What Works Clearinghouse

INSTITUTE OF EDUCATION SCIENCES

Early Childhood Education September 28, 2006

DaisyQuest for Preschool Children

Program description

DaisyQuest is a software bundle that offers computer-assisted instruction in phonological awareness, targeting children aged three to seven years (or preschool to second grade). The instructional activities, framed in a fairy tale involving a search for a friendly dragon named Daisy, teach children how to recognize words that rhyme; words that have the same beginning, middle, and ending sounds; and words that can be formed from a series of phonemes presented separately, as well as how to count the number of sounds in words. The What Works Clearinghouse (WWC) also reviewed the effects of *DaisyQuest* on the beginning reading skills of children in kindergarten through third grade and the findings are reported in a separate WWC intervention report.

Research

Two studies of *DaisyQuest* met the WWC evidence standards.[1] Together these studies included 68 preschool children from Tallahassee, Florida, and Orem, Utah, and examined intervention effects on phonological processing. The children studied were from families with low to middle socioeconomic status. This report focuses on immediate posttest findings to determine the effectiveness of the intervention.[2]

Effectiveness

DaisyQuest was found to have positive effects on phonological processing.

	Oral language	*Print knowledge*	*Phonological processing*	*Early reading/ writing*	*Cognition*	*Math*
Rating of effectiveness	Not reported	Not reported	Positive effects	Not reported	Not reported	Not reported
Improvement index[3]	Not reported	Not reported	Average: +25 percentile points Range: –13 to +34 percentile points	Not reported	Not reported	Not reported

1. To be eligible for the WWC's review, the Early Childhood Education (ECE) intervention had to be implemented in English in center-based settings with children ages 3–5 or in preschool.
2. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
3. These numbers show the average and the range of improvement indices for all findings across the studies.

Absence of conflict of interest

The WWC ECE topic team works with two principal investigators: Dr. Ellen Eliason Kisker and Dr. Christopher Lonigan. The studies on *DaisyQuest* reviewed by the ECE team included one study on which Dr. Lonigan was the primary author. Dr. Lonigan's financial interests are not affected by the success or failure of *DaisyQuest*, nor does he receive any royalties or other monetary return from the use of *DaisyQuest*. Dr. Lonigan was not involved in the decision to include the study in the review, and he was not involved in the coding, reconciliation, or discussion of the included study. Dr. Kisker led all review activities related to the study. The decision to review *DaisyQuest* was made by Dr. Kisker, as co-principal investigator, in collaboration with the rest of the ECE team following prioritization of interventions based on the results of the literature review. This report on *DaisyQuest* was reviewed by a group of independent reviewers, including members of the WWC Technical Review Team and external peer reviewers.

Additional program information

Developer and contact

Gina C. Erickson. E-mail: DaisyQuest@comcast.net

Scope of use

DaisyQuest was developed in 1992. Information is not available on the number or demographics of children or centers using the software.

Teaching

DaisyQuest is an interactive software program. The software is self-contained and teachers may send students to the computer to practice these skills, without any need to implement additional curricular materials. As children master each level of instructional activities, they are rewarded with clues that eventually lead them to discover where Daisy is hiding. *Daisy's Castle* is a follow-up instructional program to *DaisyQuest,* and both programs are bundled together. The activities in *Daisy's Castle* are linked through a similar fairy tale theme involving a search for Daisy's lost eggs. As children complete each level of instructional activities, they are given clues that take them to the location of the lost eggs.

DaisyQuest uses story lines and colorful graphics to engage children in the learning process. Children are able to navigate and enter responses by clicking with the mouse. Materials are presented using both digitized and synthetic speech. The programs also offer children choices about the sequence of instructional activities and keep track of children's responses. The software contains a tutorial that guides the child by explaining each skill or concept briefly and provides practice exercises with feedback for correct and incorrect responses. When the child completes the tutorial activities and questions—multiple choice or yes/no items—are presented that test the child's mastery of the skill or concept taught.

Included with the program is an adaptive test called *Undersea Challenge.* This test measures children's knowledge of rhyming; beginning, middle, and ending sounds; and phoneme blending and segmenting. The software also generates statistical reports that enable parents and teachers to view children's performance.

Cost

The *DaisyQuest* bundle (*DaisyQuest, Daisy's Castle*, and the *Undersea Challenge* mastery test) is available for $49.95, plus $6.95 shipping and handling.

Research

Two studies reviewed by the WWC investigated the effects of *DaisyQuest* in center-based settings. Both studies (Foster, Erickson, Foster, Brinkman, & Torgesen, 1994; Lonigan, Driscoll, Phillips, Cantor, Anthony, & Goldstein, 2003) were randomized controlled trials that met WWC evidence standards.

Research *(continued)*

Foster et al. (1994) included 27 four- to six-year-old low- to middle-income preschool children who attended a childcare center in Orem, Utah. Foster and colleagues compared phonological processing outcomes for an intervention group that used *DaisyQuest* with outcomes for children in a no-treatment comparison group who participated in their regular preschool program.[4]

Lonigan et al. (2003) included 41 three- to five-year-old low-income children attending a Head Start program in Tallahassee, Florida. Eighty-five percent of the children were African-American, 10% were Caucasian, and 5% were Hispanic. Lonigan and colleagues compared phonological processing outcomes[5] for an intervention group that used *DaisyQuest* and *Daisy's Castle*[6] with outcomes for children in a no-treatment comparison group who participated in their regular Head Start curriculum.

Effectiveness

Findings

The WWC review of early childhood education interventions addresses children's outcomes in six domains: oral language, print knowledge, phonological processing, early reading/writing, cognition, and math.[7]

Phonological processing. Foster et al. (1994) reported findings for two measures in this outcome domain. The authors reported statistically significant differences favoring the intervention group on both outcomes, and this statistical significance was confirmed by the WWC. In this study, the effect of *DaisyQuest* on phonological processing was statistically significant and positive, according to WWC criteria. Lonigan et al. (2003) reported findings for eight outcomes in this domain.[5] The authors reported, and the WWC confirmed, statistically significant differences favoring the intervention group on four of the outcomes (rhyme oddity, rhyme matching, word elision, and syllable/phoneme elision). There were no statistically significant effects for the other outcomes. In this study, the effect of *DaisyQuest* on phonological processing was statistically significant and positive, according to WWC criteria.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as: positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings,[7] the size of the difference between participants in the intervention condition and the comparison condition, and the consistency in findings across studies (see the WWC Intervention Rating Scheme).

4. Foster et al. (1994) also conducted a study with kindergarten children, but the kindergarten study is not included in the report because the children are outside of the eligible age range for the WWC ECE topic. The Beginning Reading team reviewed the kindergarten study. After the study authors completed the preschool phase of the study, *DaisyQuest* was modified.

5. Lonigan et al. (2003) included a number of measures other than the phonological processing outcomes, but posttest means and standard deviations were unavailable for these measures. So this report does not include results from the Expressive One Word Vocabulary Test-Revised (EOWPVT-R), the word identification subtest of the Woodcock Reading Mastery Test-Revised, or the letter knowledge outcomes.

6. Children participated in *Daisy's Castle* only after they had completed the *DaisyQuest* modules twice.

7. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. See the Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate statistical significance. In the case of the *DaisyQuest* report, a correction for multiple comparisons was needed.

The WWC found *DaisyQuest* to have positive effects for phonological processing

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study as well as an average improvement index across studies (see the Technical Details of WWC-Conducted Computations). The improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analysis. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results.

The average improvement index for phonological processing is +25 percentile points across two studies, with a range of –13 to +34 percentile points across findings.

Summary

The WWC reviewed two studies on *DaisyQuest*. Both studies met WWC evidence standards and found positive effects for phonological processing. The evidence presented in this report may change as new research emerges.

References

Met WWC evidence standards

Foster, K. C., Erickson, G. C., Foster, D. F., Brinkman, D., & Torgesen, J. K. (1994). Computer administered instruction in phonological awareness: Evaluation of the DaisyQuest program. *The Journal of Research and Development in Education, 27*(2), 126–137.

Lonigan, C. J., Driscoll, K., Phillips, B. M., Cantor, B. G., Anthony, J. L., & Goldstein, H. (2003). A computer-assisted instruction phonological sensitivity program for preschool children at-risk for reading problems. *Journal of Early Intervention, 25*(4), 248–262.

For more information about specific studies and WWC calculations, please see the *WWC DaisyQuest* Technical Appendices.

Appendix

Appendix A1.1 Study characteristics: Foster, Erickson, Foster, Brinkman, & Torgesen, 1994 (randomized controlled trial)[1]

Characteristic	Description
Study citation	Foster, K. C., Erickson, G. C., Foster, D. F., Brinkman, D., & Torgesen, J. K. (1994). Computer administered instruction in phonological awareness: Evaluation of the Daisy-Quest program. *The Journal of Research and Development in Education, 27*(2), 126–137.
Participants	The participants in this study were 27 four- to six-year-old low- to middle-income children selected from a pool of more than 100 children based on their scores on two pretests. Children with scores less than 75 on the Peabody Picture Vocabulary Test-Revised (PPVT-R) and scores greater than 20 on the Phonological Awareness Test (PAT) were excluded from the study. Thirty-seven percent of the children were female. The mean age of the children in the intervention condition was 65.1 months and the mean age of the children in the comparison condition was 63.4 months. The children were randomly assigned to the intervention and comparison conditions.
Setting	The study took place at the Kinderland Center in Orem, Utah.
Intervention	The intervention group participated in *DaisyQuest*, a computer-based phonological awareness training program, for 20 sessions that lasted approximately 20–25 minutes each.
Comparison	Children in the no-treatment comparison group participated in their regular preschool program.
Primary outcomes and measurement	The primary outcome domain was phonological processing as measured with two nonstandardized measures: the Phonological Awareness Test (PAT) and the Screening Test of Phonological Awareness-Experimental Version (STOPA-E). (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	No information on teacher training was provided because teachers did not deliver the intervention.

1. Foster et al. (1994) also conducted a study with kindergarten children, but the kindergarten study is not included in the report because the children are outside of the eligible age range for the WWC ECE topic. The Beginning Reading team reviewed the kindergarten study. After the study authors completed the preschool phase of the study, *DaisyQuest* was modified.

Appendix A1.2 Study characteristics: Lonigan, Driscoll, Phillips, Cantor, Anthony, & Goldstein, 2003 (randomized controlled trial)

Characteristic	Description
Study citation	Lonigan, C. J., Driscoll, K., Phillips, B. M., Cantor, B. G., Anthony, J. L., & Goldstein, H. (2003). A computer-assisted instruction phonological sensitivity program for preschool children at-risk for reading problems. *Journal of Early Intervention*, *25*(4), 248–262.
Participants	The study began with 45 low-income English-speaking children; four children withdrew during the course of the study, leaving a sample of 41 children. Eighty-five percent of the children were African-American, 10% were Caucasian, and 5% were Hispanic. Sixty-six percent of the participants were female. The average age of participants in the intervention group was 56.4 months and 53.9 months in the comparison group. The children were randomly assigned to the intervention and comparison conditions.
Setting	The study took place in a Head Start program in Tallahassee, Florida.
Intervention	The intervention group children worked individually on portable computers using two instructional programs, *DaisyQuest* and *Daisy's Castle,* to master phonological sensitivity tasks. Children participated in *Daisy's Castle* only after they had completed the *DaisyQuest* modules twice. Children participated in the intervention over an eight-week period, four to five days a week for 15–20 minutes a session.
Comparison	Children in the no-treatment comparison group participated in their regular Head Start curriculum.
Primary outcomes and measurement	The primary outcome domains assessed were oral language, print knowledge, phonological processing, and early reading/writing. Children's oral language use was measured by a standardized measure: the Expressive One Word Picture Vocabulary Test-Revised (EOWPVT-R). Print knowledge was measured by two nonstandardized measures: a letter-name knowledge task and a letter-sound knowledge task. Phonological processing was measured by eight nonstandardized measures: rhyme oddity, rhyme matching, word blending, syllable/phoneme blending, multiple-choice blending, word elision, syllable/phoneme elision, and multiple-choice elision. Early reading/writing was assessed with a nonstandardized word decoding task and a standardized measure: the Word Identification subtest of the Woodcock Reading Mastery Test-Revised—WRMT-R. The EOWPVT-R, letter knowledge tasks, and the WRMT-R are not included in this report because posttest means and standard deviations were unavailable. (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Research assistants were trained by researchers to provide one-on-one instruction and support to children throughout the eight-week intervention period.

Appendix A2 Outcome measures in the phonological processing domain

Outcome measure	Description
Phonological Awareness Test (PAT)	A researcher-developed measure that assesses the following skills: recognizing whether two words rhyme, recognizing whether a given word can be formed from a given sequence of separately pronounced phonemes, recognizing whether two words begin with the same sound, recognizing whether two words have the same middle sound, recognizing whether two words end in the same sound, and recognizing whether a word contains a given number of different sounds (as cited in Foster et al., 1994).
Screening Test of Phonological Awareness-Experimental Version (STOPA-E)	A measure of children's phonological processing that requires children to mark which of three pictured words begin with the same first sound as another pictured word, mark which of four pictured words begin with a different first sound from the other three, or count the phonemes in words that have from one to three phonemes (as cited in Foster et al., 1994).
Rhyme oddity	A researcher-developed measure that requires children to identify the nonrhyming word from three pictured words to assess children's sensitivity to rhyme (as cited in Lonigan et al., 2003).
Rhyme matching	A researcher-developed measure that requires children to look at a picture representing a word and identify rhyming words from other pictured words to assess children's sensitivity to rhyme (as cited in Lonigan et al., 2003).
Word blending	A researcher-developed measure that requires children to blend single syllable words into a compound word (such as, "cow" and "boy") to assess children's ability to blend sounds into a new word (as cited in Lonigan et al., 2003).
Syllable/phoneme blending	A researcher-developed measure that requires children to tell the researcher what results when isolated segments are put together (such as, "sis" and "ter") to assess their ability to blend sounds into a new word (as cited in Lonigan et al., 2003).
Multiple-choice blending	A researcher-developed measure that requires children to look at three pictures that the researcher names and then to identify the picture that represents the blended word to assess children's ability to blend sounds into a new word (as cited in Lonigan et al., 2003).
Word elision	A researcher-developed measure that requires children to say single syllable word components of compound words (such as, "batman" is "bat" and "man") to assess children's ability to delete parts of a word to form a new word (as cited in Lonigan et al., 2003).
Syllable/phoneme elision	A researcher-developed measure in which children are asked to say words without certain sounds (such as, say "candy" without the "dee" or say "heat" without "/h/") to assess children's ability to delete parts of a word to form a new word (as cited in Lonigan et al., 2003).
Multiple-choice elision	A researcher-developed measure that requires children to say words without certain sounds but they respond by pointing to pictures that represent those words (as cited in Lonigan et al., 2003).

Appendix A3 Summary of study findings included in the rating for the phonological processing domain[1]

Outcome measure	Study sample	Sample size (children)	Author's findings from the study: Mean outcome (standard deviation[2]) — *DaisyQuest* group[3]	Author's findings from the study: Mean outcome (standard deviation[2]) — Comparison group	WWC calculations: Mean difference[4] (*DaisyQuest* – comparison	WWC calculations: Effect size[5]	WWC calculations: Statistical significance[6] (at α = 0.05)	WWC calculations: Improvement index[7]
Foster et al., 1994 (randomized controlled trial)[8]								
PAT	4–6 year olds	27	22.40 (3.10)	19.20 (3.50)	3.20	0.93	Statistically significant	+32
STOPA-E	4–6 year olds	27	18.50 (7.20)	12.40 (6.50)	6.10	0.87	Statistically significant	+31
Average[9] for phonological processing (Foster et al., 1994)						0.90	Statistically significant	+32
Lonigan et al., 2003 (randomized controlled trial)[10]								
Rhyme oddity	3–5 year olds	41	6.01 (2.25)	3.95 (2.91)	2.06	0.77	Statistically significant	+28
Rhyme matching	3–5 year olds	41	8.66 (2.56)	6.67 (2.39)	1.99	0.79	Statistically significant	+28
Word blending	3–5 year olds	41	5.59 (4.10)	4.24 (3.97)	1.35	0.33	ns	+13
Syllable/phoneme blending	3–5 year olds	41	1.98 (2.14)	1.95 (2.13)	0.03	0.01	ns	+1
Multiple-choice blending	3–5 year olds	41	8.48 (1.31)	8.14 (1.28)	0.34	0.26	ns	+10
Word elision	3–5 year olds	41	4.58 (4.02)	1.81 (3.17)	2.77	0.75	Statistically significant	+27
Syllable/phoneme elision	3–5 year olds	41	2.52 (2.57)	0.48 (1.25)	2.04	1.00	Statistically significant	+34
Multiple-choice elision	3–5 year olds	41	5.50 (1.47)	6.05 (1.69)	–0.55	–0.34	ns	–13
Average[9] for phonological processing (Lonigan et al., 2003)						0.45	ns	+17
Domain average[9] for phonological processing across all studies						0.68	na	+25

(continued)

Appendix A3 Summary of study findings included in the rating for the phonological processing domain[1] *(continued)*

ns = not statistically significant
na = not applicable

1. This appendix reports findings considered for the effectiveness rating and the improvement indices.
2. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
3. For Lonigan et al. (2003), the intervention group mean equals the comparison group mean plus the mean difference.
4. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group. For Lonigan et al. (2003), the computation of the mean differences were computed by the WWC and took into account the pretest difference between the study groups. The resulting effect sizes may overestimate the intervention's effects when the intervention group had lower pretest scores than the comparison group and underestimate the intervention's effect when the intervention group had higher pretest scores than the comparison group.
5. For an explanation of the effect size calculation, see the Technical Details of WWC-Conducted Computations.
6. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
7. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between -50 and +50, with positive numbers denoting favorable results.
8. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. See the Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate statistical significance. In the case of the Foster et al. (1994) study, a correction for multiple comparisons was needed, so the significance levels may differ from those reported in the original study.
9. The WWC-computed average effect sizes for each study and for the domain across studies are simple averages rounded to two decimal places. The average improvement indices are calculated from the average effect size.
10. In the case of the Lonigan et al. (2003) study, a correction for multiple comparisons was needed, so the significance levels may differ from those reported in the original study.

(continued)

Appendix A4 *DaisyQuest* rating for the phonological processing domain

The WWC rates an intervention's effects for a given outcome domain as: positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of phonological processing, the WWC rated *DaisyQuest* as having positive effects. The remaining ratings (potentially positive effects, mixed effects, no discernible effects, potentially negative effects, and negative effects) were not considered because *DaisyQuest* was assigned the highest applicable rating.

Rating received
Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.
• Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a strong design.
Met. Both studies met WWC evidence standards for a strong design and had statistically significant positive effects.
• Criterion 2: No studies were identified as having statistically significant *negative* effects or substantively important *negative* effects.
Met. The WWC analysis found no statistically significant or substantively important negative effects in this domain.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain level effect. The WWC also considers the size of the domain level effect for ratings of potentially positive effects. See the WWC Intervention Rating Scheme for a complete description.