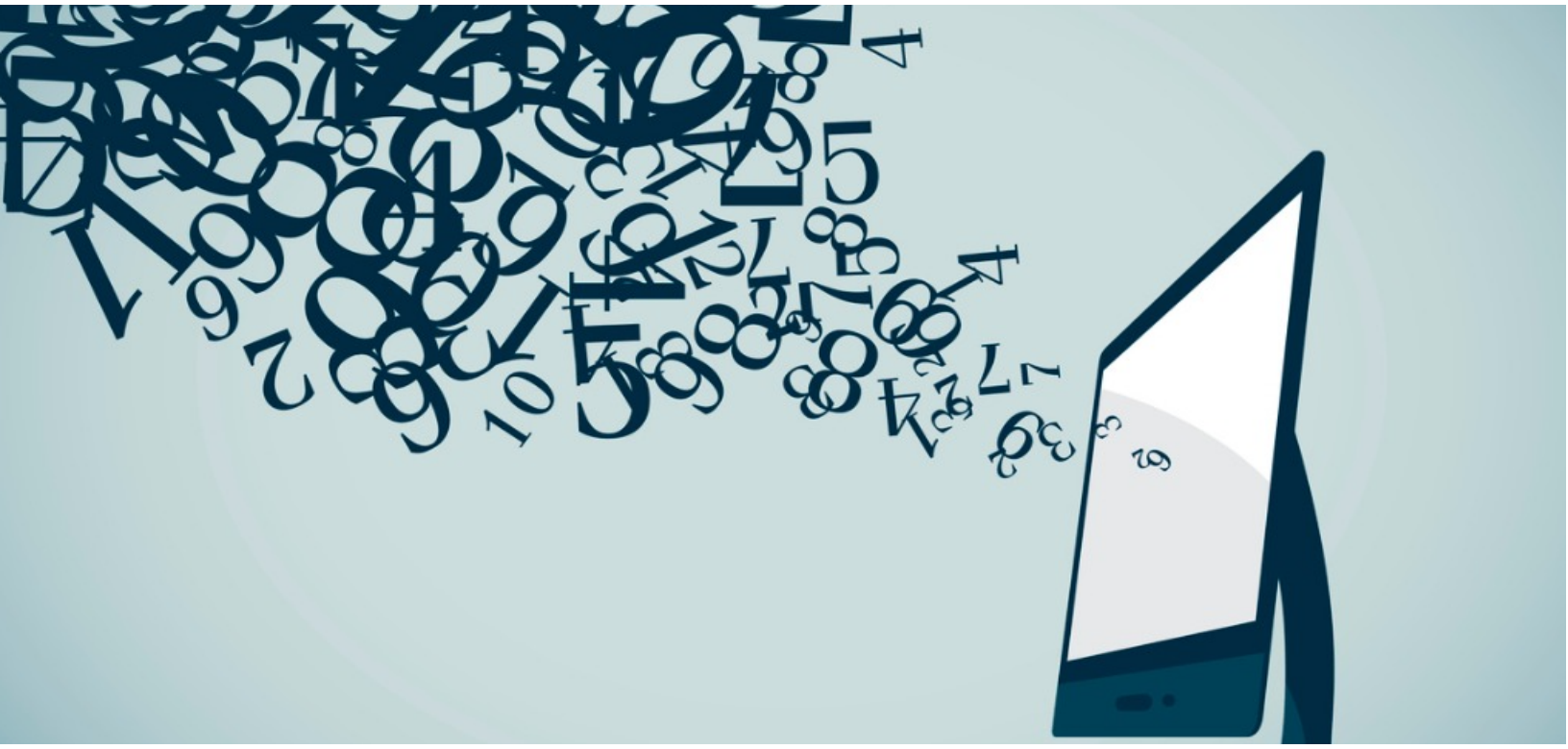
MathNet™

A Mathematics Education Network
Equity-Based Math Teaching & Learning



By Gordon Freedman

President, www.NLET.org

Why Math, Why Now?

This document is focused on the formation of the "Mathematics Network," an organization of practitioners, experts, advisors and partnering organizations comprised of math educators, math teacher educators, math curriculum specialists, mathematicians, engineers, scientists, computer and data scientists, math learning researchers, cultural bias experts and social justice advocates, policy and institutional leaders in schools, higher education and career and technical education.

Reports and data about declining student math success and concern over dominant culture effects on students of color and in poverty are well known by now. Poor math performance across the spectrum of students is likely produced by a complex combination of factors including curriculum and instruction and extending into existing culture and prevailing attitudes toward math as subject matter, attitudes and bias about which students are good math learners. The math milieu before Covid was already at a crisis level and now, with the pandemic, is even more serious and requires a new level of action.

The effects of poor math learning show up in early dropouts, loss of potential earning power, and an inability to find and keep employment. It also leads to lower college attendance and retention and is a primary barrier to college and training program completion. All of these have negative effects on personal lives, corporate earnings, hiring and, ultimately, on GDP in U.S. states and the nation.

What is surprising, given all of the indicators of declining student math performance in school and in the first years of higher education and, given all the reporting on math as a leading education and equity barrier, is that this enormous body of knowledge of failure and the data backing it up has not prompted a more pronounced and strategic response.

As the national and international figures report continued declines in math performance (PISA 2019, NAEP 2019) in the U.S., with few bright spots, the responses have been similar to past responses. These include more funding for research, more reports produced, diverse and uncoordinated interventions, diverse technology solutions and app development, more open resource production, new curriculum and professional development approaches, more association and foundation meetings focused on the problems and solutions.

What is new in the math world is the growing awareness and research on the role that race and culture, implicit bias, cultural and funding barriers, and dominant math cultural attitudes add to the underlying social, emotional and cultural factors over the difficultly with pedagogy, curriculum, professional development, teacher training, policy and administrative practice.

A number of efforts will or have produced promising outcomes across a range of school and early college settings. However, what is found to be effective may not be known elsewhere and, if the findings are discovered, schools and colleges might not have the time, will and staffing to pursue promising angles on math education. The truth is that math education is such a struggle for those whose job it is to teach, research and report on math learning, there is little room left at the classroom or course level to engage in more strategic or system conversations.

Next Steps

1) Inaugurating a unified and diverse network to chart a more strategic, culturally and social-emotionally sensitive path to math success across numerous individuals, institutions and organizations.

2) Incorporating many of the strong associations, organizations, institutes and institutions working on the issues across the field of math education research through a lens of social emotional, cultural and social justice issues.

3) Coordinating efforts to sort through, catalogue and focus the network on a handful of strategic initiatives and pilot activities and collaborate on raising funds, researching and managing pilots.

4) Piloting, testing and developing common math systems to be used remotely in classrooms that are designed to meet the individual needs of the learners with or without assistance.

Organization

The National Laboratory for Education Transformation, www.NLET.org, is a California-based research and development nonprofit formed of mostly senior volunteer staff and officers that has developed a layered approach to math teaching, learning and research that is anchored in ensuring that the progression of math standards from early grades and into college is an initial scaffold that is critical to any kind of programmatic, access or equity approach to successful learning, comprehension and conceptual capacity in math.

In addition to its focus on math, NLET has expertise in K-12 and K-to-Work state data systems for examining math and other performance. It also has deep expertise in workforce development and career and technical education (CTE). Finally, NLET is interested in persistent student and family-controlled learning records to give individual learners active access to their learning data.

NLET's Math Approach

NLET has looked at math systematically since 2011 when it coordinated an NSF DRK12 agent-based modelling grant with the Los Alamos National Laboratory's statistical division, UT Austin School of Education data visualization unit and UC Santa Cruz's Department of Education which focused on the analysis of a large 15 year longitudinal district database of student performance in math.

NLET believes that early math (K-2), foundational math (grades 3-8) and transitional math (high school into first year college) must be anchored in standards progressions as a foundational structure upon which all other social, emotional, equity and other strategies can be added. Without adequate knowledge on the part of students, teachers, mentors and faculty of where students are in the math space, it becomes difficult to apply general strategies for specific outcomes.

NLET On-Going Math Structural Programs

- **Precision Math** (competency-based pre-Algebra to precalculus system): Is a multi-million-dollar development effort that started at National University in San Diego, CA. It involves curation of hundreds of micro competency-focused Open Education Resources (OER), short-formative assessments linked to each micro-competency and progress displayed in student and teacher/faculty dashboards. This free system is highly extensible meaning that other content and assessments can be added or existing ones removed, students and instructors could work on or develop context-relevant materials, and that adjustments can be made in the system for different learners or other interventions such as social-emotional or math anxiety. Precision Math is currently used in equity based online Algebra boot camps, dual enrollment, college-ready math programs and in corequisite math learning in college. Technology developer is Cambridge, MA based www.PragyaSystems.com which has received funding from the NSF SBIR program as well external investment. NLET is actively seeking partners in schools, teacher education programs and college math and support courses.

- **CourseKata** (a new way to teach statistics and data science in college and high school): Led by UCLA faculty researcher Dr. James Stigler and the UCLA Teaching and Learning Lab, and funded in part by a grant from the Chan Zuckerberg Initiative, CourseKata Statistics and Data Science in a free, interactive and online text book where students continually practice making connections between core concepts, representations, and the world of data analysis. These connections result in deep understanding and transferable knowledge. Students also learn by doing – accessing R programming exercises, documenting learning through Jupyter Notebooks (a common tool used by data scientists), and formative assessments.

- **Work-Ready Math** (online contextualized math to individual trades): NLET, in partnership with San Diego Continuing Education, www.SDCE.edu, California's largest provider of noncredit career education, is developing an online, contextualized math system to help students learn the specific math they need for CTE pathways and licensure. A private grant is funding early work in OER development of modules and assessments for automotive and construction trade math. NLET and SDCE intend to expand this work to other continuing education operations in community colleges and CTE programs at the college and high school levels.

Collaboration Within the Mathematics Network

NLET believes it has a uniform technical and structural approach to building math competencies with its current and future math systems. NLET believes, unlike the product universe, that math education should be publicly available in infrastructures used by education institutions, individuals and other entities. Equally, NLET believes researchers should use standardized math testing platforms and have easy access to run real-time experiments and share results quickly and widely.

What is Missing

What NLET is missing is a more expansive national network with deeper representation across multiple communities of leaners and expertise in addressing deeper dominant culture strictures in math learning. NLET has a strong equity focus and representation of diverse voices, however it is looking to greatly expand its network nationally and to particularly focus on a broader engagement with African American and Latinx learner, research, educator and teacher educator communities.

Enter Covid-19, The Academic Disruptor & Opportunity for Change

The problems in math education over the last decade are difficult enough. Few would have guessed that a pandemic would close all schools, colleges, universities and training programs and send the entire apparatus of education and training into remote administration and online learning for an unspecified period of time? The level of disruption to math education is hard to predict as we are still in the middle of the virus.

What is clear is that students in all circumstances have had their lives and their math learning severely disrupted to the point that large sections of curriculum may go missing or key standards lost as educators struggle to manage day to day momentum.

By forcing education online, where measurement, feedback, reporting and analysis can be more standardized and communication more routine, there is hope for working on the systemic failures in math education and in the systemic forces that bar equal access to many Black, Latinx, Native American and Pacific Islander students and make gender equal education more difficult. That is provided that schools can ensure equal access to online learning for all students, particularly those with the fewest resources.

Invitation: Moving Forward

NLET and the math experts, advisors and advocates assembled so far, are reaching out across the country to build a network to combine the many efforts and methods of math leaders aimed at math success into a more focused set of activities that can be run as continuous improvement, constant learning, research and feedback aimed at broadening student success and to specifically redress to longstanding inequalities in math education and math understanding.

NLET has started this process creating a learning community called the Mathematics Network. But the effort must be collaborative, and we are inviting in those who can help us build this network. NLET can invest in organizing, communicating and convening to make a network possible

Four Areas of Immediate Focus for Network

NLET would hope to combine its structural approach to math competencies and conceptual understanding with other social-emotional, equity addressing, project-based oriented research, practice and policy activities across the U.S. to address four areas:

- Grades 3-8 Foundational Math
- K-5 Math Teacher Preparation
- College Ready Algebra and Statistics/Data Science
- Work Ready Math

MathNet™ Founding Team

The following individuals are directly involved with math programs of NLET, are board members, and advisors. All share a passion for math, equity and math education transformation.

Ed Tech & Math Data (Math Management, Technology Platforms, Data)

- **Gordon Freedman**, *NLET Founder & President*. Previously Vice President Education Strategy at Blackboard, Inc; active in science outreach; formerly a journalist and film producer. NSF Biographical Sketch

- **Jay Neuman**, *NLET K12 Data Specialist.* Executive Director at Career Labs USA, math visualizations and data reporting.

- **Daniel Saunders**, *NLET Data Science Coordinator*. Talent Marketplace Ecosystem Analyst, www.BrightHive.io

- **Ken Sorey**, *NLET Executive Director*. Previously manager of www.calpassplus.org; co-led the California Multiple Measures Assessment Project to shift placement practices and access to college-level math . NSF-IES Biographical Sketch

- **Ed Stanford**, *NLET Board Chair*. Previously resident of McGraw Hill Higher Education; assisted in funding www.ALEKS.com

- **Joanne Wendelberger**, Ph.D, Los Alamos National Laboratory, Statistical Division, NSF Biographical Sketch

Specialized Open Math Platforms (Unique Systematic Delivery Systems)

- **Precision Math**** (pre-Algebra to Precalculus), Pragya Systems, Inc, CEO, Ramji Raghavan

- **CourseKata^^** (R-based Statistics), Chan Zuckerberg, James Stigler, UCLA, PI. Edify Software Consulting

NLET Mathematics Education Research (NSF, IES, Chan Zuckerberg Initiative)

- **Drew Bailey**, Ph.D, University California Irvine, NSF Biographical Sketch

- **David Braithwaite**, Ph.D, Florida State University, Curriculum Vitae

- **Ferdinand Rivera**, Ph.D, *NLET Board Member*. San Jose State University, NSF Officer. Biography

- **James Stigler**, Ph.D, UCLA, Biography

- **Clarissa Thomas**, Ph.D, Kent State University, IES Biographical Sketch

Math Equity, Social Justice & Inclusion (Research, Practice, Social Justice)

Carlos Osvaldo Cortez, Ph.D, Community College President, San Diego Continuing Education, www.SDCE.org, Equity and Continuing Education Advocate

Norman "Storm" Robinson III, Ph.D., NLET Board Member-Elect, Chief Innovation and Education Officer at the Illinois Mathematics and Science Academy and founder of sySTEMsED 21, a STEM education organization to create transformative STEM learning experiences for ALL students and educators.

Danny Bernard Martin, Ph.D, Professor of Education and Mathematics, University of Illinois at Chicago

Christopher C. Jett, Ph.D., Associate Professor, Department of Mathematics, Sciences, and Technology, University of West Georgia, Racial Justice

Aris Winger, Ph.D., Assistant Professor of Mathematics, Georgia Gwinnett College

College-Ready Math (8th grade to first year college, dual enrollment)

Noah Doss**, MS Math, *NLET Advisor*. Background in mathematical neuroscience, applied probability, and discrete mathematics. Lecturer at California State University Monterey Bay; leads NLET's Online Algebra Bootcamp.

Hongde Hu**, PhD, *NLET Advisor*. Math faculty at California State University Monterey Bay, former long-time Math and Statistics Chair; uses Precision Math.

Barbara Illowsky, PhD., *NLET Senior Advisor*, Community College and State Level Math Advisor. Professor of Mathematics, Emerita, De Anza College; past president of the California Mathematics Council Community Colleges; former Project Director of the California Community Colleges' Basic Skills Initiative; Faculty for National Center of Developmental Education's Kellogg Institute.

Daniel Lopez**, MS Math, *NLET Advisor*. Instructor at Monterey Peninsula College and California State University Monterey Bay; dual enrollment instructor; uses Precision Math.

Richard Rasiej**, *NLET Board Member*. Director, NLET Math Division; Visiting Research Scholar, University of Southern California (USC) Rossier School of Education; Co-Founder, Herman + Rasiej Mathematics Initiative, https://www.hrmathinitiative.org; Adjunct Professor, Santa Monica College.

Linda Lew-Roca**,** MAT, Dual Enrollment, Monterey Peninsula College (CA)

Work-Ready Math (Trade Math)

Ernesto Garcia* (San Diego Continuing Education), specialization in math and in automobile math for trade programs.

San Diego Continuing Education, www.SDCE.edu, NLET's partner for Trade Math program development using Precision Math platform.

Upper Middle School Math

Patti Dieck, *NLET Foundational Math Co-Director*. Upper Elementary School Teacher, Amityville Public Schools; Author of Engage New York upper elementary curriculum modules; Co-author (with Christopher Sarlo) of "Thinking Math Differently" Guides.

Christopher Sarlo, *NLET Foundational Math Co-Director*. Upper Elementary School Teacher, Amityville Public Schools; Author of Engage New York upper elementary curriculum modules.

Program Evaluation

John Young, *NLET Senior Advisor*. Research & Evaluation Senior Research Fellow at Student Achievement Partners, https://achievethecore.org/author/155/john-young.

K-5 Teachers Programs

Herman + Rasiej Math Initiative, USC, https://www.hrmathinitiative.org, an NLET partner, led Richard Rasiej, NLET's board member and managing director of math.

Education Administrators (School, Higher Education, State Government)

Francisco Hernandez, Ph.D. *NLET Board Member*. Retired Vice Chancellor, Student Affairs, UC Santa Cruz and University of Hawaii; Founder of University of California College Prep Initiative (UC Scout).

Jamie Valenzuela-Mumau, EdD, *NLET K12 Director*. Superintendent of Alta Public Schools (South Los Angeles), https://www.altapublicschools.org.

Kurt Steinhaus, EdD, *NLET Board Member*. Superintendent of Los Alamos Public Schools (NM), www.LASchools.net, former Deputy Cabinet Secretary New Mexico Public Education, President ISTE, Education Policy Advisor Office of Governor Bill Richardson.