Student Response Systems in the Foreign Language Classroom: An Empirical Analysis of Potential Benefits for Learner Engagement and Language Learning Outcomes

A Student Response System (SRS) is a polling system made up of a transmitting remote control, a receiver and corresponding software. It serves as a pedagogical support device by encouraging active engagement via the remote handset by all students participating in a class or lecture. Also, it provides instant feedback to both the lecturer/instructor and the learners on comprehension of the material being presented. For almost two decades (Roschelle, 2003) and especially in North America, such systems have been routinely used by lecturers in the arts, humanities and sciences, and are broadly recognized as being beneficial to the learning process (Trees & Jackson, 2007). Only recently, however, have they made their appearance in the foreign-language classroom (Schmid, 2007).

This paper reports on a quantitative investigation to evaluate the impact of an SRS, as well as its effectiveness in the teaching of English as a foreign language to first-year engineering students (N=148) studying at a French university. The investigation was carried out during the students' mandatory in-sessional English course throughout the academic year. It focused mainly on observing learner attitude, engagement and the students' short and long-term recall.

The investigation used a pretest/posttest experimental design, as well as in-course unscheduled testing as instruments to collect data from the students who, for the purposes of the investigation, were divided into two groups: the experimental group using the SRS and the control group using traditional methods of learning/instruction.

Initial results suggest that SRSs are beneficial on several levels, and in particular from the point of view of engagement, knowledge retention and learner attitude. The implications of the technology for language learning are discussed.

1. Introduction

In compliance with ministerial decree, all university students in France are required to follow English Language courses. Many others are required to obtain external language certification. But this official discourse may have little impact on student attitudes. Students will agree that proficiency in English is important, but at the same time, they do not seem to have the time or energy to achieve the desired proficiency. Also, many students perceive foreign language learning as an abstraction; just another subject on the long list on their curriculum. Consequently, their expectations about language learning are frequently very different from the type of activity one would usually associate with a communicative approach.

In the past, the problems caused by these social-cultural difficulties could be avoided thanks to small class sizes (10 to 12 students). Recently, however, because of cuts in funding, class numbers in the institution where the present study took place have increased dramatically.

Classes now contain 24 to 26 students. Such numbers seriously compromise interaction and participation in the classroom and even put a strain on improving essential skills such as listening.

This situation, added to the general learner attitude and student culture that discourages participation, motivated the search for alternatives to conventional L2 classroom interaction. One of the solutions that has been explored is the use of Student Response Systems (SRSs).

Student Response Systems – what are they?

A Student Response System (SRS) is a polling system made up of a transmitting remote control (or keypad), a receiver and corresponding software. It allows teachers to poll learners throughout a lesson in order to sample their understanding and to adjust content if necessary. In other words, an SRS is a support device that induces active engagement in learners, both via their keypads and between themselves. Also, it can give instant feedback to the teacher and the learners on responses to questions. Accordingly, it helps provide direction, making the classroom more organic. This last point tends to modify the dynamics of the classroom. For more than two decades (Roschelle, 2003) and especially in North America, such systems have been routinely used by lecturers in the arts, humanities and sciences, and are broadly recognized as being beneficial to the learning process (Trees & Jackson, 2007). Their appearance in the foreign-language classroom, however, is relatively recent. There has been little formal research done on SRS use with language learning, the only direct research being Schmid (2008) who conducted a qualitative analysis in a British university.

2. Background

Past research on the use of SRSs is vast and covers all disciplines in higher education. Measurements of students' attitudes or of the benefits of SRSs have systematically yielded positive results.

The theory underlying use of SRSs stems from research carried out as long ago as 1977 by Smith and more recently by McKeachie (1990). Both observed that classroom participation and discussion lead to what they call "higher-order learning." This may seem obvious in the light of progress made in approaches to language learning over the past decades. But it must not be forgotten that the onset of the communicative approach in the mid-70s was a result

of work carried out by educational psychologists like Smith. However, certain educational cultures, both national and institutional, still cling to deductive methods and this is said to be particularly true of engineering and science (Prince & Felder 2006). This deductive learning culture undoubtedly has an effect on the attitudes of the students where the present study took place, reinforcing their hesitation to actively participate and interact.

Fassinger (1995) claims that class interaction norms, students' preparation, and student-to-student interactions significantly shape class involvement. Accordingly, SRSs are said to impact considerably on classroom dynamics. Without this technology, any large language-learning group would typically be led by their teacher. In spite of serial question-answer interactions with individuals in the class, the focus would remain essentially on the teacher. Such approaches may be successful when there are eight or ten students in the class. As numbers increase, however, they work exponentially less well. If a teacher wants everybody in a class of 24 to participate equally and meaningfully, there is no time to dwell on student replies, there is no time to harvest several replies to the same question and, invariably, the teacher has no idea of which learners may have completely disengaged. Using a keypad during a class allows teachers to obtain feedback from the entire class at any stage of the interaction and to archive it. They can react globally to it, they can examine responses for evidence of misunderstandings and they can adjust content or coverage as necessary. In terms of learner engagement, an SRS helps keep students alert. Furthermore, in cases where students are being asked to interact before responding with a keypad, the learners are engaged in knowledge creation and learning about the content from each other. Each individual gets feedback on all items and almost instantaneously, and all the students participate in that they all respond – those who do not are easily identified. As a result, there is more focus because the learners know a question is imminent. Finally, there is an element of competition in that the learners want to see how their responses compare to others in the class.

3. Motivational framework

Past investigations (Brown, 2009) have shown that French engineering students tend to be extrinsically motivated and performance oriented for reasons linked to their culture and educational background. As a rule, extrinsic motivation would be taken as a display of maladaptive learning behavior. However, research has shown that motivational behavior in

foreign-language learning varies from one culture to another (Bernat 2004, Iyengar & Lepper 1999) and that extrinsically motivated learners can sometimes be the norm. The educational values of our students can differ radically from ours, and their expectations in specific learning contexts may clash with ours. But this does not necessarily make their attitudes unacceptable. One observed behavior that reduces engagement in French learners is that they are systematically, and from one generation to the next, loathe to participate in communicative activities of any kind. It is believed that this behavior is due, partially at least, to (sub-)cultural phenomena such as the previously mentioned preference for a deductive approach or the tendency to perceive learning in terms of performance (that is to say, merely obtaining a good score). Whatever the cause, it was hoped that use of an SRS would impact positively on the behavior of the learners in this study and modify their motivation. Indeed, it was hypothesized that SRS use would allow the learners to by-pass (sub-)cultural limitations so that they could display more intrinsically motivated, self-regulated behavior resulting in increased participation and engagement.

4. Instruments and procedure

In this quantitative investigation the main objective was to evaluate the impact of an SRS, as well as its effectiveness when used by first-year engineering students (n = 148). The investigation was carried out during the students' mandatory in-sessional English course during the 2008-2009 academic year and focused mainly on observing learner attitudes, engagement and short and long-term recall. In other words, of central interest to the investigation was to clarify whether SRS use would lead to measurable gains in language learning outcomes.

At the time of the study, the 148 participants were aged 18 years old. They were distributed across six mixed ability language-learning groups. When distribution took place, care was taken to ensure that the mean level, as reflected by the mean of all scores within each group, was identical. All of the students had studied English at high school for 5 to 8 years (mean = 7.13 yrs). To distribute the learners within the groups, they took a Toeic test in the first week of class (this test served as our pre-test). The scores obtained on the test could be described as lower intermediate (mean = 441 / 990). A score of 405 to 600 is the fourth level of six on the TOEIC can-do guide. In other words, the language level is in the region of B1 on the Common European Framework of Reference for Languages (2010). All of the students

were freshmen starting a five-year study curriculum in the college. Entry to the first-year of study is based on a competitive entrance examination. Studying engineering is traditionally perceived as high-achievement and reputedly draws the “most intelligent” of high-school graduates (98% with the scientific Baccalaureate). Entrance to the college is highly competitive: in 2008, there were around 2000 candidates for 150 places offered.

For the purposes of the investigation, the groups were placed in one of two blocks (three learning groups in each block): students using keypads (the SRS Block) and those not using keypads (the Paper Block). The study took place in the second semester of the academic year and consisted mainly in testing standardized class content. Using standardized class content ensured that the same material was covered by all students within the same timeframe and in the same order and format. Tests consisted of a batch of six unannounced multiple-choice quizzes with 20 questions per quiz, each question having four possible answers. The quizzes were divided into two sections: questions relating to content covered in recent lessons (no more than two weeks old) and questions relating to content covered earlier (four weeks old and above). Students in the SRS Block responded to quiz questions using their keypads. Students in the other block responded on paper.

The SRS Block students saw the questions on a video projector. Each question was displayed for 30 seconds only, the cut-off being controlled by the Optivote software used to manage the entire system, including the keypads. The keypad number of the students who had responded was projected also. This meant that students who had not yet responded could be stimulated individually. All questions tested Use of English (vocabulary or grammar). At the end of the 30 seconds, the next question was displayed. In other words, entire projection time was ten minutes. At the same time, the software stored a record of each student’s response. This allowed the students to discover their scores immediately at the end of the test and also allowed the teacher to provide feedback either on questions where a significant number of students had failed to reply correctly, or to individuals who had performed particularly poorly. This stage allowed on-the-spot reaction with the additional engagement that this implies. Not all learners could be tested in the same class or at the same time, so several versions of the same test were used with both question and response orders shuffled.

Students in the Paper Block sat their quizzes within the same timeframe as the SRS students (i.e. during the same week). They were given paper copies of each quiz and had ten minutes to respond to all questions. The students answered the questions in any order they wanted to and possibly spent more than 30 seconds on some questions, but no more than 10 minutes on the entire quiz. At the end of the quiz, there was no discussion or feedback. Paper quizzes were taken in by the teacher, corrected and returned at a later date. Any discussion or feedback took place only when the paper quizzes were returned.

At the end of the study, all participants took the end-of-semester test. This provided a reference of overall learner progress and provided insight into which block displayed better overall language performance.

5. Results

The research question was, "will SRS use lead to measurable gains in language learning outcomes." Several operations were carried out in order to attempt to gain insight into this question. The following statistical analyses concern only 120 of the initial 148 participants. Any student who missed one or more of the quizzes has been excluded from the investigation. Accordingly, 63 participants were retained in the SRS Block and 57 in the Paper Block.

Table 1 shows the average scores obtained by each block (SRS versus Paper) in the end of year test. An SRS was not used in this test. As far as overall language performance is concerned (the test comprises a listening section, a use of English section and an oral expression section) there is no significant difference between the two blocks. But it must be remembered that the final test evaluates a whole raft of language skills, while the quizzes tested very specific and discrete use-of-English items.

Table 1: Average values on final test scores / 80 (SRS versus Paper)

	SRS Users (N = 63)	Paper Users (N = 57)	*p*
Average Score / 80	47.41	47.47	0.48

The Use-of-English quiz scores portray a slightly different picture as shown in Tables 2, 3 and 4. Table 2 compares overall SRS scores to overall Paper scores. Raw test scores for the SRS Block were higher on average than those of the Paper Block. However, the *p*-values (two-tailed) obtained from a Mann-Whitney Test suggest that there is little statistical significance. At first sight, it appears, therefore, that as far as overall language learning outcomes are concerned, the learners gained little from using SRS in this design.

Table 2: Mean values of overall differences between
all SRS quiz scores and all Paper quiz scores / 120
Average scores: 74.00 (SRS N = 63) and 70.81 (Paper N = 57)

Mann-Whitney Test UOE All SRS / UOE ALL Paper		U_a = 1558		
Mean for Ranks		z	$p_{(1)}$	$p_{(2)}$
Block A SRS	Block B Paper	1.25	0.1056	0.2113
N_a = 63	N_b = 57			
64.3	56.3			

Table 3 compares short-term recall (STR) SRS scores to short-term recall Paper scores. Raw test scores for the SRS Block were lower on average than those of the Paper Block. Even though there is little difference between the two, this suggests that SRS use may contribute negatively to language-learning outcomes or, at least, to short-term recall. But once again, the *p*-values (two-tailed) obtained from a Mann-Whitney suggest that there is little statistical significance in this suggestion.

Table 3: Mean values of differences between
STR SRS quiz scores and STR Paper quiz scores / 60
Average scores: 38.65 (SRS N = 63) and 39.79 (Paper N = 57)

Mann-Whitney Test UOE STR SRS / UOE STR Paper		U_a = 1957.5		
Mean for Ranks		z	$p_{(1)}$	$p_{(2)}$
Block A SRS	Block B Paper	-0.85	0.1977	0.3953
N_a = 63	N_b = 57			
57.9	63.3			

Table 4 compares long-term recall (LTR) SRS scores to long-term recall Paper scores. Raw test scores for the SRS Block were higher on average than those of the Paper Block. The *p*-values (two-tailed) obtained from a Mann-Whitney suggest that the result is of considerable statistical significance. Possibly, SRS use may contribute positively to language-learning outcomes in that their use stimulates strategies that bring about better long-term recall.

Table 4: Mean values of differences between
LTR SRS quiz scores and LTR Paper quiz scores / 60
Average scores: 35.35 (SRS N = 63) and 31.02 (Paper N = 57)

Mann-Whitney Test UOE LTR SRS / UOE LTR Paper		U_a = 1270.5		
Mean for Ranks		z	$p_{(1)}$	$p_{(2)}$
Block A SRS	Block B Paper	2.76	0.0029	0.0058
N_a = 63	N_b = 57			
68.8	51.3			

Intuitively, one might be tempted to link enhanced long-term recall to short-term recall. If the former is clearly present, why not the latter? In reality, there seems to be no logical reason why one should automatically imply the other. These results strongly support the case for enhanced effects of long-term recall in the absence of significant short-term recall. In other words, the absence of statistical significance for enhanced overall performance when using an SRS may be due to poor performance with regard to short-term recall.

6. Discussion

The results provide statistically significant evidence that the use of keypads can have a positive impact on student learning, and more precisely on long-term recall, as measured by Use-of-English quiz scores. Merely using keypads during classes may not be a sufficient guarantee of improved learning outcomes. In general terms, any technology has the potential to stimulate learners to the extent that performance levels are improved. The success of the technology in question may depend on the students as individuals, their culture, their specialist discipline, the educational culture of their country of origin, the educational sub-culture of their institution, or the type of feedback they expect. It does seem, nevertheless, that this particular group of individuals benefited form using an SRS.

Their enhanced long-term recall seems to suggest that the classroom activities (peer interaction and more meaningful / focused teacher-learner dialogue) around keypads has led to deeper cognitive processing which, in turn, leads to better long-term recall. In other words, the kinds of strategies usually developed or implemented for quizzes (rote learning just before the quiz with high scores being the sole objective) are cancelled out by the strategies implemented during SRS use and, consequently, stimulate durable learning or cognitive schemata that would otherwise remain superficial (Middleton & Midgley, 1997).

In two cases (overall scores and short-term recall) quiz scores did not differ significantly from one block to the other. Both groups had been exposed to the same course material and classroom methodology was identical. The main exception was keypad use. Also, as the number of students retained in each block suggests (63 SRS students and 57 paper students), there were more student absences in the paper block than in the SRS block. Although this is not a controlled variable, it suggests that the SRS students looked forward to using the keypad and, accordingly found being in the classroom more enjoyable. Anecdotally, this suggests that the less motivated or even weaker learners in the SRS block were more likely to attend class than their counterparts in the Paper block. As a catalyst for engaging learners and teachers in interaction around specific questions or issues, keypads seem to be beneficial on at least that level.

Conclusion

SRS use in this investigation seems to have increased learner engagement. Indeed, if there is one advantage of SRS use that is consistently underlined in most research, it is the increased student engagement and focus they confer on lectures whatever the discipline (see Yourstone et al 2008, Hall et al 2005, Cutts & Kennedy 2005, Draper & Brown 2004). Overall, learner perception of SRSs is positive and their general feeling is that they benefit from SRS use. Learners seem to be more focused and more oriented towards the classroom activity, rather than merely physically present and, in some cases, just going through the motions. Teacher perception too is that the students are more engaged when SRSs are being used.

The findings of this paper are consistent with previous research carried out in other disciplines. They are also consistent findings in Schmid's (2008) qualitative study that investigated SRS use and performance knowledge in the English language classroom. SRSs may not necessarily be appropriate for all learning environments; in particular, using them

with smaller classes would probably prove pointless. Although SRSs have not been investigated from this point of view, their success may depend on the type of learner, learning styles and the type of learning environment. However, nothing in the literature suggests that SRS use is not beneficial, even though statistics tend to suggest varying outcomes. Such outcomes may depend on teacher / learner attitudes, creativity in the use of these devices and student expectations. In other words, SRSs may not be a general technological solution, but rather a good fit when it comes to a specific context.

Does learner engagement imply motivation? Not necessarily: learners can superficially engage because they have to. They may go through the motions because they are required to, or because they believe they must. That is to say, in such conditions their motivation would be extrinsic. However, if learners are artificially engaged (via a particular technology, for example) in activities that would usually lead to deeper cognitive processing, then the payoff may come at a later date.

References

Bernat E (2004). Investigating Vietnamese ESL learners' beliefs about language learning. *English Australia Journal, 21,* 40-54.

Brown DN (2009). Performance orientation and motivational strategies in high-achievement language learners. *LIDIL, 40,* 105-121.

Brown KW & RM Ryan (2003). The benefits of being present: The role of mindfulness in psychological well-being. *Journal of Personality and Social Psychology*, 84, 822-848.

Cutts QI & GE Kennedy (2005). The association between students' use of an electronic voting system and their learning outcomes. *Journal of Computer Assisted Learning, 21,* 260-268.

Draper SW & MI Brown (2004). Increasing interactivity in lectures using an electronic voting system. *Journal of Computer Assisted Learning, 20,* 81-94.

Fassinger PA (1995). Teachers' and Students' perceptions of why students participate in class. *Teaching Sociology, 24,* 25-33.

Hall RH, ML Thomas, HL Collier & MG Hilgers (2005). A student response system for increasing engagement, motivation and learning in high enrollment lectures. *Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, USA, August 11-14 2005,* 1-7.

Iyengar SS & MR Lepper (1999). Rethinking the value of choice: a cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology, 76,* 349-366.

McKeachie W (1990). Research on college teaching: The historical background. *Journal of Educational Psychology, 82,* 189-200.

Middleton MJ & C Midgley (1997). Avoiding the demonstration of lack of ability: an underexplored aspect of goal theory. *Journal of Educational Psychology, 89,* 710-719.

Prince MJ & RM Felder (2006). Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases. *Journal of Engineering Education, April 2006*. On line: http://findarticles.com/p/articles/mi_qa3886/is_200604/ai_n17186573/?tag=content;col1 (retrieved February 2010).

Roschelle J (2003). Unlocking the learning value of wireless mobile devices. *Journal of Computer Assisted Learning, 19,* 260-272.

Schmid EC (2008). Using a voting system in conjunction with interactive whiteboard technology to enhance learning in the English language classroom. *Computers and Education, 50,* 338-356.

Smith D (1977). College classroom interactions and critical thinking. *Journal of Educational Psychology, 69,* 180-190.

Trees AR & MH Jackson (2007). The learning environment in clicker classrooms: student processes of learning and involvement in large university-level courses using student response systems. *Learning, Media and Technology, 32,* 21-40.

The Common European Framework in its political and educational context. On line: http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf (retrieved July 2010).

Yourstone SA, HS Kraye & G Albaum (2008). Classroom questioning with immediate electronic response: do clickers improve learning? *Decision Sciences Journal of Innovative Education, 6,* 75-88.