465 Early Algebra: Handle With Care

CARE

Conceptual Algebra Readiness for Everyone

Conceptual Algebra Readiness for Everyone, CARE is a curriculum development project funded through a grant from the Indiana Mathematics and Science Partnership to the Michigan City Area Schools in collaboration with Purdue University North Central for grades 3-7. The goal of the project is to help children develop conceptual algebra readiness through weekly classroom activities and by providing extensive professional development for teachers.

Algebra Readiness

Conceptual algebra readiness is sometimes referred to as 'early algebra' or 'algebraic reasoning'. One of the key points we want to make is that conceptual algebra readiness is not (formal) algebra early (Carraher, Schliemann & Schwartz, 2008). Our intent is not to teach children how to solve algebraic equations with x's and y's; rather, our intent is to help children understand the underlying concepts of algebra so that when they do solve equations in algebra; they will have a conceptual basis, stemming from their work with whole numbers, fractions, decimals, and percent, for interpreting and operating meaningfully on algebraic equations and symbols. In other words, conceptual algebra readiness lays a foundation for students to make sense of algebra rather than to manipulate symbols mindlessly!

Activities

The activities in this project are designed to be done once per week and take two forms: 1) **Problem Sets** and 2) **Whole-class Activities**. A blend of the two activities is recommended. A sequence of activities is provided but it can be adjusted to fit teachers' schedules and students' needs. It is essential that students be engaged with these activities continually, approximately once per week. Students need continued experiences to develop conceptual algebra readiness.

> **Problem Sets** typically consist of 10-15 problems in 4^{th} and 5^{th} grade and 5 problems in 6^{th} and 7^{th} grade for students to solve. These problems are a mixture of problem types and topics. Research has shown a mixed review approach to be an effective way to help children learn mathematics. This approach provides students with multiple experiences with the same concepts.
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> **Whole-class Activities** vary in form. Some are game-like activities and others are one or two problems that the class may work on in groups and then discuss.

CARE is designed to challenge students at a variety of developmental levels. Our primary purpose is to help children develop conceptual understandings to prepare them for algebra.

Teacher Notes

The teacher notes in CARE are extensive. They include the sequence of activities, an explanation of algebra readiness, a general description of the activities, a discussion with specific suggestions for realizing class discussion and small-group work in the classroom, and a rationale for the activities with practical suggestions to help teachers make sense of the curriculum, so that students develop conceptual algebra readiness. The CARE curriculum guide provides specific notes and suggestions for <u>each problem</u> in the Problem Sets and for each Whole-class Activity.

Professional Development

Teachers participating in this project receive two weeks of professional development and day-long follow-up workshops. In the workshops teachers experience the activities, learn about the theories guiding the project, model the classroom group work and whole-class discussion, and engage in rich mathematical thinking.

CCSS and NCTM Standards

CARE incorporates the NCTM National Standards (2000) and is aligned with the Common Core State Standards in Mathematics (2010). The appendices include a table where each problem and whole-class activity is aligned with the Common Core Stand Standards and *Everyday Math*. A second table aligns the CCSS with CARE.

Effectiveness

Preliminary results of a statistical analysis examining the effects of the CARE program on students' mathematical achievement indicate that the use of the program had a significant impact on student achievement (Pratt, Schroer, Feikes, submitted paper). Specifically, teachers' use of CARE was positively correlated with their students' mathematics ISTEP scores. Specifically, students showed significant score increases in the topics of Algebraic Functions and Measurement. These findings were also consistent for students from low SES backgrounds and students of color. The results suggest the program may be effective in decreasing the achievement gap in mathematics for at risk students.

Teachers' Perspective of CARE

> This year I watched my kids move on their own from arithmetic thinkers to algebraic thinkers. They make generalizations every time now and they want to use variables. They love using variables and the best part is they understand them, not everyone, but most do. They also want to justify everything now.
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> The use of the CARE activities has dramatically increased my student's confidence in their problem solving abilities. Problems my students wouldn't have even attempted in the past are now met with enthusiasm. My students see the CARE activities as a challenge to take on, and not something that is over their heads. More importantly, I have seen my students start to believe in themselves and their ability to tackle complex challenges.
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> CARE Math has made a world of difference in my classroom. I was able to see each child grow algebraically on a weekly basis and ultimately in their standardized tests. My students soared to all-time highs in all math standards, specifically algebra and functions. These children's ability to generalize, reason, and find an easier way to solve problems was nothing short of amazing!

Contact: David Feikes Ph.D.
Professor of Mathematics
Purdue University North Central
1401 S. US 421
Westville, IN 46391
Email; dfeikes@pnc.edu
Phone: (219) 785-5489