Student Response Systems

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Abstract

Teachers have always used some form of response system to gauge if their students understand a concept. Whether it is hand raising or the newest innovation of electronic systems, the benefits can be substantial. This literary research review focuses on how feedback, pedagogy, and assessment can be influential in instructional practices using student response systems. Student attendance, participation, behavior, attitudes, motivation, and self regulation are also affected and influenced by the use of these systems. The need for more research in this area is needed. Most of the research on electronic systems of response has been done at the college level. However, with the current research available regarding student response systems, one could hypothesize that the benefits relate to elementary school instruction, as well.

**Student Response Systems**

 Student response systems (SRS) have been around for many years. It could be as simple as students raising their hands for responding to questions posed by a teacher, or current practices using digital devices. SRS can basically be divided into two major categories for teachers. First as a “goal construct focused on improving learning and instruction”, and second, as ”assessing learning and improving teaching efficiency” (Penuel, Boscardin, Masyn, & Crawford, 2007, p. 327). These two major categories become more complex when looking at the effects on students. Many research studies have been done on the effects of responding on pedagogy, attendance, behavior, attitude, self-efficacy, self regulation, and the results of the various types of feedback. The teachers’ goal of use of the SRS impacts the effect on the student.

 The original motive for choosing to investigate SRS was an observation of classes using them for assessment only. Information on the products available for electronic resources is abundant in professional journals such as Learning & Leading and Tech & Learning. In searching for literature pertaining to electronic response systems on Galileo and especially EBSCOhost, limited information was available for studies performed in the elementary setting. Looking at many of the references sited in many of the original sources also allowed for further research. The only study located with the inclusion of electronic response at the elementary level was by Penuel et al.(2007). However, the link between the current studies of other response systems and the research at the college level using electronic response can be hypothesized into a potential theory of correlation. The research in this paper will show that SRS can be used to provide support to answer the question, “How are electronic student response systems beneficial to elementary students during their classroom instruction?”

**Response Systems**

 “Learning is enhanced when the frequency with which students actively respond during instruction is increased” (as cited in Gardner, Heward, & Grossi, 1994, p. 63). There are many ways for students to actively respond during instruction, such as, raise their hand, thumbs up/down, response cards or white boards, electronic systems (clickers), personal digital assistant and even cell phones. The purpose of responding is to allow students to reveal to the teacher an element of understanding. If a system is used that requires only a sampling of responses, then the teacher is unaware of potential problems with students. If a system is used that engages all students, then the teacher can assess if every student understood the concept.

 At the elementary level, Gardner et al. (1994) replicated a study by Narayan et al. (as cited in Gardner, 1994, p. 68), and both studies reported that response cards increased the frequency of active student response during whole group instruction and improved students’ scores on quizzes. The response cards they used were individual white boards with markers. Each student responded for every question. Answers were either praised or corrected.

**Timeliness of Feedback**

 How important is the timing of feedback for students? “The research literature is clear that within the assessment process feedback is potentially the most important and powerful part with regard to affecting future student learning” (as cited Price, O’Donovan, & Rust, 2007, p. 144). Teachers often assess students’ learning with a quiz. These quizzes are used to prepare for an upcoming test. If the students do not receive feedback in a timely manner, the chances for incorporating the correct information decrease. “Immediate, rather than delayed feedback, enhances acquisition and retention” (Brosvic, Epstein, Cook & Dihoff, 2005, p. 416). In the study by Greer and Heaney (2004) the majority of students in an introductory college level of physical science felt that using the electronic response system helped them to gauge their level of understanding because the feedback was immediate. The immediate feedback presented to the instructor allows them to focus on problems with understanding and move quickly through mastered concepts (Greer & Heaney, 2004, p. 345). As noted in the study by Donovan (2008), students liked the ability to spend less time on topics that students had mastered based on the results from the electronic response system.

**Pedagogy**

 The pedagogy and content should be the focus; the technology should be the tool. (Premkumar and Coupal, 2008, p 146). The type of teacher dictates the type of instruction used with an SRS. Whole class, teacher directed instruction continues to dominate most elementary schools. (as cited Penuel et al., p. 316). In fact most education classes from elementary through college level courses are taught mostly in whole group situations. The pedagogy of a teaching style dictates the type of questions that a teacher uses in any type of response system. SRS can be used in a traditional class or one that engages in constructivism and is student centered. Most classrooms are usually under constraints of high-stakes testing which is a polar opposite to using differentiated approaches. However, Edens (2008) research concluded that use of SRS in a whole group instruction or a constructivist style was no better than the other on student achievement.

 The pedagogy can also dictate the timing of the questions. Teachers that are student centered may use SRS to pose questions at the beginning of a class, “to elicit pre-conceptions in ways that can be used to shape instruction” (as cited Penuel et al.,2005, p. 318). Constructivist teachers would then create instruction based on the students’ responses. “Researchers have suggested that questions that yield divergent student responses are more effective than those that are easy or lead all students to the same answer” (Penuel et al., 2005, p. 318). Another option for using it in a collaborative manner is to have students respond individually, discuss it with their classmates, and then respond again (Beukkman, Rebello, & Zollman, 2007, p. 129). Classrooms that are more traditional will use the SRS to assess understanding and basic comprehension of topics presented in a whole group teacher centered style of instruction.

**Assessment**

 Assessment is the most generally accepted influence on student learning (Price, et al., 2007, p. 143). SRS can be used for formative or summative assessment. For formative assessment teachers ask question s and provide feedback based on the answers. The instruction may be altered depending on the class’ responses. “Good formative assessment becomes seamlessly integrated with good instruction” (as cited Penuel et al., 2005, p. 339).

There are teachers using SRS as a form of summative evaluation; however, there is not any research on this type of use. This type of assessment is really only a time saver for the teacher and not enhancing learning. “Learning is enhanced only if pedagogy takes first place and technology second” (Premkumar& Coupal, 2008, p. 149).

**Student Attendance, Participation, and Behavior**

 At the college level, class attendance rates decline in larger classes. In the study by Greer and Heaney (2004) students average attendance using SRS went from an average of 30% to 40% to as high as 81% to 84%. Another study indicated that 71% of students that participated strongly agreed or agreed that they would attend class more if clickers were used (Preszler, Dawe, Shuster, & Shuster, 2007, p. 35). Attendance is required in schools for the K-12 environment, so SRS would not be an enormous factor in this realm. However, it does give light to the fact that students are more engaged and willing to participate.

 Students using SRS that involves each student creates an atmosphere of participation. Stowell and Nelson (2007) reported that during their study only 76% of students participated while using a hand raising system of questioning, while 100% participated with a response card or clicker system. “Thus, another advantage of clickers and response cards is that they create an avenue for interaction with students who might be too shy to speak or even raise their hands” (Stowell & Nelson, 2007, p. 257). Other research suggests if response cards or clickers were used “instead of hand raising during a single 30-minute lesson each school day, each student would make approximately 3,700 additional academic responses over the course of a 180-day school year” (Gardner et al., 1994, p. 69).

 Students who are attending class and actively participating are more likely to engage in appropriate behavior. Several studies have been done on the effects of SRS using cards and its effects on behavior. Armendariz’s and Umbreit’s research showed that each participant had fewer occurrences of disruptive behavior with a mean reduction of 59% to 100% (as cited Lambert, Heward, Cartledge, & Lo, 2006, p. 89). Other studies have provided similar results to the relationship of the use of response cards and lower disruptive behavior. Lambert et al. (2006) discusses an obvious explanation for the correlation in their study; “Response card intervention required students to remain attentive throughout instruction by eliciting high levels of responding for all students in the classroom (Lambert et al., 2006, p. 94).

**Attitudes, Motivation, and Self Regulation**

 Students’ attitudes about SRS are generally positive. “Judson and Sawada (2002) concluded that three decades of studies have consistently documented positive student evaluations of the use of student response systems in lectures” (as cited Preszler et.al., 2007, p. 30). Students that have good self efficacy have been shown to have a key motivational component and the ability to have a better quality of effort (Metallidou& Vlachou, 2007, p. 3). “Self efficacy beliefs predict the use of deeper processing and regulatory strategies and are, consequently, related to better achievement outcomes” (as cited (Metallidou& Vlachou, 2007, p. 3). Positive attitudes, motivation, and a good self efficacy will aid in the road to self regulation. SRS is a helpful tool in helping students to regulate their metacognitive processes. The instant feedback allows students to reevaluate their knowledge and change their thinking process (Edens, 2008)

**Conclusion**

 “Technology integration has been defined as educators’ use of technology to enhance instruction and to create rich environments to help each individual student develop a depth of understanding and critical thinking skills” (ChanLin, 2007, p. 45). The application of electronic SRS can aid teachers to accomplish this definition of technology integration. Past research patterns clearly show that student response and interaction is are key elements in learning. The correlation between all students responding (as opposed to hand raising) and having instant feedback also gives positive results to student achievement. Even though there is no clear evidence at this point that electronic SRS improves the academic link of better achievement, the patterns of responding do provide strong possibilities. Through combining the research, the best method to use with elementary students would be to use it in a student centered classroom, with interaction between students and teacher and between the students. The use of electronic SRS led Barnes (2008) to the conclusion that students become more active and also allows him to move towards a more constructivist style of classroom instruction. Electronic SRS allow s for instantaneous feedback and for the teacher to immediately change the direction of instruction. Questions that allow for discussion and are not single answers inspire higher level thinking skills, but comprehension checks can also be used for formative assessment. As shown in the research, students that attend class, and are involved, also have better behavior. This allows for all students to have better opportunities to learn.

**Future Research**

 Research in the area of electronic SRS in an elementary setting is scarce. There are so many areas to focus upon, but the critical idea is, ”What are the best SRS methods to use to help elementary students to reach curricular objectives and move them into the 21st century?” The research clearly shows that SRS has positive effects on learning; however, there needs to be more studies in the elementary schools. This is important to provide staff development to teachers in what methods best suit their students’ needs.

**Hypothesis**

 Based on the research in this literature review and the conclusion, teachers using a student centered teaching approach with electronic SRS and formative assessment allows students to achieve curricular goals. The study would need to be mixed with both quantitative and qualitative since the research in elementary is still sparse.

**Participants**

 The participants would need to be teachers and students in an elementary school setting. Though random selection would be the best method, a convenience sampling would most likely be the method that would be used to choose the participants. Even though it would not be generalized to the public, the study could be valuable. There would need to be 2 groups to study, so two classes of students learning the same content and curricular objectives would be needed. Fourth grade students would be used so that it is in the middle of the range of students in elementary. Students in the fourth grade study vocabulary words called “Wordly Wise” which is a traditional method of learning vocabulary words. This program is used in many elementary schools to boost students’ vocabulary for standardized testing. These will be the curricular objectives that will be used for the study.

**Procedures**

There will be two groups for this study using a repeated measures design. All students will be given a pretest. The first group will be students learning with the current method of instruction that is used for Wordly Wise. Currently teachers are using the electronic SRS for a summative assessment only. The second group will consist of the teacher using electronic SRS with students in a student centered, collaborative teaching method, and formative assessment during instruction. Instead of the teacher using the SRS only for assessment, the teacher would also use it to promote discussion in class to further the understating of the content. The teacher would also use it to check for understanding and either move on to another word or provide more instruction for understanding. Each student will take the same posttest using the electronic SRS. The study would be repeated for the next Wordly Wise lesson with the groups exchanging methods.

**Instruments**

 The instruments used in this study would include a pretest, observations, post-test, and interviews with the teacher. The teacher would be interviewed to provide qualitative input. A questionnaire survey would be given to the students after both experiments have been completed. This survey will assess the students’ attitudes and beliefs about the two different methods of instruction. The survey will be a Likert style survey with reversed wording encompassing questions pertaining to both methods of instruction.

**Analysis**

 The data will be analyzed in several ways. First the pretest and posttest will be compared to see the evidence of learning. Then the posttests will be compared see if one group did better than the other. The survey will be coded to see how the students responded to the two different methods of instruction. The teacher interview will be assessed, as well.

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