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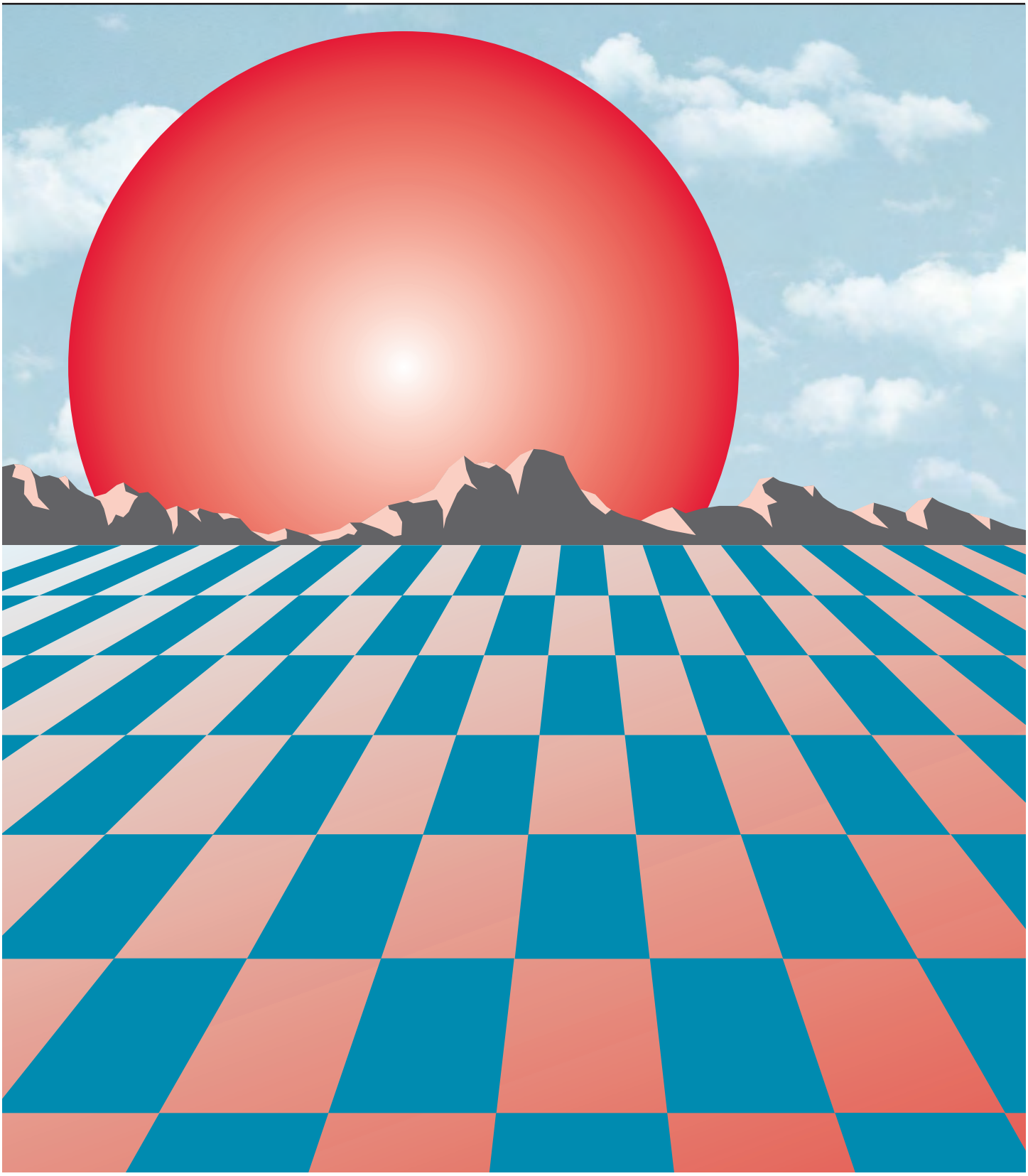

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Lessons from a University-K-12 Partnership:
Five Strategies for Mathematics Professional Development

Matthew G. Jones
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For the past four years, I have worked on a series of funded projects aimed at improving the teaching of mathematics in the upper elementary and middle grades, work for which I had no formal training. In that time, I have moved from being a co-facilitator of an institute to being the primary investigator of a comprehensive professional development partnership between my university and a local K-8 district. While I initially approached the work of teaching teachers from the naïve principle, "Show them the depth and richness of the mathematics they teach," I have now become well-acquainted with the literature on effective mathematics professional development, and through the literature and personal experience, have refined this notion into a set of five empirical principles for the design of professional development.

It is likely that some of these principles will be familiar to most of those experienced in professional development. However, I believe it is the combination of multiple strategies that give the program its strength. I share these five principles to encourage others in the field to consider the synergy possible in using multiple strategies. For more detail on the design of my current project and its basis in the research literature, see Author (2005, November; 2006a).

1. Teachers' experience with mathematical content must be readily connected to the mathematics that the teachers must teach but deep enough to foster new learning.

While it is true that teaching middle school teachers about trigonometric proofs would enhance their content knowledge, and the material is full of rich connections, it is too far removed from the middle school curriculum, where the focus is simply on understanding angles, polygon angle sums, and basic ideas of similarity and congruence. The phrase "readily connected" means that some portion of the task must actually overlap with a task that the teachers can use with their students. Yet the task must also be rich enough to challenge the teachers to develop a new understanding of their content.

2. Teachers must grapple with how reform-oriented teaching is incorporated into real classrooms.

Mere exhortations to teachers, "Please implement these ideas because your students will better understand mathematics," will get you very little. Contrary to popular myth, when given the time, teachers can and do read research and glean insights from it. In my professional development courses, I ask teachers to read research when I believe that research will enable them to expand their vision of what is possible or reflect on their current practices. This often means showing teachers research on how students perform when certain kinds of changes are made in the classroom. The article by Hufferd-Ackles, Fuson, and Sherin (2004) provides a good example. In this article, the researchers describe a framework for understanding the changes in practice that comprise movement toward reform-oriented teaching. An article such as this one promotes the teachers to reflect on how various components of teaching interact to produce a reform-oriented classroom. However, such discussions are only the beginning.

Teachers must also see teaching as it is enacted. Recently, a number of authors (e.g., Smith, Silver, and Stein, 2005) have produced written or video cases. Such cases allow teachers to delve into the details of a single lesson to explore what is involved in enacting the kind of teaching promoted by reformers. This allows teachers to see teaching in all the rich, real detail that a daily lesson encompasses. It is a

complement to the theoretical perspective provided by research, in that it focuses not on the theory driving the instructional decisions, but on the practical decisions that teachers must make on an everyday basis in order to reform their classrooms.

3. Teachers must be given time to translate the ideas of professional development into ideas they can enact in their own classrooms.

How does the vision we promote impact the classroom? It happens through planning. In my courses, I employ several classroom teachers (co-facilitators) who have already implemented reform ideas. I then explain the process of unit planning, adapting but simplifying ideas from Wiggins and McTighe (2005). Then, my co-facilitators and I each sit with a group of teachers and help them plan, typically a one- or two-week unit, focusing on using problems adapted from the content I have presented and also drawing on resources such as the NSF curricula. Teachers collaborate, using these resources, to craft a unit of instruction that they then try out in their classrooms.

4. Teachers need support as they implement new ideas.

The teachers I have worked with have the best of intentions in using the units designed during professional development. But, given the constraints of everyday teaching, it helps if the teachers can rely on the co-facilitators and me to provide assistance in implementing the units. Therefore, the co-facilitators and I go into classrooms and either model or observe lessons, and may interact with the students as well, acting as a second teacher by assisting the students as they work on problems individually or in groups.

5. Teachers need the opportunity to reflect on the impact of the changes.

Finally, teachers need the opportunity to study the data on the impact of the changes. Typically, we provide follow-up meetings in which teachers bring student work and examine students' performance. Teachers may be surprised at what their students can do, or they may find that fewer students understood the lesson than they thought. In either case, student work and data from our observations lead to important conversations about what is and is not effective in getting students to learn mathematics.

Project evaluation thus far indicates that teachers have been able to enact changes in the classroom, and that different aspects of the professional development were most effective for different teachers (Author, 2006b). I believe that the lessons shared here will be of use to other mathematics education leaders who work to provide quality professional development to teachers.

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