What Works Clearinghouse

Investigations in Number, Data, and Space®

Effectiveness

No studies of *Investigations in Number, Data, and Space*® that fall within the scope of the Elementary School Math review protocol meet What Works Clearinghouse (WWC) evidence standards. The lack of studies meeting WWC evidence standards means that, at this time, the WWC is unable to draw any conclusions based on research about the effectiveness or ineffectiveness of *Investigations in Number, Data, and Space*®.

Program Description[1]

Investigations in Number, Data, and Space®, published by Pearson Scott Foresman, is an activity-based K–5 mathematics curriculum. It is designed to help all students understand the fundamental ideas of number and operations, geometry, data, measurement, and early algebra. The curriculum encourages students to use prior knowledge to develop an understanding of fundamental mathematical ideas. *Investigations in Number, Data, and Space*® is problem-centered and de-emphasizes algorithms. Rather, the curriculum focuses on activities that encourage students to develop their own strategies for solving problems and engage in discussion about their reasoning and ideas. The curriculum at each grade level is organized into units that offer from two to eight weeks of work focused on a particular content strand, and students work in a variety of groupings, including whole class, individually, in pairs, and in small groups.

The WWC identified 40 studies of *Investigations in Number, Data, and Space*® that were published or released between 1994 and 2008.

Seven studies are within the scope of the review protocol and have an eligible design, but do not meet WWC evidence standards because they do not establish that the comparison group was comparable to the treatment group prior to the start of the intervention.

Seven studies are out of the scope of the review protocol because they have an ineligible study design that does not meet WWC evidence standards, such as having no comparison group.

Twenty-six studies are out of the scope of the Elementary School Math review protocol for reasons other than study design.

- Two studies were conducted outside the geographic area specified in the protocol.
- Twenty studies do not assess students' math achievement or are not studies of the effectiveness of *Investigations in Number, Data, and Space*®.
- Four studies are literature reviews or meta-analyses in which the author does not conduct a primary analysis of the effectiveness of *Investigations in Number, Data, and Space*®.

1. The descriptive information for this curriculum was obtained from a publicly-available source at http://investigations.terc.edu, downloaded October 2008. The WWC requests developers to review the description for accuracy from their perspective. Further verification of the accuracy of the descriptive information for this curriculum is beyond the scope of this review.

References

Studies that fall outside the Elementary School Math protocol or do not meet evidence standards

Battista, M. T., & Clements, D. H. (1996). Students' understanding of three-dimensional rectangular arrays of cubes. *Journal for Research in Mathematics Education, 27*(3), 258–292. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Additional sources:

Battista, M. T., & Clements, D. H. (1998). Students' understanding of three-dimensional cube arrays: Findings from a research and curriculum development project. In D. Chazan & R. Lehrer (Eds.), *Designing learning environments for developing understanding of geometry and space* (pp. 227–248). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Bay-Williams, J. M., Scott, M. B., & Hancock, M. (2007). Case of the mathematics team: Implementing a team model for simultaneous renewal. *The Journal of Educational Research, 100*(4), 243–253. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Bowen, E. W. (2006). Accounting for agency in teaching mathematics: Understanding teachers' use of reform curriculum. Unpublished master's thesis, Vanderbilt University, Nashville, TN. The study is ineligible for review because it does not include a student outcome.

Bush, W. S. (2005). Improving research on mathematics learning and teaching in rural contexts. *Journal of Research in Rural Education, 20*(8), 20–28. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Cai, J., Lew, H. C., Morris, A., Moyer, J. C., Fong Ng, S., & Schmittau, J. (2005). The development of students' algebraic thinking in earlier grades: A cross-cultural comparative perspective. *ZDM, 37*(1), 5–15. The study is ineligible for review because it does not include a student outcome.

Casey, B., Erkut, S., Ceder, I., & Young, J. M. (2007). Use of a storytelling context to improve girls' and boys' geometry skills in kindergarten. *Journal of Applied Developmental Psychology, 29*, 29–48. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Clements, D. H. (2007). Curriculum research: Toward a framework for "research-based curricula". *Journal for Research in Mathematics Education, 38*(1), 35–70. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Ebby, C. B. (2005). The powers and pitfalls of algorithmic knowledge: A case study. *Journal of Mathematical Behavior, 24*(1), 73–87. The study is ineligible for review because it does not use a comparison group.

Essex, N. K. (2006). Looking for gender differences in the mathematical work of elementary students. *Dissertation Abstracts International, 67*(12A) 204–4489. (UMI No. 3243791) The study is ineligible for review because it does not examine the effectiveness of an intervention.

Feger, S., & Zibit, M. (2005). *The role of facilitation in online professional development: Engendering co-construction of knowledge.* Providence, RI: The Education Alliance at Brown University. The study is ineligible for review because it does not include a student outcome.

Fernandez, C., & Cannon, J. (2005). What Japanese and US teachers think about when constructing mathematics lessons: A preliminary investigation. *The Elementary School Journal, 105*(5), 481–498. The study is ineligible for review because it does not include a student outcome.

Flowers, J., Krebs, A. S., & Rubenstein, R. N. (2006). Problems to deepen teachers' mathematical understanding: Examples in multiplication. *Teaching Children Mathematics, 12*(9), 478. The study is ineligible for review because it does not include a student outcome.

References *(continued)*

Goodrow, A. (1998). Children's construction of number sense in traditional, constructivist, and mixed classrooms. *Dissertation Abstracts International, 59*(04), 1055A. (UMI No. 9828874) The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Hands, L. (2006). Using classroom assessment to support growth of number sense in first grade. In S. Z. Smith, D. S. Mewborn, & M. E. Smith (Eds.), *Teachers engaged in research: Inquiry into mathematics classrooms, grades pre-K–2* (pp. 171–210). Greenwich, CT: Information Age Publishing. The study is ineligible for review because it does not use a comparison group.

Heinerikson, L. (2006). *The effects of Scott Foresman's mathematical* Investigations *curriculum on elementary standardized test scores.* Unpublished master's thesis, Northwest Missouri State University, Maryville, MO. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Hill, H. C. (2005). Content across communities: Validating measures of elementary mathematics instruction. *Educational Policy, 19*(3), 447–475. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Hundley, K. L. (2006). *Teacher efficacy in relation to mathematics education reform: An examination of a professional development study group of elementary teachers.* Unpublished master's thesis, Brigham Young University, Provo, UT. The study is ineligible for review because it does not include a student outcome.

Junk, D. L. (2006). *Teaching mathematics and the problems of practice: Understanding situations and teacher reasoning through teacher perspectives.* Unpublished doctoral dissertation, The University of Texas at Austin, Austin, TX. The study is ineligible for review because it does not include a student outcome.

Kamina, P. (2006). *How fifth grade teachers used* Investigations in Number, Data, and Space®*: A standards-based curriculum.* Paper presented at the 28th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Merida, Mexico. The study is ineligible for review because it does not include a student outcome.

Additional sources:

Kamina, P. A. O. (2005). Teachers' perceptions and practices of inquiry-based instruction: A case study of fifth grade *"Investigations"* curriculum in an urban school. *Dissertation Abstracts International, 66*(05A), 229–1684.

Kamina, P., & Tinto, P. (2005). *Lesson study: A case of the* "Investigations" *mathematics curriculum.* Paper presented at the 27th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Roanoke, VA.

Klein, D. (2007). School math books, nonsense, and the National Science Foundation. *American Journal of Physics, 75*, 101–102. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Kniss, K. B. (2007). The effects of *Investigations in Number, Data, and Space*® on the performance of at-risk students. *Masters Abstracts International, 46*(02), 68–605. The study is ineligible for review because it does not use a comparison group.

Lehrer, R., & Schauble, L. (2005). Developing modeling and argument in the elementary grades. In T. A. Romberg, T. P. Carpenter, & F. Dremock (Eds.), *Understanding mathematics and science matters* (pp. 29–54). Mahwah, NJ: Lawrence Erlbaum Associates, Inc. The study is ineligible for review because it does not examine the effectiveness of an intervention.

McCormick, K. K. (2006). Examining the relationship between a standards-based elementary mathematics curriculum and issues of equity. *Dissertation Abstracts International, 66*(08A), 2872. The study does not meet WWC evidence standards

References *(continued)*

because the intervention and comparison groups are not shown to be equivalent at baseline.

Additional sources:

McCormick, K. K. (2005). *Third-grade students, a standards-based mathematics curriculum, and issues of equity.* Paper presented at the 27th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Roanoke, VA.

Middleton, J. A., & Coleman, K. (2006). The development of leadership in mathematics: Cases of urban reform. In A. B. Danzig, K. M. Borman, B. A. Jones, & W. F. Wright (Eds.), *Learner-centered leadership: Research, policy, and practice* (pp. 131–148). Mahwah, NJ: Lawrence Erlbaum Associates, Inc. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Mokros, J. (2003). Learning to reason numerically: The impact of *Investigations*. In S. L. Senk & D. R. Thompson (Eds.), *Standards-based school mathematics curricula: What are they? What do students learn?* (pp. 109–131). Mahwah, NJ: Lawrence E. Erlbaum Associates. (This reference is for one of three separate studies included in the section: a study of proportional reasoning.) The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Mokros, J. (2003). Learning to reason numerically: The impact of *Investigations*. In S. L. Senk & D. R. Thompson (Eds.), *Standards-based school mathematics curricula: What are they? What do students learn?* (pp. 109–131). Mahwah, NJ: Lawrence E. Erlbaum Associates. (This reference is for one of three separate studies included in the section: children's construction of number sense.) The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Mokros, J. (2003). Learning to reason numerically: The impact of *Investigations*. In S. L. Senk & D. R. Thompson (Eds.), *Standards-based school mathematics curricula: What are they? What do students learn?* (pp. 109–131). Mahwah, NJ: Lawrence E. Erlbaum Associates. (This reference is for one of three separate studies included in the section: third- and fourth-grade students' number skills.) The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Mokros, J., Berle-Carmen, M., Rubin, A., & Wright, T. (1994). *Full year pilot grades 3 and 4:* Investigations in Number, Data, and Space®. Retrieved September 15, 2005, from TERC website: http://investigations.terc.edu/impact/impact-studies/pilot3-4.cfm. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Noble, T., Nemirovsky, R., Wright, T., & Tierney, C. (2001). Experiencing change: The mathematics of change in multiple environments. *Journal for Research in Mathematics Education, 32*(1), 85–108. The study is ineligible for review because it does not use a comparison group.

Reyes, W. G. (2007). *How integrating mathematics-based children's literature into the* Investigations *curriculum impacts students' acquisition of mathematical concepts and vocabulary in meaningful contexts.* Unpublished master's thesis, State University of New York College at Brockport, Brockport, NY. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Rosebery, A. S., Warren, B., Ballenger, C., & Ogonowski, M. (2005). The generative potential of students' everyday knowledge in learning science. In T. A. Romberg, T. P. Carpenter, & F. Dremock (Eds.), *Understanding mathematics and science matters* (pp. 55–80). Mahwah, NJ: Lawrence

References *(continued)*

Erlbaum Associates, Inc. The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

Ross, L. G. (2003). The effects of a standards-based mathematics curriculum on fourth and fifth grade achievement in two Midwest cities. *Dissertation Abstracts International, 64*(04), 1180A. (UMI No. 3088273) The study is ineligible for review because it does not use a comparison group.

Schifter, D., Bastable, V., Russell, S. J., Seyferth, L., & Riddle, M. (2008). Algebra in the K–5 classroom: Learning opportunities for students and teachers. In C. E. Greenes & R. Rubenstein (Eds.), *Algebra and algebraic thinking in school mathematics: 70th yearbook* (pp. 263–267). Reston, VA: National Council of Teachers of Mathematics. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Simpson, N. (2004). Investigations in Number, Data, and Space® *evidence for success.* Retrieved September 15, 2005, from New York City PS6 PTA Web site: http://www.smfcsd.org/math/validation.pdf. The study is ineligible for review because it does not use a comparison group.

Smith, M. E. (2006). Introduction to the pre-K–2 volume. In S. Z. Smith, D. S. Mewborn, & M. E. Smith (Eds.), *Teachers engaged in research: Inquiry into mathematics classrooms, grades pre-K–2* (pp. 1–14). Greenwich, CT: Information Age Publishing. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Time, I. (2005). Math that matters. *Hands On, 27*(1), 1. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Triantos, L. M. (2005). *The aftermath of implementing a standards-based curriculum in a K–8 district: Is there a correlation between hands-on instruction and math scores?* Unpublished master's thesis, Rowan University, Glassboro, NJ. The study is ineligible for review because it does not use a comparison group.

Vaisenstein, A. (2006). A look at a child's understanding of mathematical ideas through his representations. In S. Z. Smith, & M. E. Smith (Eds.), *Teachers engaged in research: Inquiry into mathematics classrooms, grades pre-K–2* (pp. 95–108). Greenwich, CT: Information Age Publishing. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Yelland, N. (2002). Creating microworlds for exploring mathematical understandings in the early years of school. *Journal of Educational Computing Research, 27*(1&2), 77–92. The study is ineligible for review because it does not take place in the geographic area specified in the protocol.

Yelland, N., & Masters, J. (2007). Rethinking scaffolding in the information age. *Computers & Education, 48*(3), 362–382. The study is ineligible for review because it does not take place in the geographic area specified in the protocol.