



Review of
Enhancing Critical Reading
Skills with Kindergartners: A
Study of a Computer-Based
Intervention

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Review of
Enhancing Critical Reading Skills with Kindergartners: A Study of a
Computer-Based Intervention

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Abstract

The report being reviewed presents the findings from an experimental study of the use of Learning Letter Sounds (LLS), a computer-based literacy program, in two Kindergarten classrooms at one school. The study was a pretest/posttest two-group (experimental, control) design with three dependent measures of early literacy skills. The independent variable was the use of a computer-based intervention; in the experimental condition, students used the LLS program, while students in the control condition used the A+dvanced Learning System Mathematics I software program for an equal amount of time (20 minutes per session, 3 times per week, for 6-8 weeks). Three subtests from the Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Initial Sound Fluency, Letter Naming Fluency, and Word Use Fluency—served as the dependent variables and were administered to the students prior to the beginning of the study and again at the conclusion of the study. Initially, four classrooms, balanced on demographic variables, were randomly assigned to the experimental or control conditions; parent requests for student transfers and attrition resulted in two of the classrooms (one experimental, one control) becoming unbalanced in demographics and these classes were dropped from the analyses. Repeated measures analyses of variance were performed at the student level ($n = 43$) on the two remaining classrooms (one experimental, one control). Significant results were found for the interaction of time by group for Initial Sound Fluency, with a $\eta_p^2 = .21$, indicating a large effect size. Students exposed to LLS demonstrated an accelerated learning of initial sounds compared to students exposed to the math software program.

Reviewer Comments

Relevance

Does the evidence provided by the researchers or the developers address a question that is relevant?

The intent of the study was to examine the efficacy of a commercially available software program designed to enhance Kindergartners' phonemic awareness. The study, therefore, addresses the relevant issue of using an instructional technology application to enhance early literacy skills.

Do the developers provide evidence that the research they claim supports their product or program links to and flows from relevant theory and theory-based research?

The Learning Letter Sounds software program is adapted from Durrell's *System 80*, a widely used program for individualized instruction used in the 1970s. The instructional techniques allow students to set their own learning paces and direct students' attention to the names and sounds of letters via computer-generated stimuli and audio and visual scaffolding. Learning Letter Sounds is grounded in research demonstrating the importance of intentionally teaching phonemic awareness and of systematic phonics instruction. Research—both experimental and nonexperimental—on the connections between phonemic awareness and reading performance and phonics instruction and reading performance are well supported in the report's literature review and are directly relevant to the current research study with Learning Letter Sounds.

Do the research procedures, analysis, and findings support the researchers' or developers' claims?

Given the limitations of the research design dictated by the circumstances in which the study was conducted, the research procedures, analyses, and findings suggest that Learning Letter Sounds may have a significant impact on Kindergartners' ability to recognize initial sounds in words. Although the current research study is not without problems (described below), the positive findings from this study combined with similar positive findings from other studies of Learning Letter Sounds lend credence to the authors' assertion that the software program is an effective intervention to increase students' phonemic abilities.

Rigor

If the researchers or developers claim a causal relationship between the intervention (product, service, program) and an outcome measure such as student achievement, did they include a control or comparison group in the study, in addition to the experimental group?

The study included students in intact classrooms that were randomly assigned to either an experimental or control condition. The design included repeated measures (pretest and posttest) to assess gains in phonemic awareness skills theoretically related to the software program intervention.

Were the study participants (usually students or teachers or schools) randomly selected and/or randomly assigned to experimental versus control/comparison groups?

The students and classrooms were not randomly selected from a larger and defined population; therefore, external validity beyond the two classrooms involved cannot be known from this single study. Random assignment to the experimental or control conditions was performed at the classroom level—the four Kindergarten classrooms, balanced on gender and free/reduced lunch status, were randomly assigned, with two as experimental and two as control classrooms. Two of these classrooms (one experimental, one control) were later dropped from the study due to attrition, contamination, and the resulting imbalance of the economic status variable between the two classrooms that were dropped and the two that remained in the study.

Is sufficient information provided to determine whether the research design, instruments, and procedures are appropriate for answering the research questions posed by the researchers/developers?

There is sufficient information provided in the article to make assertions regarding the appropriateness of the research design, instruments, and procedures to study the efficacy of the use of the LLS software program. Specifically, the research design is weak in that it crosses levels—randomization occurs at the classroom level while analyses occur at the student level. This weakness, however, is noted by the authors, who did not have a choice about the unit of randomization and qualified their conclusions accordingly. The Dynamic Indicators of Basic Early Literacy (DIBELS) is a widely employed assessment used to measure literacy-related skills in age groups including Kindergarten students (Good & Kaminski, 2002), and, thus, is an appropriate literacy skill assessment for this study. In addition, reliability and validity data on the subscales used are provided. Most of the procedures are clearly described and, with the exception of the intervention occurring within intact classrooms (which weakens the design), are appropriate for answering the question of initial efficacy of LLS. The procedures for administering the pretest and posttest to the students and for monitoring implementation fidelity were described in detail.

Were the research instruments and procedures applied with consistency, accuracy, and for the purpose intended by the developers of the instruments and procedures?

Three DIBELS subtests were used, including Initial Sound Fluency, Letter Naming Fluency, and Word Use Fluency. The report indicates that one of the reasons the DIBELS assessment was chosen was due to the school's pre-existing plans to use it as a diagnostic tool. Sufficient information is provided regarding the administration of these assessments. The assessments were administered by trained classroom teachers. The use of the LLS software was overseen by trained computer media specialists and assistants. No major deviations from established protocols were noted.

Systematic Approach

Was the research conducted using carefully planned, logical steps?

Other than the inability to randomly assign students instead of classrooms, the research appears to have been conducted in a systematic manner. There was an attempt at random assignment and balancing on key demographic variables, use of a reasonable control (i.e., the math software) condition, implementation fidelity monitoring, and careful deliberation of how to handle issues of attrition and contamination.

Objectivity

Did someone other than the publisher or developer conduct the research attesting to the product's or program's effectiveness?

Two researchers associated with the software product conducted the study. However, they engaged an independent third party to review the research study. Hence, this review is an effort to provide an objective review of research conducted by the publishers of the software product.

Replicability

With the information provided, could the same researchers likely repeat the study and obtain the same or highly similar results?

There is sufficient information provided to replicate the study. If there were a true program effect above and beyond any teacher effects that could not be estimated in the current study, a replication using the procedures described should find similar results.

With the information provided, could other researchers likely replicate the study's methodology and obtain the same or highly similar results?

There is no reason to believe that other researchers, using the instruments and procedures described, would not obtain similar results, given the caveats described above.

Data Analyses and Interpretation

Does the research evidence provided include data or data summaries?

The researchers provide a summary of the sample sizes, means, and standard deviations for the experimental and control groups' pretest and posttest scores on each of the three dependent measures. A figure graphically portraying the interaction between time and group assignment also is provided to assist the reader in understanding the results of the analysis. It would have been helpful for the reader to know whether pretest scores were significantly different between groups. Although means and standard deviations are reported and tests of significant differences were conducted on the distributions of the demographic variables, no tests for significant mean differences were reported on the pretest scores.

Are significance levels and effect sizes reported?

The level of significance used in the repeated measures multivariate analysis of variance (MANOVA) is reported, as is the partial Eta-squared, which provides a measure of strength of association (i.e., an effect size measure).

Are the conclusions drawn by the researchers/developers clearly supported by the data?

The conclusions offered by the authors are appropriate within the limitations of the study. The authors note that this study adds incrementally to the results from a previous study of LLS; together, the body of research on LLS is beginning to show some effect of the software on early reading skills. However, it is probable that some of the variance, or effect, attributable to LLS may instead be teacher effects, which were impossible to parcel out due to the confounding of the randomization at the classroom level and analysis at the student level. Further research would need to address the issue of randomizing and analyzing at the same unit (e.g., teacher level or student level). In addition to mentioning the need for additional studies to address limitations of the research performed to date on LLS, the authors state, "Further investigation should work to identify the effects of moderating variables upon the efficacy of such computer programs as LLS, the duration of any effects, and the predictive value of these effects on future reading ability."