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A Century of Leadership in Mathematics and its Teaching

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Leading People: Leadership in Mathematics Education

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The issue of leadership in mathematics education—always a matter of some contention—has been complicated by developments in the field over the past half century or so. When mathematics education began to emerge as an academic field at the beginning of the twentieth century, so few people were seriously concerned with either its practice or its study that virtually all of them could be considered leaders of some sort. That situation prevailed until the new math era, when a new and larger generation of mathematics educators appeared in colleges and universities. Since the new math era, mathematics education people and programs have proliferated to such an extent that leadership has become much more diversified and identifying leaders much more difficult. Today we need attention not only to the nature of leadership in our field but also to a serious study of that leadership.

Note: Based on a colloquium presentation at Teachers College in March 2013. I am grateful to Bruce Vogeli and Henry Pollak for inviting and introducing my contribution, Gabriella Oldham for transcribing my remarks, Sandi Clarkson for catching several lapses, and Benjamin Dickman for helping untangle my thoughts on leadership characteristics. The remaining flaws are all my own.

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Introduction

In *Twelfth Night,* the foolish, puritanical Malvolio reads a forged love letter he thinks Olivia has addressed to him. Instead, the maid Maria has tricked him into thinking that his adored Olivia is modestly asking him not to fear her "greatness":

> Be not afraid of greatness. Some are born great, some achieve greatness, and some have greatness thrust upon 'em. (Act 2, Scene 5)

As I thought of the ways in which leadership might work in mathematics education, Malvolio's celebrated lines came to mind. In our field, some might become leaders through their own accomplishments, and others might lead because they have been put in charge of a stellar program or organization. So with apologies to Shakespeare, I offer the following:

> Be not afraid of leadership. Some are born leaders, some achieve leadership, and some have leadership thrust upon 'em.

It may well be that nobody is born a leader—one can debate that claim. But if you think about leadership in our field, it is pretty clear that some people become leaders through the force of the ideas that they communicate to the rest of us through their speeches and publications. We might call them our intellectual leaders. They achieve leadership by means of their own activities, and they have no explicit designation to indicate that they are leaders.

In contrast, we have other people in the field who take on the role of leader because they are elected to the presidency of an organization, are chosen to chair a committee, or become the director of a curriculum project or a research project. Those people have leadership positions, and then it becomes an interesting question: What are they able to make of that leadership position that was thrust upon them, so to speak?

Mathematics education, therefore, has leaders of at least two kinds: We have intellectual leaders who lead because of ideas, and we have what we might call political-social leaders who occupy leadership positions. There are many of the latter, and whether they come to take on genuine leadership roles is often a function of various and peculiar circumstances. In what follows, I identify a number of leaders. It should become obvious that both kinds of leadership, sometimes commingled, are present in our field.

In this paper, I first cite some early leaders in mathematics education, all of whom should be familiar names. Then, because we work in a very young field, I discuss briefly how over the last century or so, mathematics education has entered the academy and what that has meant for our field and its leadership. I go on to offer a few words about the new math era. I have chosen several leaders from that era to demonstrate one of the outcomes of the new math. The new math reformers wanted to transform the school mathematics curriculum, but they did not achieve true reform—at least not in the United States (Kilpatrick, 1997/2009, 2012a, 2012b; Stanic & Kilpatrick, 1992). There was change, and some of it was lasting change, but it was not reform. Although the new math did not achieve its intended consequences, it did have a number of unintended consequences. One of the most important of those was to bring into the field a very large number of talented, dedicated people, and I offer several examples. Then I consider the nature of leadership today and what that might mean. How might we think about the characteristics of leadership? Finally, I consider the study of leadership and how it might be addressed in mathematics education.

Early Leaders

As examples, I have chosen four leaders from among the first people to be identified as mathematics educators. They are Henri Fehr, Felix Klein, David Eugene Smith, and Jacob William Albert Young. The first two are from Europe; the second two, from the United States.

Henri Fehr (1870–1954) was a Swiss mathematician at the University of Geneva. With Charles Ange Laisant, who was a French engineer and politician, Fehr founded *L'Enseignement Mathématique* in 1899. It is the oldest journal in our field, and it became the official journal of the *Commission internationale de l'enseignement mathématique* (CIEM, anglicized as the International Commission on the Teaching of Mathematics) when that group was founded in 1908. Fehr was the first secretary general of that international group. So he was a leader who occupied a position where he could, by editing a major journal for many years and being the CIEM secretary general, have a great influence on the development of mathematics education as an academic field, primarily in Europe.

Felix Klein (1849–1925) was the first president of the CIEM. He was president from its founding in 1908 until 1920, when various issues and differences of opinion over the First World War led to its suspension. One of the many reasons I chose Klein is that he was a noted mathematician who developed and conducted courses on teaching methods. I think he must have been the first person to teach a course on methods of teaching mathematics. His larger academic agenda was to establish applied mathematics in higher education and to make mathematics a foundational discipline there. To achieve that ultimate goal, he adopted the remarkable strategy of beginning with the reform of secondary school mathematics. In other words, he really wanted to do something at the collegiate level, but he started by working at the secondary level. His main idea was to make calculus the capstone of secondary mathematics, which he was successful in doing in many countries although not the United States.

The key phrase that Klein used was *functional reasoning*. He wanted to introduce the notion of the function into school mathematics, which he was largely successful in doing. And that, of course, was the reason that calculus became the endpoint of that approach. He was a very savvy political mathematician. Klein's strategy for change "was clearly to forge an extraordinarily broad and powerful alliance of teachers, scientists and engineers that would advocate a series of reforms for mathematics and science curricula" (Schubring, 1989, p. 188). So he had a very ambitious program and was able to accomplish much of it, especially by using his position as the president of the International Commission. Under Klein's leadership, the International Commission began to function as an agent for curriculum change and continued to push reforms in teacher education.

> [Klein then] began to interest himself in the improvement of teacher education. By so doing, he hoped to reverse the trend toward one-sidedly formal abstract approaches to mathematics instruction by promoting practical instruction and the development of spatial intuition. (Schubring, 1989, p. 184)

A nice objective, I think. Klein was very much aware that young people going through the secondary school and on to college who might become mathematics teachers faced what he called a *double discontinuity*. There was a discontinuity when the prospective teachers went from secondary mathematics to collegiate mathematics. Those two domains did not connect very well. And then when the prospective teachers turned around and went back to teach secondary mathematics, they encountered another discontinuity: The mathematics they had been learning in the college did not apply to what they were teaching in the secondary school. So Klein set out to try to rectify that problem.

Now consider David Eugene Smith (1860–1944), a name that should be known to everyone at Teachers College. In the journal *L'Enseignement Mathématique* in 1905, Smith proposed the idea of an international commission. He gets the credit for recognizing that our field, mathematics education, needed an international commission to study its various activities. At the International Congress of Mathematicians in Heidelberg in 1904, there had been a call for reforms in teaching mathematics in higher education. So Smith, like Klein, said, "Let's start by looking at secondary education." And at the 1908 International Congress of Mathematicians in Rome, Smith made a formal proposal to establish the International Commission. First, he proposed a comparative study on the methods and plans of teaching mathematics at secondary schools, and that was done in a number of countries. If you have not seen it, you might be interested to take a look at the U.S. reports of that study and others (International Commission on the Teaching of Mathematics, 1912). My secret suspicion is that Smith wanted his counterparts to study the teaching of secondary mathematics in their countries so that educators in the United States would realize that we had some way to go relative to what was happening elsewhere. We needed improvement in what we were doing. He used a tactic that has a lot of modern resonance, I think. The International Commission started by looking at secondary schools but soon expanded its view to include all types of schools, vocational schools, normal schools, and universities. So this international group started out by undertaking some of the first comparative studies in education, which a lot of people participated in, and the idea of an international commission to do such studies had been launched.

The International Commission had been organized at the 1908 International Congress of Mathematicians in Rome, but before 1952 it was not connected with the International Mathematical Union. The IMU did not begin its work until 1920 and then was dormant from 1932 to 1952. In contrast, the CIEM began in 1908, ceased work in 1920, came back in 1928, was dormant from 1939 to 1952, when it was recast as the International Commission on Mathematical Instruction (ICMI), and has continued as such until today (Kilpatrick, 2008).

Because international congresses of mathematicians have been held for such a long time (since 1897), we tend to think of mathematicians as forming the senior group, with mathematics educators the junior partner. As an organization, however, the CIEM (later the ICMI) began in 1908, whereas the IMU did not begin until 1920. So the international organization of mathematics educators is actually older than the international organization of mathematicians.

In contrast to the other early leaders in mathematics education, David Eugene Smith was not trained as a mathematician. His doctorate was in art history, and before he taught mathematics, he clerked in his father's law office. We all recognize his talents as a historian of mathematics, however, and the really fine historical work he did. Before coming to Teachers College, where he did most of that work, he taught mathematics at several places, including Cortland Normal School in New York and Michigan State Normal School (now Eastern Michigan University). From our perspective today, he was a unique leader. As one of the two founders of mathematics education in the United States, he built the program at Teachers College. He developed the first doctoral program in mathematics education in the country, and I am almost certain it was the first anywhere. His were the first doctoral students in mathematics education (Donoghue, 2001).

The other founder of mathematics education in the United States, Jacob William Albert Young (1865–1948) was, like most of the other people I cite as leaders, trained as a mathematician. He got his degree at Clark University in group theory and was one of the young faculty members recruited to staff the University of Chicago when it was being formed. The administration there raided East Coast schools to get mathematicians, educators, and others. Young had a dual title; he was professor of mathematics and mathematics pedagogy. I consider his book *The Teaching of Mathematics in the Elementary and the Secondary School* (Young, 1907) to have been pivotal in establishing the field. Like Smith and like many of the other people I mention, Young wrote mathematics textbooks, which was another way that people showed their leadership qualities: by preparing the textbooks that would be used in mathematics classes.

Young and Smith had very different approaches to mathematics education. Teaching in Chicago at the beginning of the twentieth century, where there was a movement to unify the secondary school curriculum, Young was very interested in taking a unified approach to algebra and geometry, as well as introducing a more practical and applied school mathematics. Smith, in contrast, perhaps in part because he was not highly trained as a mathematician, was conservative in his view of the subject. In particular, he thought that the year-long course in geometry was sacrosanct. It was where children learned to reason, and mathematics educators should not eliminate that year-long bout with Euclid. There were, of course, other people at Teachers College—specifically Edward L. Thorndike—who did not agree with Smith on that matter, as you might guess. But it is an interesting contrast between these two leaders: Out in the Midwest, mathematics educators were experimenting with an integrated curriculum and more applications. Back in the East, they were staying true to mathematics the way it was intended to be taught.

Mathematics Education Enters the Academy

At the end of the nineteenth century, which is really when our field began to take shape, teacher education was moving into higher education institutions. Some of the pioneering chairs in education included the following: the University of Halle, Germany, in 1799; the University of Iowa in 1873; the University of Edinburgh in 1876; the University of Göttingen, Germany, in 1893 (a chair in mathematics education resulting from the work of Klein); and Uppsala University, Sweden, in 1910. In the early nineteenth century, anyone who wanted to be a teacher needed to finish secondary school and enter another institution, which might be called a normal school, pedagogical high school, teaching academy, or something like that. Such an institution went little beyond the secondary level and could not take any student very far into higher mathematics. But by the end of the nineteenth century, teacher education was becoming a more demanding subject, and mathematics education at that time began to develop as a university subject, which changed a lot of things.

In a 1912 survey for the CIEM, four countries reported having university lectures in mathematics education—Belgium, Germany, Great Britain, and the United States (Kilpatrick, 2008)—which shows how small our field was in those days. That situation has changed dramatically, as I show below. Beginning in the nineteenth century, so-called normal schools were becoming teachers colleges and then becoming departments, schools, or colleges of education. In many U.S. states, there are universities today with *state* in their name that began as normal schools. They evolved into state colleges and then became state universities. Even today, in some less economically developed countries, primary teachers get a short training course that is at the secondary level. In more economically developed countries, however, all teachers are educated in university programs. And there are other arrangements in various countries that are somewhere in between. In summary, mathematics education as a practice developed within a variety of academic structures, and as a field of study developed within universities.

The contrast between mathematics education and mathematics was drawn by Hyman Bass and Bernard Hodgson (2004):

> Mathematics education and mathematics . . . are fundamentally different as domains of practice and scholarship. Their main historical intersection has been the induction and advanced mathematical preparation of mathematical researchers and scientists, . . . and this primarily at postsecondary levels. While most mathematicians teach, mathematics education treats teaching much more seriously as a professional practice, requiring dedicated training and certification. (p. 640)

Bass and Hodgson raise and partially answer two questions about the two fields:

> How are mathematics and mathematics education, as domains of knowledge and as communities of practice, now linked, and what could be the most natural and productive kinds of connections? The ICMI represents one historical, and still evolving, response to those questions at the international level. (p. 640)

When people think about the relationship between mathematics and mathematics education, they are often tempted to say that mathematics education is the child of mathematics, which is the more mature, responsible endeavor. But a better metaphor, and I have used this elsewhere (Kilpatrick, 2008), is that of yin and yang. We can think of mathematics and mathematics education as partners and as complements. Mathematics is both a profession and a discipline, whereas mathematics education is neither. It is a field of practice and a field of study. And both involve teaching, which is what brings them together. So yin and yang is a picture that I prefer to that of mother and child.

The New Math Era

The new math era was an international phenomenon (Kilpatrick, 2012a), but here I focus on U.S. leaders at the time. As examples, I have chosen Edward G. Begle, Mary P. Dolciani, Max Beberman, and Howard F. Fehr.

Ed Begle (1914–1978) was my major professor. He was a mathematician—first at Yale and then at Stanford—who became a mathematics educator during the new math era. He directed the School Mathematics Study Group (SMSG), which was the largest and the best known of the U.S. new math curriculum development projects. One could argue that Ed was a leader who, because he had been secretary of the American Mathematical Society and because Yale University had offered to host the project that became the SMSG, got into mathematics education because of a leadership position that was thrust upon him. Consider, however, this quotation from Ed's talk at the First International Congress of Mathematics Education: "Mathematics educators should abandon our reliance on philosophical discussion based on dubious assumptions, and instead follow a carefully correlated pattern of observation and speculation, the pattern so successfully employed by the physical and natural sciences" (Begle, 1969, p. 239). Ed very clearly thought that we needed to turn mathematics education into an experimental science. At the time, I did not entirely agree with him then, nor do I now. You can argue that he had too narrow a conception of research in our field. But you have to give him credit for thinking about how we should conduct our work. Ed had the courage to stand up and make that proclamation, and I think it really shaped the field when he led by putting out that idea for all of us to think about.

The second leader is Mary P. Dolciani (1923–1985), who was also a mathematician. Her association was with Hunter College, where she got a degree and then went back to teach. She was a textbook author who worked with the SMSG textbook writing teams, but even before that, she had published a series of commercial school mathematics textbooks. When I taught ninth-grade algebra in a Berkeley, CA, junior high school as the new math era was beginning, I used one of her textbooks. I cite her as an example of someone who was a leader in our field through the textbooks that she wrote, and not necessarily because anybody elected her to some position or because she chaired some committee, although she did accomplish many things in the field. She became a dean and provost, which is leadership of a sort. But I cite her because she was an intellectual leader in the way she approached school algebra. After working on the SMSG secondary mathematics program, she went back and published a revised series of textbooks that became best sellers.

Max Beberman (1925–1971), who earned his doctorate at Teachers College, was not educated as a mathematician but rather as a mathematics educator. He was both a professor of education at the University of Illinois and a faculty member at the University of Illinois Laboratory High School, where in 1952 he began the University of Illinois Committee on School Mathematics project—the world's first curriculum development project in mathematics (Kilpatrick, 2012a).

We tend to think of the new math as having emerged out of Sputnik in 1957, but by then Max had already been revising the high school mathematics curriculum along with others, particularly Herb Vaughan, a mathematician and logician. Max was a great teacher who led a pioneering project but also put forward important ideas to guide the secondary mathematics curriculum: The language used should be precise, and the student should have the opportunity to discover generalizations (Beberman 1958).

Howard Fehr (1902–1982) was on the Teachers College faculty when I arrived as a new assistant professor in 1967. He was a prominent mathematics educator who was directing the Secondary School Mathematics Curriculum Improvement Study (SSMCIS), another of the well-known new math curriculum projects. Howard had a lot of contacts among international mathematics educators, many of whom were advisors to SSMCIS. He enlisted me to travel with him to a conference in France to work on a volume for UNESCO (1973). That was my first trip to Europe, and I became acquainted with Alan Bishop, with whom I worked on the chapters of the volume that dealt with research and assessment. A year or so later, I went to Cambridge for a sabbatical year and got to know Alan and other English mathematics educators much better. I owe Howard my introduction to international mathematics education.

Among my examples of leaders, I chose both Henri Fehr and Howard Fehr. To my knowledge, they were not related; at least, I have not been able to find any connection. But I do know that 40 or 50 years ago there were mathematics educators around the world who thought that H. Fehr at Teachers College was either the Henri Fehr from Geneva or his son. So it certainly did not hurt Howard in international circles to be associated with, and possibly mistaken for, Henri Fehr.

As an aside, I recently published a paper (Kilpatrick, 2012b) in which I discuss U.S. mathematicians and the new math movement. It turns out that some revisionists are claiming that the mathematicians who worked on the U.S. new math projects were few in number, not well respected, and the wrong people for the job. In my paper, I attempt to refute those claims because it seems to me that they were among the best of their generation. And they helped erect the edifice of mathematics education that we benefit from today.

The Nature of Leadership Today

The nature of leadership is a function of the field in which that leadership is exerted. Consider the changes that have occurred in mathematics education since the first meeting of the International Commission in 1908 in Cologne. At that meeting, there were 19 participating countries plus 14 so-called associated countries. In 2008, when ICMI celebrated its centennial, there were 72 member states. That is just one indication of how much growth has taken place internationally in our field. And today, in each member state there is a community of mathematics educators. If we compare 1908 and 1952, when both the ICMI and the IMU were reconstituted, mathematics educators faced similar situations: Schools and the school mathematics curriculum were being faced with new demands, a gap was widening between school mathematics and mathematics as a scientific discipline, the views of mathematicians were setting the terms for debate, countries had begun or would soon begin to reform their curricula, and the international exchange of views seemed especially appropriate. At both times, the ICMI played a decisive role in addressing the reform issues as well as in shaping the field.

In the century from 1908 to 2008, the field of mathematics education changed enormously, and it has changed even more in the 5 years since 2008. Today we have a profusion of books, handbooks, proceedings, articles, research reports, newsletters, journals, meetings, and organizations that did not exist a century ago. In 2008, in connection with the ICMI centennial, I searched the Web for "mathematics education." Using Google, I got 1,280,000 hits; using Google Scholar, I got 129,000 (Kilpatrick, 2008). In February 2013, I did a similar search. Using Google, I got 3,100,000 hits; using Google Scholar, 287,000. In each case, the number more than doubled in just 5 years.

Mathematics education is a burgeoning field. What does that say about its leadership? How do we find out who our leaders are when the enterprise is growing so rapidly?

The Study of Leadership

How might we study leadership? How might we find out what experts consider leadership characteristics to be? One possibility is to use Google. In February 2013, I searched for "leadership characteristics" and got a long list of sites. Among the first five on the list, I found *10 characteristics of superior leaders* (Javich, 2009), *7 important traits of leadership* (Leadership-Toolbox.com, 2008), and *the 5 characteristics of great leaders* (McBean, 2013). The characteristics are listed in Table 1.

The striking thing about these three lists is that there is almost no overlap. Communication is the only idea that shows up on all three, although Flexibility appears on the last two. One might argue that Goal and Ambition on the first list bear some resemblance to Direction on the second, or that Honesty on the second list is like Being responsible on the third, but each of those connections requires something of a stretch.

What this small and unscientific sample says to me is that for the most part, the items that one authority identifies as

Table 1. A Comparison of Three Top Websites' Leadership Characterization

10 characteristics of superior leaders	The characteristics of leadership: 7 important traits	The 5 characteristics of great leaders
• Mission • Vision • Goal • Competency • A strong team • Communication skills • Interpersonal skills • A "can do, get it done" attitude • Inspiration • Ambition	• Empathy • Consistency • Honesty • Direction • Communication • Flexibility • Conviction	• Being flexible • Being able to communicate • Having courage, tenacity, and patience • Humility and presence • Being responsible

being characteristics of leaders are not the items that another authority would identify. These lists are compiled by people whose Web sites show up at the top, so they must know something. But they are not telling us the same thing. All of the terms on the lists are great. They sound like leadership heaven. The lack of overlap across the lists, however, suggests strongly that the identification of leadership characteristics has not progressed very far.

It may be that by trying to identify characteristics or traits of leadership, we are looking in the wrong place. It might be better to start by taking recognized leaders in mathematics education and through case studies, discover what it is that makes them leaders. That might or might not work. One reason I am somewhat skeptical goes back to 1965, when Larry Stolurow published a book chapter whose title posed the dilemma "Model the Master Teacher or Master the Teaching Model." Stolurow drew a contrast between modeling what master teachers do and developing an explicit model of teaching using a computer program based on data from students' performance while learning from instruction. He saw mastering the model of teaching as likely to be more useful than efforts to model the master teacher. Similarly, it might also be that developing a model of leadership in mathematics education would be a more fruitful enterprise than attempting to model the master leader.

For some years, Teachers College has produced the most U.S. doctorates in mathematics education, and the University of Georgia has been second (Reys & Kilpatrick, 2001). At Georgia, we have been reviewing what we want in our doctoral program. Here is a list of program components that we have been thinking about:

- Mathematics
- School mathematics curriculum
- Teaching mathematics
- Students and their learning
- Critical issues and foundations
- Research

One would think that mathematics would be the obvious first item, but we discovered at the conference that led to the Reys and Kilpatrick book that there are a number of U.S. doctoral programs in mathematics education that a student can pass through without taking much if any mathematics. That is certainly not the case at either Teachers College or Georgia. We have been emphasizing courses in statistics for our doctoral students, and I recently learned that Teachers College is adding work in modeling, which is an example for us to follow.

The school mathematics curriculum belongs in every doctoral program so that candidates will have some idea of what the teachers they prepare will be encountering. Teaching mathematics as an enterprise needs to be studied and thought about and reflected on. Students, how they learn, and what is involved in that learning should be a part of any good doctoral program. Critical issues and foundations are important, too, and we try to build that into our program. Finally, learning about and doing research in our field has to be a central part of the program, including learning how to apply educational statistics to large data sets.

Several years ago, when the University of Georgia and the University of Michigan were working together on the Center for Proficiency in Teaching Mathematics, we at Georgia undertook a kind of inventory of our doctoral program. We realized that even though most of our doctoral students were going out to become teacher educators, and they were getting some practice with prospective teachers, they were never given a good opportunity to reflect on what teacher education is, to think about it as an enterprise, to study it. Since then, what we have been trying to do is make teacher education and professional development an important part of our doctoral program. We realize that it is an aspect of our field that needs to be addressed more fully than it is.

I have been especially impressed by what John Dewey (1904/1964) said about the professional development of teachers. He argued that both practical and theoretical work are required. The teacher educator should prepare prospective teachers both to manage the practical aspects of teaching that arise daily and to grapple with deeper questions of the relationship between subject matter knowledge and educational principles and theories. For example, the teacher preparation program at Teachers College is not only preparing people to handle the day-to-day enterprise of teaching but also trying to get them to reflect on what it is all about, what it involves. It has a theoretical aspect, and it has a practical aspect, as it should. As Dewey pointed out, if you focus on the preparation for the practical aspects, then you would follow the *apprenticeship* approach which has its virtues. It is a traditional approach in which past performance serves as a model for future performance. If one focuses, however, on the more theoretical aspects of a job, then one takes the *laboratory* approach, which is a forward-looking approach. It is, in the words of Lee Shulman (1998), "local, particular, and situated" (p. 512).

Randy Philipp and his colleagues at San Diego State (Philipp et al., 2007) studied the beliefs of prospective teachers who had done one of several things: Some groups studied children's mathematical thinking in a laboratory approach, either by watching videos only or by doing that but also working with individual children. Other groups followed an apprenticeship approach by visiting classrooms and observing teaching. Those prospective teachers who followed the laboratory approach underwent more change in their beliefs than those prospective teachers who followed an apprenticeship approach. In other words, visiting classrooms is not as good as actually studying what children do in responding on a video or even going out and working with children. The most effective practice was to go out and work with children, but the biggest difference was between studying children's thinking and going out and sitting in a classroom somewhere. By controlling the mathematical tasks used with children, Philipp and his colleagues increased the likelihood that the prospective teachers would encounter situations that had the potential to affect their beliefs. The study indicates that Dewey's view that a laboratory approach to preparing teachers is more effective, at least in this case, than an apprenticeship approach, which is what most of us use.

As an analogy, something that has been missing in preparing mathematics educators in our programs has been attention to leadership development. I know of no program to prepare mathematics educators, doctoral or not, that pays attention to what it means to develop leaders. Here are some thoughts: Should we provide laboratory experiences or apprenticeship experiences for leadership development? Think about the program that you would run if you were conducting a doctoral program in mathematics education. Would you provide some experiences in leadership development? What characteristics would you attempt to promote? You have seen my pathetic effort to try to decide on the characteristics of a leader. Well, maybe those of us who conduct doctoral programs ought to study the issue and ask the question: What characteristics do the leaders in our field have that we would like to promote in our programs for preparing mathematics educators? And finally, how should we study leadership development? In the same way we have been overlooking the study of teacher education and development, we have been overlooking the study of leadership development. I am not saying such a study would be easy. Clearly it would not be. But a program like the one at Teachers College ought to be giving some attention to the question of how we develop leaders. What can we do differently in our programs if we want a generation of leaders that will be able to do what is going to be needed to move us all forward?

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