What Works Clearinghouse

Detailed Study Report

Reviewed Study: **Peters, K. G. (1992). *Skill performance comparability of two algebra programs on an eighth-grade population.* Unpublished doctoral dissertation, University of Nebraska, Lincoln.**

WWC Study Reports are intended to support decision making; neither the What Works Clearinghouse (WWC) nor the U.S. Department of Education endorses any interventions. No single Study Report should be used as a basis for making policy decisions because (1) few studies are designed and implemented flawlessly and (2) all studies are tested on a limited number of participants, using a limited number of outcomes, at a limited number of times, so generalizing from one study to any context is very difficult. To highlight these issues, the WWC Study Reports describe in detail the specifics of each study, focusing primarily on studies that provide the best evidence of effects (randomized controlled trials). Systematic reviews of the evidence will be conducted to summarize the results of the individual studies.

See the WWC Brief Study Report (PDF) for a summary of this study.

Topic:	Curriculum-Based Interventions for Increasing K–12 Math Achievement—Middle School
Intervention:	Saxon Algebra
Research Design:	Randomized Controlled Trial
Study Rating:	
Date Released:	October 28, 2004
Summary of Results:	Peters (1992) reports that students in the intervention and control groups showed gains on the Orleans-Hanna test during the course of the school year (that is, from pretest to posttest). However, the test score gains of the two groups did not differ significantly. There was no evidence that the Saxon Algebra curriculum (intervention) was more or less effective than the University of Chicago Mathematics Project curriculum (control). Sample sizes were not adequate to allow for sufficiently precise estimates of the effect size.

= Meets Evidence Standards = Meets Evidence Standards with Reservations = Does Not Meet Evidence Standards

Intervention: Saxon Algebra

Operational Features

The Saxon Algebra curriculum covers topics typically treated in a first-year algebra course. The Saxon curriculum teaches mathematics via "incremental development." Incremental development as described by the developer introduces topics in small, understandable pieces (increments), permitting the assimilation of one facet of a concept before the next facet is introduced. All facets are then practiced together until another concept is introduced.

The incremental introduction of topics is combined with continual review, wherein all previously learned material is reviewed in every lesson for the entire year. Topics are never dropped. Instead, they are increased in complexity and practiced every day, so that concepts will become more familiar over time.

Instruction is typically teacher centered, with the instructor introducing the daily concept and demonstrating problems for the first 30 minutes of class time. Students, then, practice the problems during the remaining class time.

In this study, one mathematics instructor was trained on both the Saxon Algebra curriculum and the curriculum from the University of Chicago Mathematics Project (UCMP). The teacher taught two classes of students, one using the Saxon Algebra curriculum and the other using the UCMP curriculum. Peters reports that the UCMP curriculum was designed to comply with the standards of the National Council of Teachers of Mathematics (NCTM).

Thirty-six 8th-grade students were randomly assigned to two classes. The intervention group was taught using the Saxon Algebra curriculum, and the control group was taught using the UCMP curriculum. The study lasted from August 1991 to May 1992.

People, Settings, and Timing

The students in this study were enrolled in 8th grade and judged as "math talented" based on teacher recommendations, prior academic achievements, and personal maturity levels. Little other demographic information is reported. The Orleans-Hanna pretest was administered in August 1991, and the posttest was given in May 1992.

Cost Information

Cost information is not reported in this study.

Intended Duration

Saxon Algebra curriculum is intended to be a complete and comprehensive full-year algebra curriculum.

Scientific Rationale

Peters (1992) does not present any particular scientific rationale for the study, other than to compare and contrast Saxon Algebra curriculum's effectiveness with that of the UCMP curriculum, using the NCTM standards as the basis for comparison. Only the UCMP curriculum was based on the NCTM standards.

Overview of the Study

Purpose

Peters sought to determine whether mathematics achievement differed between 8th-grade students taught in a Saxon Algebra curriculum classroom and those taught in a UCMP curriculum classroom. Peters was also interested in students' overall satisfaction with the mathematics program. Thus, students were surveyed about the strengths and weaknesses of their experiences and about their comfort level with mathematics study. Students also participated in exit interviews with Peters, but this WWC Study Report focuses only on the achievement component of the study.

Intervention Fidelity

Peters reports little information about implementation. One teacher taught both the intervention and control classes. Peters reports that the teacher did not have any prior firsthand experience with the Saxon Algebra curriculum or the UCMP curriculum. Peters indicates that the instructor had read extensively about each program prior to the study. The teacher was provided with professional development opportunities for both curricula and was periodically monitored by the researcher to ensure treatment fidelity of key components of the Saxon Algebra intervention.

Outcome Measures

Peters used two tests of mathematics achievement: the Orleans-Hanna Prognosis Test (a test of algebra readiness) and a set of four researcher-developed unit tests that were specifically aligned to content taught in both curricula. The items on the unit tests were reviewed by the researcher, the teacher, and other mathematics educators before the tests were administered. The Orleans-Hanna test has been documented as reliable and valid. No reliability or validity evidence was provided for the unit tests.

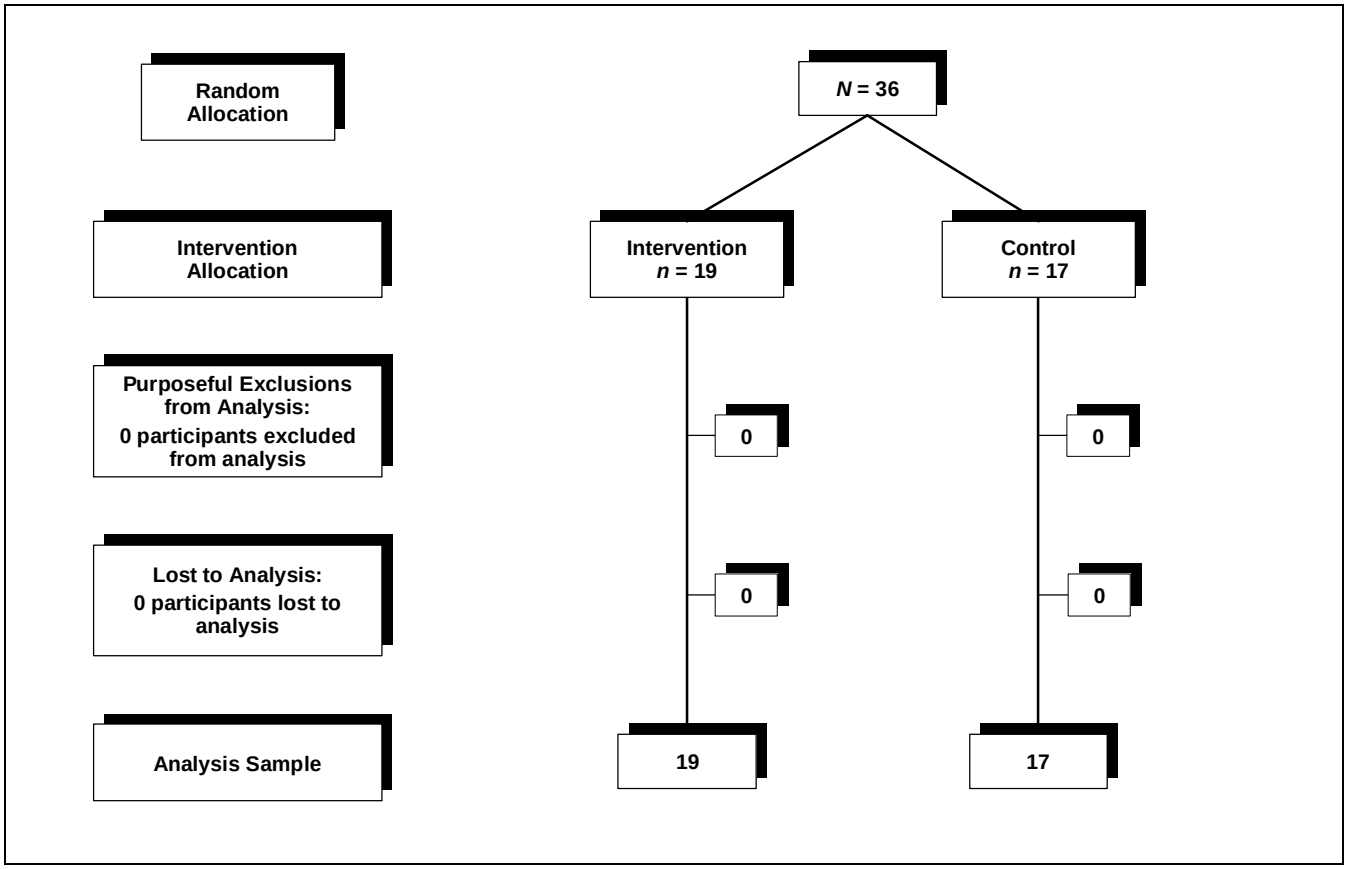
Research Design

The 8th-grade enrollment in the school totaled 121 students, of whom 36 had been identified as "algebra ready" on the basis of California Achievement Test scores, prior school grades, and teacher recommendations. These 36 students were randomly assigned to one of two classes: the Saxon Algebra curriculum class and the UCMP curriculum class. Analyses were conducted at the student level.

Participant Flow

Peters notes that scheduling difficulties and student requests for other course offerings resulted in imbalanced groups: 19 students were in the Saxon Algebra class and 17 students were in the UCMP class. Peters does not document exactly how many students changed group assignments. (See Figure 1, Participant Flow.)

Figure 1. Participant Flow (Students)



Note. Intervention = Saxon Algebra curriculum; Control = University of Chicago Mathematics Project curriculum.

Reference Periods

The study took place during the 1991–1992 school year. The Orleans-Hanna pretest was administered in August 1991, and the posttest was given in May 1992.

Baseline Data

Using previous scores from the California Achievement Test and pretest scores from the Orleans-Hanna test, Peters did not find significant differences between the student groups. The numbers of boys and girls in each group are the only other student characteristics reported. (See Table 1.)

Statistical Methods

Using group assignment as a predictor, Peters presents analysis of variance results for the Orleans-Hanna posttest. Peters also provides an analysis of covariance, where scores from the pretest are used as a covariate to predict posttest scores.

Outcomes and Estimation

Students in the intervention and control groups showed gains on the Orleans-Hanna test during the course of the school year (that is, from pretest, August 1991, to posttest, May 1992). However, the test score gains of the two groups did not differ significantly. There was no evidence that the Saxon Algebra curriculum was more or less effective than the UCMP curriculum. (See Table 2 and Figure 2.)

Table 2 presents the effects of the Saxon Algebra curriculum on mathematical achievement, as reported by Peters. This table presents unadjusted posttest means and standard deviations. Peters also reports the results of the surveys and exit interviews of the participating students; however, this WWC Study Report focuses only on the achievement results.

Table 1. Pretest Characteristics of the Study Sample

	Intervention (Saxon Algebra)	Control (UCMP)
California Achievement Test: Raw Mathematics Mean Score	96.1	94.9
Orleans-Hanna Pretest: Mean Score (*SD*)	89.8 (8.8)	89.9 (5.6)
Gender	8 boys/11 girls	8 boys/9 girls

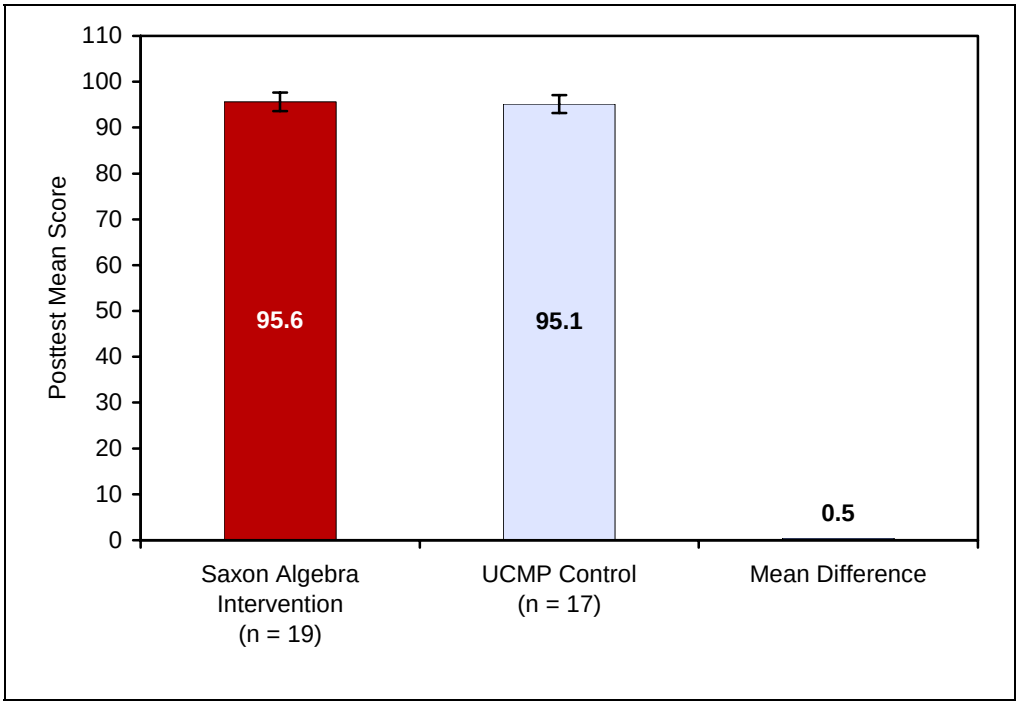
Note. UCMP = University of Chicago Mathematics Project curriculum.

Table 2. Impact Reported by Peters (1992)

	Intervention (Saxon Algebra)	Control (UCMP)
Orleans-Hanna Posttest: Mean Score (*SD*)	95.6 (4.5)	95.1 (4.1)

Note. UCMP = University of Chicago Mathematics Project curriculum.

Figure 2. Impact Calculated by Peters (2002)[a]: Orleans-Hanna Posttest



Note. Peters reports that the intervention group scores did not differ significantly from the control group scores ($p > .05$). UCMP = University of Chicago Mathematics Project.

[a] Confidence intervals were calculated by the WWC.

Intervention Developer Contact Information

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Related Studies

See reports on other studies of Middle School Math curricula.

See reports on other studies of Saxon Algebra curriculum.

Report Production

Date created: October 28, 2004

Topic area reviewed under: Curriculum-Based Interventions for Increasing K–12 Math Achievement—Middle School

WWC Study Ratings[a]: Peters (1992)

Causal Validity: Meets WWC Evidence Standards, a Randomized Controlled Trial with No Randomization, Attrition, or Disruption Problems

Participants were randomly assigned to intervention and control groups. The Orleans-Hanna Algebra Prognosis pretest was administered before the study at the beginning of the school year. Pretest scores did not show any significant differences between the study groups. The random assignment procedure was revised because of student scheduling conflicts, but the magnitude of the revision is unknown. No other extraneous events were identified that appeared to confound the intervention's effects.

Other Study Characteristics	Study Rating	Study-Specific Information
Intervention Fidelity	●●	The Saxon Algebra curriculum is well designed and implemented and meets the definition for Middle School Math. Peters does not provide any evidence of changed expectancies, novelty effects, and disruptions or any information about implementation fidelity.
Outcome Measures	●●	Two outcome measures were used in this study: the Orleans-Hanna Prognosis Test and researcher-developed unit tests in algebra. The Orleans-Hanna assessment shows evidence of acceptable reliability, and both outcome measures appear to be well aligned with the Saxon Algebra curriculum.
People, Settings, and Timing	●	Although some important characteristics are represented in the sample, many are not. Students were selected from a single school, and the sample of students is part of the identified population. However, Peters documents variation in gender only and does not report variation in the location or academic track of classrooms in the study. The outcome measure was administered at the end of the school year. Peters reports that the study took place between August 1991 and May 1992.
Testing within Subgroups	●	The intervention's effect was tested across the entire sample but not within important subgroups.
Analysis	●	Students were randomly assigned to intervention and control groups, but an unknown number of students changed group assignments because of scheduling conflicts and requests for other classes. In addition, the sample sizes were not adequate to allow for sufficiently precise estimates of the effect size. Peters does not report sufficient statistics for analyzing performances on the researcher-developed algebra tests.
Statistical Reporting	●●	The statistical tests were adequately reported, and effect sizes could be estimated for the outcome measure of interest.

Note. ●● Fully meets criteria; ● Meets minimum criteria; **X** Does not meet criteria.

[a] For more information on the criteria used to rate this study, see the WWC Evidence Standards: Middle School Math.