process and assist them in developing mastery of skills (Ketabi & Ketabi, 2014; Micheletto, 2011; Premkumar, 2016). Student engagement is important if effective and efficient learning is to be achieved, but this is not always easy to implement (Love, 2012). It can also be made more difficult in contexts where classroom contact hours are limited (Sundqvist & Sylvé, 2016; Yim, 2016) and students have a fear of being wrong or are too shy to respond to questions asked of them (Voelkel & Bennet, 2014; Wong, 2016). Such contexts lead to difficulties for students in terms of being able to attain adequate language practice and to receive prompt feedback from instructors. However, classroom use of student response systems (SRSs) has been reported to improve aspects of participation and involvement while leading to increases in student achievement (Kalinowski & Jones, 2005). They also allow instructors to provide effective, efficient, and immediate feedback while using student responses to modify instruction (Crossgrove & Curran 2008), which can lead to improvement in both student understanding and teaching quality (Gok, 2011). So too, SRSs have been used to stimulate active learning (Ayu, Taylor, & Mantoro, 2009) and increase student engagement with content (Heaslip, Donovan, & Cullen, 2014) by using teacher-interaction and peer-interaction pedagogical techniques (Hung, 2017).

Teacher-interaction and peer-interaction techniques can arguably be used effectively in EFL contexts, as Hung (2017) demonstrates. However, the efficacy of these techniques when using a SRS in a reading comprehension classroom to elicit second language (L2) production from students, highlight responses, and provide effective learner feedback has not been investigated, particularly when using active learning techniques and a structured questioning process. In such a context, SRS-integration alongside teacher- and peer-interaction techniques may encourage levels of teacher–student and student–student engagement that

can establish what Kalinowski and Jones (2005) rationalize as being important for many students: a learning environment that helps them break out of their boundaries by employing group dynamics that bring students together as part of a socially collaborative learning community. In such an environment, student receptiveness to SRS integration may (a) see learners increasingly realize what they know as a group; (b) help them stay focused in class; (c) engage them, so they become more involved with content under study; and also (d) see them become increasingly comfortable with the implementation of SRS technology for learning. This study aims to explore these aspects.

SRSs in EFL

SRSs have long played a variety of roles in tertiary classrooms, from taking attendance to practicing quizzes, and have been used as a means of enhancing engagement with content by supporting interactivity through teacher- or peer-led small-group discussions (Espey & Brindle, 2010). Yet, studies focusing on the use of SRS-integrated instruction are still relatively sparse in the context of teaching English to speakers of other languages (TESOL). Among these studies, increases in learner satisfaction (Hung, 2017), vocabulary development (Yu, 2014), as well as participation (Cordoso, 2011) and motivation (Yu & Yu, 2016) are evident, along with measured improvements in communicative competence (Agbatogun, 2014). Yoon (2017) also affirms that SRS use leads to increased opinion sharing, participation, and teacher interaction in the Korean classroom. In addition, questioning methods provided by SRS-integration, where students identify relationships between new information using prior knowledge to help them reach their final conclusions, have been seen to work well, particularly for increasing comprehension, enhancing engagement, and leading to improved learning outcomes in support of reading skills in the Korean context (Lee & Oh, 2014).

SRS Integration

The most significant implementation of SRSs at the tertiary level is via assessment, especially formative assessment (Espey & Brindle, 2010). Formative assessment is both integral and essential to the instructional process (Ketabi & Ketabi, 2014), and it can provide immediate feedback to assist in guiding students with their learning. Yet to appropriately foster any aspects of communication or learning in an SRS-integrated EFL classroom, as well as student knowledge, attention, engagement, and interaction, it is important to consider what kind of approach to use, what kind of SRS to employ, and what kind of classroom interaction techniques to rely upon.

Approach

Kim, Al-Mubaid, Yue, and Rizk (2011) highlight that SRS-integration that relies on active learning approaches leads to the most beneficial learning gains. In this regard, principles of active learning (e.g., collaboration, group work, and peer- or teacher-guided discussion and feedback) which rely on constructivist methods and communicative language teaching (CLT) approaches have long been at the heart of TESOL classrooms. Further, as Monk (2014) stresses, any TESOL classes implementing CLT will already be employing principles of classroom engagement, motivation, and interaction. Additionally, SRS use can, through an integrationist approach, bring with it an increased sense of community, supporting learning from self-evaluation, peer comparison, and group-based responses (Curtrim Schmid, 2007). It can also enhance student participation in the classroom, which in turn leads to increasing levels of interactivity with both the teacher and with peers (Curtrim Schmid, 2008). Lastly, it can provide a means of enhancing language input (Cordoso, 2011) and foster generative learning (Lee & Oh, 2014) when using a pedagogical model that provides scaffolding for active knowledge construction.

Which SRS System to Employ

Although many varieties of SRSs exist, [Plickers](#) is unique, in that it uses quick response (QR) paper-based clickers and is deployable without the need for any student reliance on technology. This leads to minimal in-class disruption, as there is no special equipment to collect, disseminate, or maintain (Taylor, 2016). Students do not need to comprehend or use new technical systems or download any new

applications (Lam, Wong, Mohan, Xu, & Lam, 2011). This also means that, in a minimum use setting where technology may be lacking, an instructor-held smartphone and a paper-based handout per student is all that is required for this particular SRS to be deployed. In contexts where class hours are limited, the technology is fast and easy to setup—equally employable with a small- or large-sized classes—and can be structured to ensure that the focus remains on content over technological implementation (Lam et al., 2011). This also ensures a means of providing increased instructor autonomy over the technology use and, in turn, the learner content being delivered through it (Kent, 2015). QR codes have also been used in EFL settings like Korea to great effect (Kent & Jones, 2012a), improving motivation and allowing for the easy integration of various technologies into the classroom alongside the practice of language content (Kent & Jones, 2012b).

Classroom Interaction Techniques

Arguably, traditional SRS-integration pedagogically supports a teacher-interaction technique where the adjustment of instruction or feedback to meet the needs of students, based on their responses, is led by the instructor. The teacher-interaction technique sees the teacher assess students' prior knowledge based on an aggregate of responses, and then adjusts feedback (and instruction) to meet student needs (Novak, Patterson, Gavrin, & Christian, 1999). This technique also reflects a conventional classroom initiation–response–(teacher)feedback model, where teacher–student engagement and teacher-led discussion are primary. Yet this model, particularly from CLT and constructivist learning perspectives, can be criticized, as it promotes a teacher-centered classroom that can potentially limit opportunities for students to engage in interaction and knowledge construction. On the other hand, the peer-interaction technique, as highlighted by Mazur (1997), can potentially provide students with the opportunity to discuss peer responses to questions with classmates before providing a rationale for the correct response. This leads to increased student–student engagement and discussion and an initiation–response–(student)feedback model. The peer-interaction technique has been seen to make classrooms more interactive and, in turn, improve student learning, generating increased opportunities for L2 output and interaction. Peer-focused learning has also been seen to promote reading achievement (Ghaith, 2003) and reading motivation for EFL learners taking classes supported by peer-assisted learning with technology (Lan, Sung, & Chang, 2007). Learners participating in peer-focused learning also perceive it to enhance their knowledge of literacy, along with critical thinking and problem-solving skills (Hurst, Wallace, & Nixon, 2013). Yet peer-focused learning is often not used outside of oral conversational tasks (Philp, Adams, & Iwashita, 2014), and it is rarely implemented alongside the use of an SRS system in language classrooms.

Purpose of the Study

To date, no studies have examined the effectiveness of Plickers SRS-integration in the EFL setting of Korea. There are also no studies attempting to determine learner receptiveness to the Plickers system in such classes. Additionally, there are no studies that compare the effectiveness of promoting active learning through teacher-interaction and peer-interaction techniques while undertaking formative assessment activities supported by SRS-integration in the EFL reading classroom context of Korea. This study aims to fill these gaps.

Underscoring the aims of this research is the notion that student language learning and development is enhanced through classroom interaction. SRS was deployed as a means to promote learner engagement and to assess active learning results in a Korean university, junior-level, EFL reading classroom while undertaking textbook-based formative assessment activities. A digitally interactive learning environment was therefore established to gather student responses through an active learning method, relying on either a teacher- or peer-interaction utilization techniques, with the following questions arising:

1. Does stimulating active learning via peer-interaction (over that of teacher-interaction) while using a SRS lead to a greater gain in the development of reading comprehension skills?
2. What is the learner receptiveness to SRS-integration in a for-credit, college EFL reading class?

Methodology

Participants

This study adopted a quasi-experimental research design involving two experimental groups, each consisting of a cohort of 12 participants enrolled in the same English language reading course and coming from a purposive sample (Fraenkel, Wallen, & Hyun, 2012). All were juniors (third-year students) minoring in English in Korea with a mean age of 23.58. In terms of first language (L1) and L2, all participants held a homogeneous background with 12.5 years of L2 study behind them. Additionally, no difference was found between the two groups' English proficiency levels as per self-reported Test of English for International Communication (TOEIC) scores, falling between 605 and 780. Prior to intervention, none of the participants had previously used the Plickers SRS.

Target Technology

Plickers is a free SRS that uses QR codes printed on paper for use as a paper clicker. In this case, each side of the QR code corresponds to one of four options depending on how the card is oriented (A, B, C, or D) (Johnson, Adams Becker, Estrada, & Freeman, 2015). Responses are scanned by an instructor-held smartphone or tablet and can be displayed to learners in real-time if Wi-Fi and a computer with a projector are available. Feedback, and discussion on each item can then be conducted easily on-the-fly.

Intervention

To maintain comparable conditions, the same instructor was responsible for teaching both groups, adopting identical materials, developing lesson plans, using elicitation techniques, and implementing technology in the classroom. The purpose of this study was to compare two groups' learning outcomes due to two different classroom interactions employed while using the Plickers SRS. This would then help determine how successful each interaction was in influencing reading comprehension skills (Research Question 1) and assess learner receptiveness to use of the technological elicitation technique (Research Question 2).

The target technology was implemented with two groups to elicit student answers based on classroom interactions, with steps developed akin to those used by Hung (2017) and outlined in [Table 1](#). The two techniques (i.e., peer-interaction and teacher-interaction) were also adapted for the class context and material being studied. For the peer-interaction technique, peer discussion and choice of answers prior to voting using the SRS was removed. This was undertaken for two reasons: first, so that interaction would align with the question cycle for technology-enhanced formative assessment by Beatty and Gerace (2009) and second, because it was otherwise felt that a trend-type response could potentially emerge and skew the data collected for formative assessment of the class by the teacher. Further, the teacher-interaction technique was extended to follow the peer-interaction technique more closely. This was done so that the conditions could be as similar as possible between the two interactions while also emphasizing the role of active learning from structured questions in both conditions.

In total, the course provided 48 hours of instruction over a 16-week semester, meeting once per week for three hours. Each lesson consisted of three continuous 50-minute blocks, with the use of treatment confined to the first block of each lesson. Units covered in the timeframe of the study consisted of Chapters 9–12 of the course textbook (Smith & Mare, 2015). The book provided the reading content for each group, consisting of an average of four paragraphs per chapter, and 21 multiple choice questions in total for each reading (seven per paragraph). The reading content used with intervention was made available to students in print form in addition to being digitally displayed in the classroom alongside the questions presented by the Plickers SRS web-based platform. For the dependent variable, the textbook and digital display of learning material was relied upon to present and check content being taught to students. Reading comprehension was assessed through student responses to the multiple-choice type questions coming from the class textbook. All responses were recorded utilizing the Plickers SRS in a digitally interactive manner. The independent variables were classroom interaction (peer- or teacher-led) and the techniques utilized with the two groups to verify the appropriateness of student responses to the multiple-choice questions. Two

instruments were developed for data collection: a reading test and a learner receptiveness survey. The reading test was developed for both groups and provided at onset as a pre-test. The same test was later utilized as a post-test. Meanwhile, the post-intervention survey was delivered after the treatment to determine learner receptiveness to the Plickers SRS.

Table 1. *Interaction Technique Steps*

Step	Description	
	Peer-Interaction Group	Teacher-Interaction Group
1	Students read a paragraph from the assigned text aloud, one sentence each going around the room.	
2	The teacher poses a question from the textbook, at the completion of each paragraph.	
3	Students respond to the question individually using their assigned Plickers card.	
4	The teacher reveals the anonymous responses of the class as a whole.	
5	The teacher comments on the performance of the whole class, highlighting the number of responses for correct and incorrect answers.	
6	(a) Students are then asked to discuss the question and anonymous peer responses with their partners, and (b) determine a justification for the rationale behind the correct answer, meanwhile (c) the teacher provides supplementary guidance to pairs and individuals as they work.	(a) Students are then asked to discuss the question and anonymous peer responses with the teacher as a class group, and (b) determine a justification for the rationale behind the correct answer, meanwhile (c) the teacher provides supplementary guidance to the class as a whole.
7	The teacher, with the class as a final summary, affirms the appropriate justification for the correct answer to the question, highlighting the rationale behind the choice.	
8	The group returns to Step 2, cycling through the steps again until all assigned questions for the reading passage are complete—after which the group then returns to Step 1 if there are any further paragraphs to read.	

Instruments

Reading Test

All participants were required to undertake a reading test twice, once before and once after Plickers-based instruction, in order to measure the development of their L2 reading abilities throughout the course of research. These reading tests were conducted during regularly scheduled class times with the same questions utilized in each pre- and post-test. The reading test passages and questions were different to the ones covered by the classroom curriculum, but they shared similar difficulty levels and formatting. They were created using the exam maker software specifically provided by the publisher to create tests (with answer keys) for the content covered by the course textbook. Data from these tests were used to determine the effect on reading skills of the intervention and to answer Research Question 1.

Post-Treatment Learner Receptiveness Survey

The learner receptiveness survey was based on surveys developed by Crossgrove and Curran (2008) and Mendez-Coca and Slisko (2013; see the [Appendix](#)). It was administered in the L1 to both groups one week after the final use of the Plickers SRS. Back-translation was undertaken to ensure language accuracy. The survey consisted of an 8-item demographic section and a 4-item SRS receptiveness section where ratings were recorded using a 5-point Likert scale (1 = *Strongly Disagree*; 5 = *Strongly Agree*). The first three items

of the receptiveness section focused on student use of the SRS and constructs regarding how it related to their knowledge, attention, and involvement with the instructional content. The last item focused on frequency of use of the SRS itself. Data from this survey was used to determine learner receptiveness to use of the Plickers SRS in order to answer Research Question 2.

Procedure

This research was conducted mid-course over a period of seven weeks of a 16-week semester. In Week 1 of the study, to assess baseline reading skills, all participants took the reading test as a pre-test. Instructional intervention then took place in Weeks 2–5 of the study, during which both groups completed four lessons along with associated in-class assessment of reading comprehension activities using the Plickers SRS to gather responses. During Week 6 of the study, all participants took the same reading test as a post-test to determine any improvements made. Finally, the post-intervention learner receptiveness survey regarding use of the digitally interactive method of eliciting responses was delivered during Week 7 of the study. To analyze the data, independent samples *t*-tests were used. In addition to comparing *p* values, Cohen's *d* was calculated to examine whether the *p* values had any practical importance.

Results

Effect on Reading Skills

Descriptive statistics and group comparison results for the participants' reading test performance are detailed in Table 2. While both groups did not differ greatly on the pre-test, the independent samples *t*-test results indicated a significant difference in the post-test scores between the groups ($t = 2.411$, $p = .028$) with a small effect size (Cohen's $d = 0.16$). This suggests that engaging EFL learners in the development of their reading skills in a classroom utilizing a peer-interaction technique to promote active learning does exert a statistically significant effect. However, when compared to enhancement of L2 reading comprehension using a teacher-interaction technique, the effectiveness is actually marginal. This result could have been due to the small sample size. However, other studies utilizing small sample sizes along with peer-interaction techniques and SRS technology (e.g., Hung, 2017) did demonstrate both statistically significant differences as well as large effect sizes. So, there is conceivable potential for use of the SRS with a peer-interaction technique in the reading classroom. Perhaps the experiment could be scaled up to see if the same results occur. A future study on the use of the peer-interaction technique using SRS technology could conduct a comparative analysis between an in-class and a flipped-classroom model. Such a study could see what findings emerge in EFL reading classroom contexts of Korea, particularly in light of the positive results from the learner receptiveness survey.

Table 2. Results of Reading Performance for Both Groups

Reading Test	Peer Interaction ($n = 12$)		Teacher Interaction ($n = 12$)		t	p
	M	SD	M	SD		
Pre-Test	90.55	60.16	88.33	57.46	0.708	.486
Post-Test	95.63	18.56	89.45	60.16	2.411	.028*

Learner Receptiveness to the Plickers SRS

Participant responses to the post-intervention survey are summarized in Table 3. Descriptive statistics and the results of independent samples *t*-tests illustrated high satisfaction with use of the Plickers SRS overall. Essentially, these results suggested that implementation of the Plickers SRS, in combination with either a peer- or teacher-interaction technique, could stimulate active learning. The students believed that using a SRS was a satisfactory alternative to traditional instruction. All students also perceived deployment of the Plickers SRS as a useful means of highlighting knowledge gaps and focusing attention on specific content under study. It was viewed as particularly engaging by those students utilizing a peer-interaction technique.

The peer-interaction group level of SRS satisfaction regarding involvement, or engagement with learning content, was significantly higher than that of the teacher-interaction group ($t = 2.152$, $p = .046$). There was also a very large effect size (Cohen's $d = 1.16$).

Table 3. *Learner Receptiveness Responses for Both Groups*

Survey Item	Peer Interaction ($n = 12$)		Teacher Interaction ($n = 12$)		t	p
	M	SD	M	SD		
Knowledge	4.50	0.27	4.50	0.27	0.000	1.000
Attention	4.83	0.15	4.50	0.27	1.773	.090
Involvement	4.50	0.27	3.83	0.88	2.152	.046*
Use	4.50	0.27	4.50	0.27	0.000	1.000

Conclusion

The integration of various SRSs in the classroom has been shown to boost active learning in a variety of non-EFL contexts (e.g., Ayu et al., 2009; Espey & Brindle, 2010), with this study contributing to the literature by demonstrating that similar potential exists in the EFL context. The findings highlight the potential behind the use of a peer-interaction technique to enhance the language acquisition skills of Korean EFL students at the university level for reading comprehension, particularly in terms of fostering student engagement with material when using an SRS. This study also builds upon the scarcity of literature focusing on the use of SRSs with EFL students, thereby serving to contribute to the emerging discussion in the field. It also simultaneously meets the recent call by Yoon (2017) to undertake experiments in Korean contexts and SRS studies using pre-, during-, and post-classroom activities. In addition, the study comes to demonstrate that the Plickers SRS can be successfully integrated within an EFL reading classroom when conducting formative assessment activities. It is also capable of providing a digitally interactive learning opportunity for all students that is welcomed, helping focus attention on content under study, stimulating engagement, and highlighting knowledge gaps.

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Appendix. SRS Survey

This survey is about your use of the SRS recently used in class.

The following questions ask for (1) some information about you, and (2) your experience with the SRS.

1. Please fill in-the blanks for the seven statements below (1a–1g), and circle *Yes* or *No* for the eighth question (1h).

1a. Age _____

1b. Class _____

1c. Gender _____

1d. Major _____

1e. Minor _____

1f. My most recent TOEIC score is _____

1g. I have been studying English for _____ years

1h. Have you previously taken a course that used Plickers? Yes No

2. When thinking about the course you have just taken, and the use of the SRS in the course, look over the four statements below (2a–2d) and circle your level of agreement with the statements from 1 = *Strongly Disagree* to 5 = *Strongly Agree*.

2a. Using the SRS helped me realize what I knew. 1 2 3 4 5

2b. Using the SRS helped me pay attention in class. 1 2 3 4 5

2c. Using the SRS made me feel more involved with the material. 1 2 3 4 5

2d. The SRS should be used during every lesson of the course. 1 2 3 4 5

About the Author

David Kent is an Assistant Professor in the Endicott College of International Studies at Woosong University in the Republic of Korea. He provides teacher education through the Graduate School of TESOL–MALL, where he heads the program. His principal research focus revolves around digital language learning.

E-mail: dbkent@wsu.ac.kr