

TEACHING AND LEARNING LINEAR ALGEBRA

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Short description of the DG: organizers, aims and underlying ideas

Sepideh Stewart is an Associate Professor of Mathematics at the Department of Mathematics, University of Oklahoma. She is the editor of *And the Rest is Just Algebra* (2017), and co-editor of *Challenges and Strategies in Teaching Linear Algebra* (2018). She is one of the guest editors of a special edition of ZDM special issue on “Research on Teaching and Learning in Linear Algebra” (Issue 7, 2019). She is the Chair of education committee at International Linear Algebra Society (ILAS). She is the organizer of an NSF-Funded workshop on linear algebra in 2018. Her current research interests are on teaching and learning of Linear Algebra.

María Trigueros is an Associate Professor of Mathematics at the Department of Mathematics, Instituto Tecnológico Autónomo de México. She is a member of the *Mexican Academy of Sciences* and of the *Researchers’ National System* (SNI) in México. She has spent many years doing research on the teaching and learning of Linear Algebra. Her current research interests are on the teaching and learning of Linear Algebra and multivariable Calculus.

Michelle Zandieh is a Professor in the Faculty of Science and Mathematics in the College of Integrative Sciences and Arts at Arizona State University. She is a co-editor of *Challenges and Strategies in Teaching Linear Algebra* (2018), and one of the guest editors of a special edition of ZDM special issue on “Research on Teaching and Learning in Linear Algebra” (Issue 7, 2019). She has had funding from the National Science Foundation of the USA for research and curriculum development efforts in the teaching and learning of linear algebra since 2007. The *Inquiry-Oriented Linear Algebra* (IOLA) curriculum developed out of this collaboration across five universities; aspects of the curriculum have now been used by instructors at over 60 universities.

This discussion group will draw on the experience of three Linear Algebra researchers and curriculum designers to facilitate discussions around the past and future of Linear Algebra education. Linear Algebra is an important area of study for STEM majors. In a survey paper by Stewart, Andrews-Larson, and Zandieh (2019) the authors summarized some advances in many areas of linear algebra education (e.g., span, linear independence, eigenvectors, and eigenvalues). The survey paper also identified areas that need more research (e.g., systems of linear equations, properties of linear transformations, orthogonality, and least squares), and revealed the gaps (e.g., proof).

This working group will provide the opportunity to continue to develop and extend the field. Key questions and issues to be discussed are: What do we know from research about the teaching and learning of Linear Algebra? How can research results be used in the teaching of Linear Algebra? What innovative teaching methods have proved some success in the teaching of Linear Algebra?

Planned structure (21:30 – 23:00, July 14):

The planned structure is designed to maximize the opportunities for participants to engage with each topic and to provide feedback that may lead to future joint projects.

Planned timeline	Planned activity	Working format /Responsible person
21:30-21:40	Introduction	The organizers will give a brief overview of their research. Attendees will introduce themselves. The plan for the discussion group as well as a set of questions will be presented.
21:40-22:05	(a) Issues on first-year Linear Algebra topics (b) Teaching Resources (application, technology)	The attendees will break up in small groups to discuss: (a) What are some pressing issues concerning the teaching of first-year courses? (b) What teaching resources do you use to help students to understand the concepts better?
22:05-22:30	(c) Linear Algebra proofs, (d) Second courses in Linear Algebra	The attendees will break up in small groups to discuss: (a) What are some issues surrounding teaching linear algebra proofs? (b) What is the nature of second courses in your institution? The attendees will discuss the pertinence and possible contents of the second courses as a group.
22:30-22:50		Group discussion
22:50-23:00	Closing remarks, supporting new researchers, future work	The organizers will close by summarizing participants' views about future research.

References:

Stewart, S. Andrews-Larson, C., & Zandieh, M. (2019). Linear algebra teaching and learning: Themes from recent research and evolving research priorities, *ZDM Mathematics Education*, 51(7), 1017-1030.