TPSE Math is a small, informal group of mathematics leaders who work pro bono to address a series of related challenges affecting undergraduate math education. Members include Phillip A. Griffiths, Institute for Advanced Study, Convener; Eric Friedlander, University of Southern California; S. James Gates, Jr., University of Maryland at College Park and PCAST; Mark Green, UCLA; Tara Holm, Cornell University; Karen Saxe, Macalester College; and Uri Treisman, University of Texas at Austin.

The following summary describes TPSE Math in four phases: (1) origins; (2) information gathering and sharing; (3) strategic planning; and (4) implementation of the strategic plan.

**Origins:** The formation of TPSE was triggered by major changes in the field of mathematics itself, by demands on the field from other STEM and non-STEM departments, and by economic pressures and technological changes throughout higher education. Additional impetus came from two influential reports: the NRC’s *Math 2025*, which called for mathematics teaching that better aligns with other disciplines; and PCAST’s report *Engage to Excel*, which reported dissatisfaction in how undergraduate mathematics is taught to students outside the mathematics major. Further, outdated course materials and teaching techniques have not provided students generally with the quantitative skills demanded for employment and good citizenship. These challenges led to a gathering at Carnegie Corporation of New York (CCNY) of a small group from the mathematics community, from higher education more broadly, and from outside mathematics, especially those concerned with the demand for stronger quantitative skills of graduates in the workforce. This meeting led directly to the formation of TPSE, which received initial funding from CCNY and the Alfred P. Sloan Foundation.

**Information gathering:** After early discussions, TPSE reached out to gather and share additional information through a national-scale meeting and a series of regional meetings. The intent was to work with the mathematics community to identify the most urgent issues, how they were being addressed, and how early experiments and models could be scaled up and used by others. TPSE also sought opinions from the “demand” side of the equation, including employers and disciplinary partners, and heard about new teaching technologies and the evolving economic models of mathematics departments. Over the course of these meetings, TPSE has become aware of the need to increase the diversity of those involved in the discussion, reaching out to mathematicians from underrepresented institutions, ethnicities, races, and gender.

**Strategic plan:** From information gathered at the regional meetings, TPSE identified a strong consensus in the mathematics community about how these pressing issues might be addressed, and in fact are being addressed by many leaders across the country. In planning for action, TPSE engaged the consulting firm Parthenon EY, which gathered and synthesized opinions and experiences of mathematicians, math educators, federal and state agencies, funders, and others involved with building the strength of post-secondary education in mathematics.
Based on input from these stakeholders, TPSE identified the end vision for its efforts:

*Post-secondary education in mathematics will enable any student, regardless of his or her chosen program of study, to develop the mathematical knowledge and skills necessary for productive engagement in society and in the workplace.*

It further articulated its own mission relative to the end vision:

*TPSE Math will facilitate an inclusive movement to strengthen post-secondary education in mathematics by working closely with—and mobilizing when necessary—faculty leaders, university administrations, membership associations, and relevant disciplinary societies in the pursuit of mathematically rich and relevant education for all students, whatever their chosen field of study. TPSE Math will identify innovative practices where they exist, advocate for innovation where they do not, and work with and through partners to implement and scale effective practices.*

A near-term plan of concrete actions has emerged from this vision and mission:

- Mathematics Action Group and department chairs: (1) Create and convene a diverse and representative Mathematics Action Group (MAG) consisting of 20-25 department chairs and a smaller number of outside stakeholders. This core group is envisioned as a key action and communication partner, both advising TPSE on “grass roots” issues at the departmental level and receiving advice on potentially valuable models. (2) Informed and supported by MAG, convene a larger meeting of 100 to 200 department chairs to share information and extend the partnership committed to reform in undergraduate education in mathematics.
- Multiple pathways and completion rates: TPSE will function as an advisory partner of APLU/AASCU/the Dana Center (UT-Austin) in developing multiple pathways in lower-division mathematics to improve completion rates and quality of instruction.
- Educational and economic outcomes of new teaching technologies: TPSE will be an advising partner to ITHAKA, a research group that studies uses of technology to improve both teaching and learning.
- Enhanced alternative pathways: Promote reform of upper division curricula in response to demand for improved math courses for other departments.
- Broader training for graduate students: Enhance preparation of the next generation of faculty as teachers of undergraduates and advisors of undergraduates on career development.

**Implementing the strategic plan:** TPSE is now entering its implementation phase, beginning with administrative changes, including the arrival of William (Brit) Kirwan as Senior Advisor. To support next steps, TPSE has requested an implementation grant from the Sloan Foundation to create the Mathematics Action Group and to prepare a multi-donor, multi-year proposal to carry out, scale up, and evaluate the effectiveness of major reforms. This action phase will also signal the beginning of sustained efforts to increase the diversity of the mathematics community and to build expertise in data analytics to better assess needs and evaluate outcomes.

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