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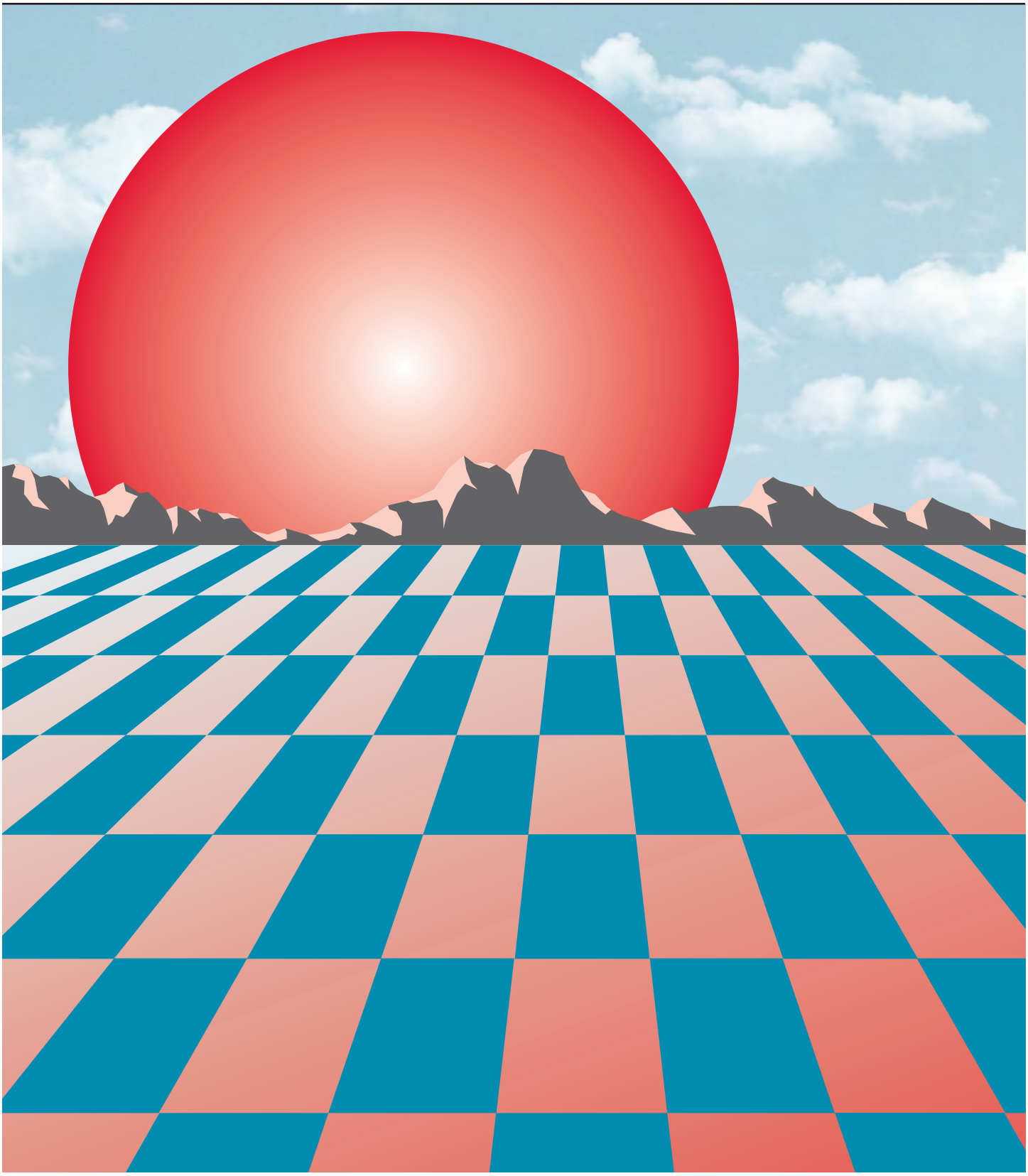

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Reforming Mathematics to Meet the Needs of Exceptional Learners

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Introduction

Reform mathematics is researched mathematics that is based on the National Council of Teachers of Mathematic's (NCTM) Principles and Standards (1989, 2000). These standards advocate that every child have access to stimulating, real-world mathematics that includes problem solving. These standards encourage a more constructivist approach to the teaching and learning of mathematics. Constructivist teaching and learning means some group work and hands-on activities will probably be included in the lesson.

The standards and the expectations outlined by NCTM for opportunities that will promote mathematics knowledge apply to all children, those who are typically developing as well as those children with special needs. A glance at the data from many school districts reveals that special education students are still struggling in the mathematics classroom even as their peers are making gains. Identifying effective strategies that will reduce the achievement gap between these two groups is crucial to their school success. More often than not, these strategies focus on classroom techniques rather than how the administration or mathematics supervisors can and should be key players.

The purpose of this paper is to review simple, yet effective strategies to assist administrators and teachers in promoting learning opportunities for children with special needs. First, we will describe a mathematics curriculum in an elementary classroom and then suggest strategies that administrators can consider to support teachers as they enhance the learning experience of children who receive special education services. The target population is students who are fully included in the regular education classroom.

Background

The National Science Foundation (NSF) funded the development of three elementary curricula in the early nineteen nineties. These curricula include Everyday Mathematics, Trailblazers, and *Investigations*. The purpose of this curricula development project was to insure that all children had access to "good" mathematics as prescribed by the NCTM standards. Once the 1989 standards were published, teachers across the country tried to implement them even though their curricula at that time rarely included content and pedagogy that was consistent with the standards. These curricula, then, were to provide resources for teachers as they were implementing the standards. Because these curricula are consistently being used in elementary classrooms across the country, it is imperative that we examine the impact of these curricula on the mathematics experiences of exceptional students.

Mathematics

An example of a reform mathematics unit is number theory. The unit builds on the student's prior knowledge of factors and products. This is the first unit for the Grade 5 *Everyday Mathematics* curriculum. In this unit, the activities are designed to start all students on "equal footing". Topics within this unit include: review of multiplication facts, factors, division, prime numbers, and square numbers. The structure of the unit includes assessment at three levels (ongoing, product and periodic). Included in the *Everyday Mathematics* curriculum are curricular options for learners with exceptionalities as well as ESL learners. In addition, there are suggestions for individualization of a task as well as whole class, small group, and dyadic options for instruction.

Now consider this unit with an overview of adaptations at two levels, administrative and classroom based. Adaptations are changes to the learning task and considered temporary and can be reduced over time (Janney & Snell, 2000). For example, classroom adaptations that may be implemented at the beginning of the school year would decrease over the year with the consistent objective that the student would participate in the lesson in a way that is meaningful and purposeful, and of course, increase knowledge. In the case of administrators, the objective of implementing adaptations with teachers would again, be a process of active participation that would lead to increased knowledge of working with exceptional populations.

Time is of the essence. Just as teachers provide adaptations for students on daily lessons, administrators can also implement adaptations for the teachers with the same outcome of reducing them over the school year. One adaptation that a teacher may implement for students with auditory or visual processing issues, is to allow them additional time beyond that suggested in the unit to increase the likelihood that the child will comprehend the material. For administrators, it is essential to allow teachers time during the instructional day so that they can determine the most effective adaptations to consider given the pacing of the curriculum per unit, strand and lesson. By providing teachers with more time to collaborate with the special education support staff or other teachers who work with the same students increases the likelihood that teachers can implement the most effective adaptations.

Many children lose track of time and may find it difficult to maintain a teacher's instructional pace. By providing the student with an advanced organizer of the tasks that will be completed during a math lesson as well as the time devoted to each component of the lesson, the student will be able to know what activities will occur during that time and have two methods to reference time. In addition, the teacher can announce the amount of time remaining in a given activity. This announcement can be individualized, i.e. going near the student at 1 or 2 minute intervals during a class activity to provide a visual prompt as well as monitor and adjust as needed given the student's progress on the task.

This strategy can be used by administrators as well. Given the importance of the standardized assessments, providing teachers with an advanced organizer of expectations related to outcomes is essential (e.g. previous performance of students with exceptionalities, students exempt from components of the assessment, general adaptations that would be used for multiple students with exceptionalities). By having access to the structure of the assessment months in advance of the test will allow teachers to determine how to imbed and reinforce essential math skills.

Maximizing use of supports. In preparation for a lesson, teachers can break down the use of adaptations that are general to the class and those that are specific to an individual student or students. Each lesson has whole class, partner and independent activities. Teachers can identify what adaptations could be implemented given these three types of activities. In most cases fewer adaptations are more effective than more. For example, providing a handout of the multiplication facts as well as an ongoing list of the vocabulary can be used not only for a single unit but throughout the school year. Given the temporary nature of adaptations, students can assist the teacher in determining when a given adaptation is no longer needed.

Determining what strategies would be most effective in supporting teachers' mathematics knowledge and pedagogy while they are instructing exceptional populations often offers uniform solutions. Such solutions include an inservice or ongoing support using online collaborations with other teachers not only in the school building but across districts or states. But an alternative often under-used strategy exists. Pair the expertise of working with exceptional students with the content expertise of the classroom teacher. This collaboration is by far the best strategy for transforming the mathematics experiences for these students.

Timing, implemented from both a top down and bottom up perspective is one simple adaptation to consider. Planning what adaptations are needed given the instructional context is another. Teaming the classroom teacher with the special education teacher for mathematics instruction provides dual expertise. The consequences of not providing teaming, timing, and planning far outweigh implementing these strategies which will increase the likelihood of complying not only to NCTM standards but more importantly, the effective instruction of *all* students — including exceptional students!

Reference

Janney, R., & Snell, M.,(2000) *Modifying schoolwork: Teachers guide to inclusive practices.* Baltimore, MD: Brookes Publishing.