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Research on Children's Learning as a Tool to Improve Math and Science Teaching: A Resource Review

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Math/Science Matters: Resource Booklets on Research in Math and Science Learning, Tina A. Grotzer. Project Zero, Harvard Graduate School of Education.

This set of three booklets is intended as a practical guide for teachers of math and science. The stated goal of this series is to summarize "the findings of current research applicable to math and science education." The author argues in her introduction that such summaries are necessary background knowledge for teachers, who often are presented with educational reforms that they are not able to fully evaluate. The information in these booklets is therefore provided as a tool that allows teachers to better understand the theoretical models and empirical findings that are the foundation for a host of educational innovations in math and science teaching. With increased understanding, teachers will presumably be more successful in implementing reforms because they will understand innovative techniques at a conceptual level rather than simply as formulas to be applied by rote and easily abandoned at the first sign of difficulty.

Each of the three booklets addresses a specific research literature that is deemed relevant to math and science learning. Within a booklet, the specific readings are bound separately, and it is not necessary to read them as a set or in any particular sequence. Booklet #1 focuses on findings from the study of cognition. Four essays consider children's information processing and ways of knowing, theories of constructivism, and theories of achievement motivation. Booklet #2 addresses research on teaching and learning in five essays. These include discussions of curriculum theory, thinking skills, and problem based learning. Booklet #3 concentrates on the individual characteristics of learners, exploring ethnic diversity, gender differences, learning disabilities, and gifted education in four separate essays.

Overall these booklets are very basic and highly accessible introductions to specific bodies of research

literature, suitable for those with limited knowledge in the areas discussed. Each essay is also accompanied by a reference list for those interested in furthering their knowledge of the topic. The author provides very broad overviews of highly complex issues and runs the risk of oversimplification and overgeneralization in a desire to make the knowledge available. The discussion of achievement motivation in Booklet #1 for example, is a clearly written introduction to cognitive theories of motivation. However, it ignores how children develop their understandings of ability and effort. Although these fairly brief essays can hardly be expected to fully cover the topic presented, a basic discussion of developmental change in motivation seems necessary to avert misunderstandings of children's behavior in the classroom. Similarly, an essay in Booklet #2 addresses the distinction between teaching for conceptual knowledge and rote memorization of mathematical algorithms. However, the discussion ignores the role of cognitive development in shaping children's "invented procedures." A developmental perspective would be helpful for the experienced teacher, because it would allow the teacher to assess the level of thinking represented by the invented procedure.

The author describes these works as accessible for parents, although intended primarily for teachers. The reference list that accompanies each essay is a valuable tool for anyone interested in the topic of discussion. Current teachers of math and science who lack this basic level of knowledge and information, should consider these booklets required reading. However, the booklets' content may indeed be more suitable for parents, and other noneducators, as well as for new and preservice teachers, than for experienced professionals working in the field. The author has done a great service in providing a point of entry into the research literature for those who lack basic information. Whether experienced teachers of math and science are the appropriate audience is not completely clear.