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Assessing Beginning Reading Skills with a Smart Pen technology

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Keywords: Assessment, Reading, Technology

Objectives:

This paper reports a study on how innovative technology (a smart pen) can be integrated into the Primary 1 Reading Assessment to enhance the process of assessment, learning, and teaching in grade 1 classrooms in Singapore. Specifically, we will provide data on (a) the reactions of pupils and teachers to formative assessment with smart pens and (b) the teachers’ reactions and satisfaction with diagnostic output from assessments that can be linked to differentiated instruction. The findings from the project will be presented, along with their relevance and implications to the larger international field of research on formative assessment.

Perspective:

The links between diagnostic assessment and differentiated instruction are critical because they allow teachers to provide appropriate instruction to their students. Teachers around the world are being asked to assess their students’ knowledge and skills in primary grades, especially in literacy and numeracy, to insure that children master fundamental skills. Singapore, like many other nations, wants to assure early success in reading, particularly in English, because many children come from homes where English is not the first or native language. Children who may speak Chinese, Malay, or Tamil at home are expected to begin first grade ready to read and learn in English. Consequently,
parents and kindergarten teachers provide early instruction for learning to read English before formal schooling begins. Teachers in first grade, Primary 1 in Singapore, are thus confronted with pupils who have a variety of mother tongue languages and various levels of English proficiency when they begin first grade. Thus, a test of early reading skills at the beginning of first grade can provide important information for Singaporean teachers.

The increasing pressure to teach literacy to young children is based on developmental and cross-national research that shows early and systematic teaching of reading skills can lead to enduring advantages in developmental trajectories (Cunningham & Stanovich, 1997; Snow, Burns, & Griffin, 1998; Stevenson, Lee, Chen, Stigler, Hsu, & Kitamura, 1990). In Singapore, as in Taiwan, Japan, and Hong Kong, the push towards earlier intervention is also driven by strong cultural and political discourses around the necessity for national, community, and individual competitiveness (Luke, Freebody, Lau, & Gopinathan, 2005). Because early success in reading usually leads to later high achievement, Stanovich (1986) described the longitudinal “fanning” of individual differences as the “Matthew effect” because the rich get richer while the poor fall further behind. Thus, one research strategy has been the identification of the early skills required to learn to read because early identification can lead to early remediation and diminished Matthew effects. Which skills are critical for learning to read? In the United States, the National Reading Panel (2000) identified five essential components of beginning reading: the alphabetic principle, phonemic awareness, oral reading fluency, vocabulary, and comprehension, that have become the foundation for curricula, instruction, and assessment of beginning reading because instruction on these skills can
prevent later reading difficulties (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998).

Literacy researchers have also shown that effective instruction is rooted in teachers’ thoughtful assessments of developing skills (Paris & Paris, 2006; Rathvon, 2004). Indeed, an historical corollary to increases in explicit reading instruction for younger children has been the increase in the variety, frequency, and accountability of reading assessments in primary grades (Paris & Hoffman, 2004). From 1970-2000, most high-stakes tests of reading were administered in grades 4 or 5, but now most American states, as well as many nations around the world, begin to test reading skills in first grade. The present paper reports the design of new primary reading assessments in Singapore, a research project that is set within these historical contexts of new educational policies for teaching young children to read. A 1998 curriculum review by Singapore’s Ministry of Education recommended the use of formative assessments that supports and improves learning (Black & Wiliam, 1998; Wiliam & Leahy, 2007). We have added a technology component so that teachers can save time and increase the quality of information they derive from early reading assessments.

This paper reports a research project that examines how a smart pen technology can be used to enhance assessment and teaching in elementary classrooms. Tag (Leap Frog trademark) pens have an infrared camera that “reads” patterns in dot-embedded paper and converts the patterns to audio files. As they touch different areas of the dotted paper, students can hear text read aloud, learn new vocabulary, work on activities, and listen to questions. Thus, Tag pens allow students to proceed with learning at their own
pace. This paper reports the test data and the interviews with teachers and students on
their perceptions of the use of Tag pens in assessment and learning.

Methodology:

This study is a culmination of three years of research aimed to develop new
reading assessments in Primary 1 classrooms. The original paper-and-pencil version of
the Primary 1 Reading Assessment was developed and tested in Primary 1 classes in
Singapore in 2006-07. For this study, the paper-and-pencil version of the Sing*Read
Assessment was put into an innovative technological tool, the Tag smart pen.
Approximately 800 children in first grade classes from four elementary schools
participated in the study. All children took a screening assessment in the second month of
first grade. It included 40 multiple-choice items based on the five essential skills. At the
end of first grade, all students took a second multiple-choice assessment based on similar
but more difficult items. The assessments were administrated to the children in each class
as a group. There were four conditions of the study. Condition 1 included about 300
children who practiced using the Tag pens during the year in reading centers. Condition 2
included about 200 children who read the Tag books in their reading centers but did not
use the pens. Conditions 3 and 4 included children in two control groups, one who used
the pen for testing and one who used paper and pencil tests. The teachers and students
were also interviewed about the relative satisfaction, difficulty, and preference for testing
modes.

Findings:

The data from four subscales of the test were analyzed with multi-level HLM with
students nested in classes within conditions and revealed significantly overall better test
scores for children in Conditions 1 and 2 than 3 and 4. Word reading and comprehension subtests were significantly better in the experimental conditions and letter knowledge and phonemic awareness showed no differences.

Structured interviews with students revealed that they enjoyed using the pens with the test and, those in Condition 1, enjoyed using the pens with books. Few students reported any difficulty with understanding how to operate the pen, using the headphones, and following the audio directions. Some teachers reported frustration monitoring the test because they could not see the answers because the pens left no visible mark on the page. This negative reaction was counterbalanced by the economy of reusable test books and security of no student cheating. Teachers also reported high satisfaction with the data output because it allowed them to view individual and class level performance on all subscales. Teachers were very satisfied with the minimal time and work required for them to obtain rich assessment data. Overall, teachers and students endorsed the use of smart pens for classroom reading tests.

**Significance of the Study:**

The findings from the study will inform contemporary research on assessment by providing a model of innovative technology integrated into the Primary 1 Reading Assessment to enhance assessment, learning, and teaching. The study will also provide input for policy-makers in countries that are using Information-communication Technology (ICT) for more effective teaching and learning in the schools. The results will provide better understanding of formative assessment practices, in particular the impact of technology on assessment and classroom instruction. Lastly, the study can inform professional development for teachers by promoting teachers’ use of technology.
in their teaching and assessment. Although the data are relevant to Singapore, the study is useful for states or countries that examine how technology can be integrated into assessments and subsequently, how these innovations increase teachers’ use of assessments for learning.

(1339 words)

References


