



RICE UNIVERSITY  
SCHOOL MATHEMATICS PROJECT

# Being Research-Based and Research-Minded in Helping K-12 Mathematics Education

Adem Ekmekci  
*Rice University*

The 2019 AWM Research Symposium  
April 6-7, 2019  
Rice University  
Houston, TX



## ***Why Research?***

- Informing practice (critical especially in the context of very diverse and high-poverty urban schools and school districts)
- Developing proof of concept for future grant proposals benefiting schools
- Knowledge generation



# How does *Research* improve K-12 math education?

- Professional development of teachers
- Teacher quality
- What works, what does not work
- Barriers for teachers to transfer new learning into their classrooms



## Professional Development

Core features of effective professional development (Darling-Hammond, 2018; Desimone, 2009; Loucks-Horsley et al., 2010):

- a) rigorous content focus,
- b) active learning,
- c) collaboration,
- d) models of effective teaching practices,
- e) frequent feedback and reflection, and
- f) long-term duration.



## Teacher Knowledge

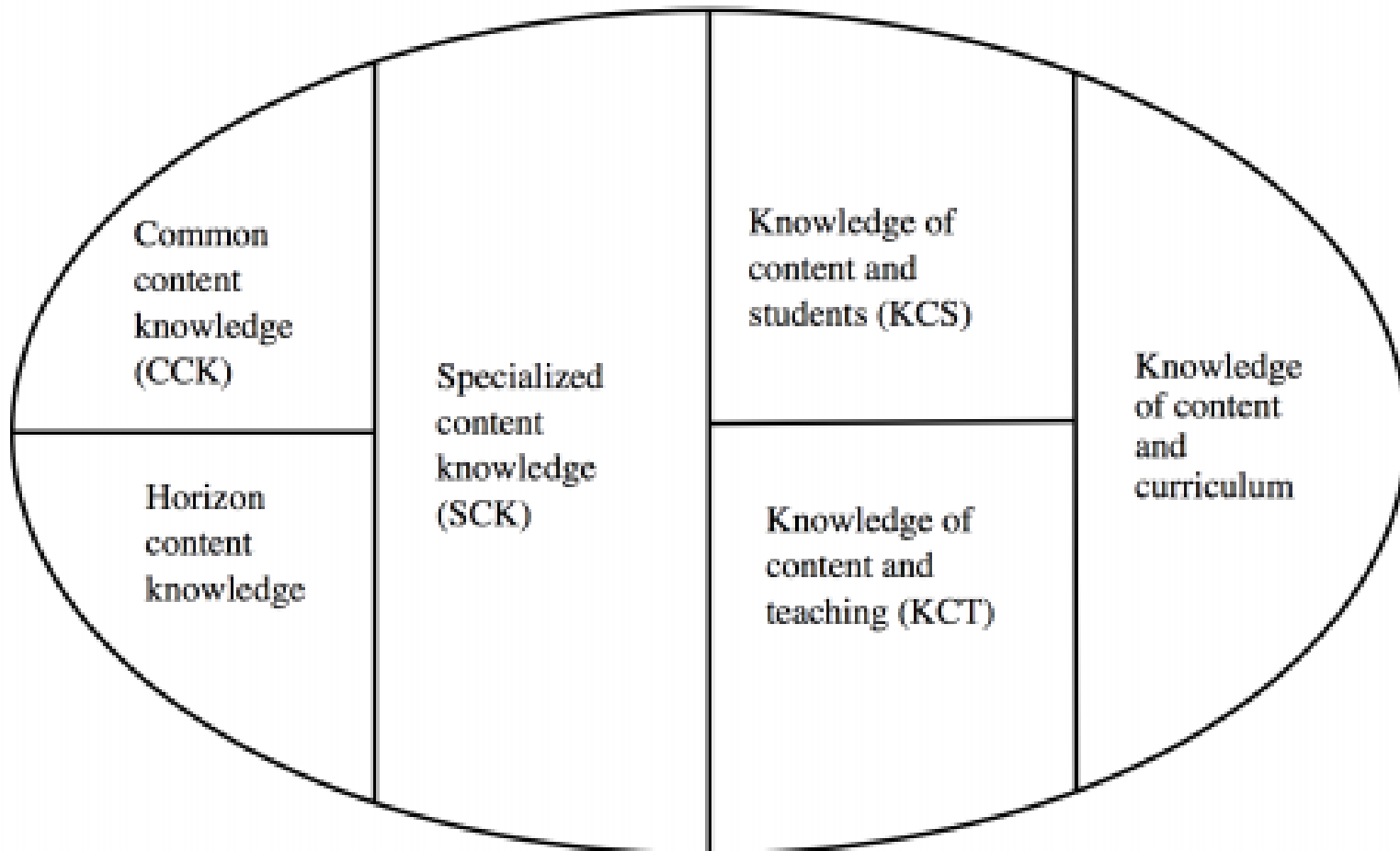
- Mathematical knowledge for teaching  
(MKT; Ball, Thames, & Phelps, 2008)
- Technological pedagogical content knowledge  
(TPACK; Mishra & Koehler, 2006)



# RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT

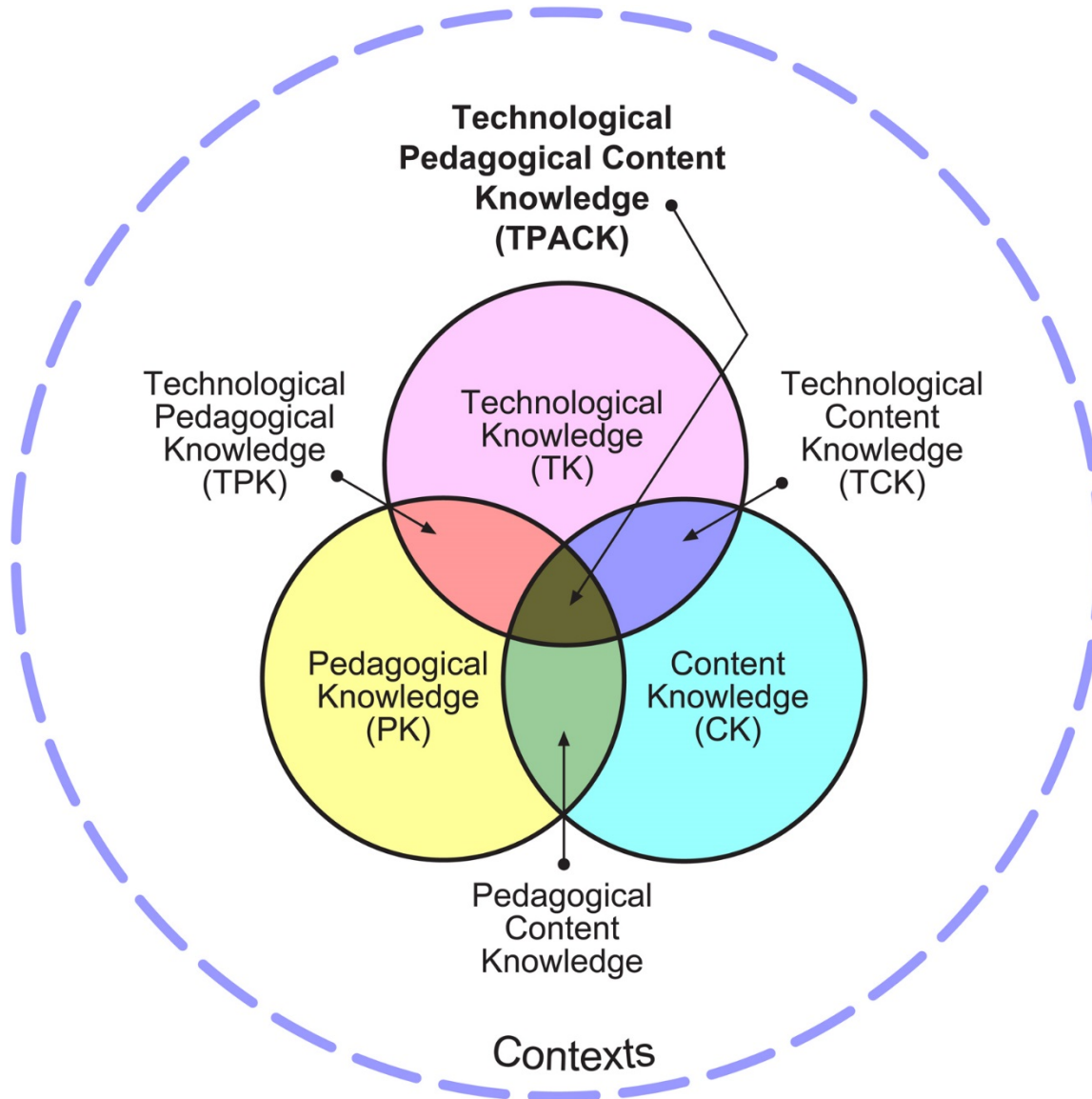
## SUBJECT MATTER KNOWLEDGE

## PEDAGOGICAL CONTENT KNOWLEDGE





# RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT





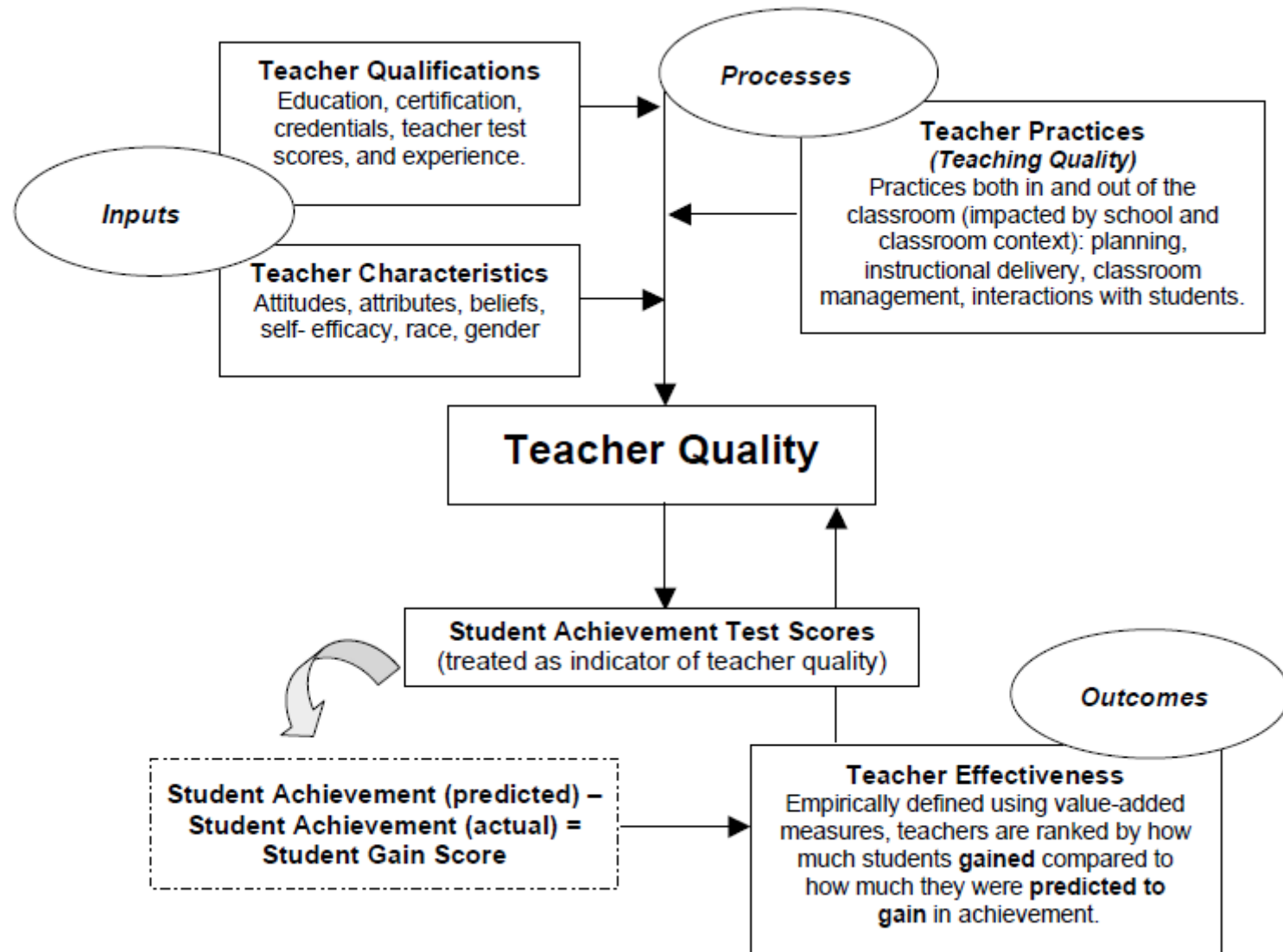
## Teacher Quality

- Professional background
- Motivational beliefs
- Instructional practices
- In-service training, professional development, coaching, etc.





# RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT



Adapted from Goe (2007)



## Teacher Instructional Practices

- Self-reported practices
- External observations



## **Social Cognitive Career Theory**

- Individual
- Motivational and behavioral
- Contextual

(Lent, Brown, & Hackett, 1994)



## Student Motivation towards STEM

- Self-efficacy
- Task value
- Utility value
- Interest
- Identity

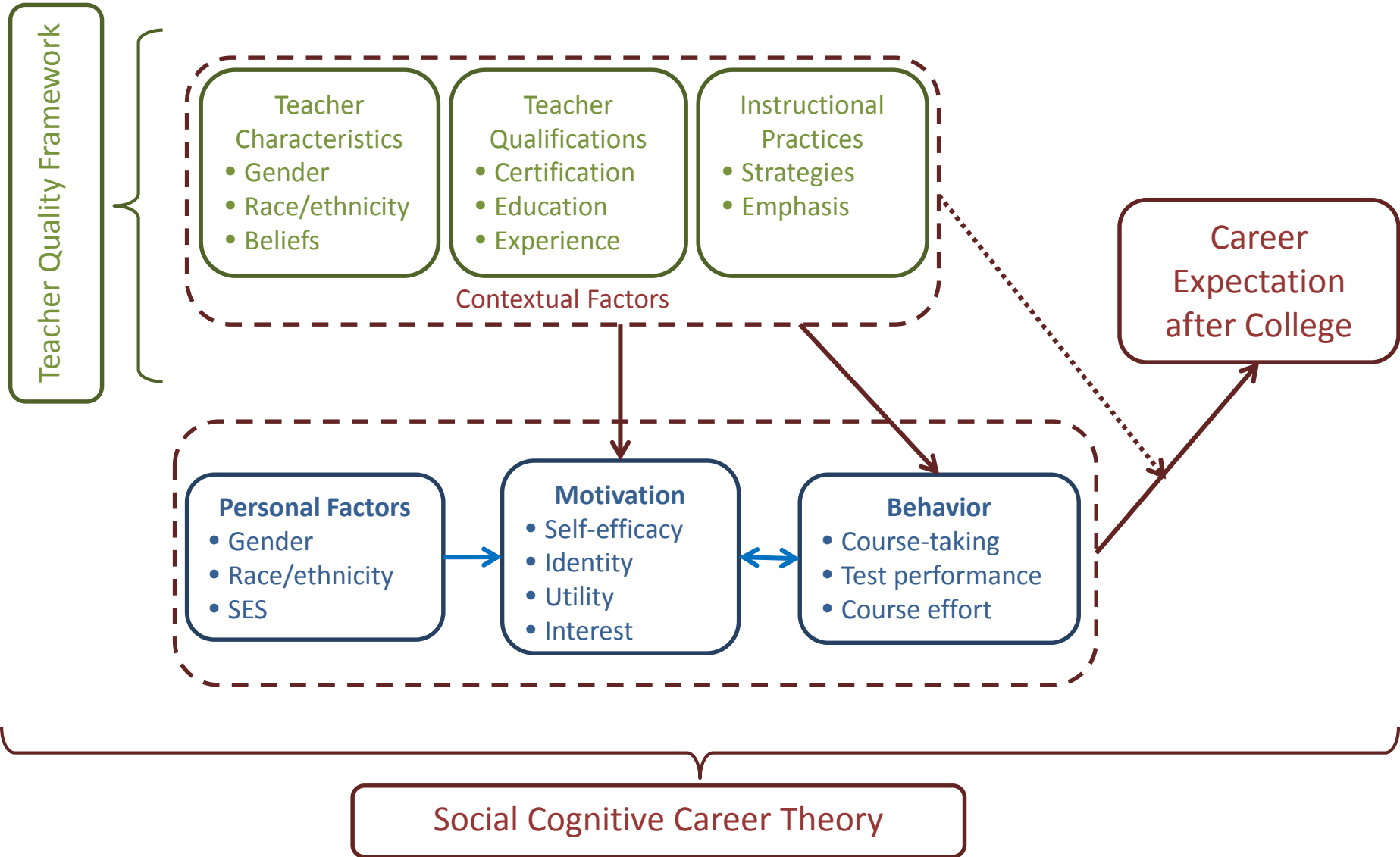


## Student Persistence in STEM

- Course-taking behavior
- Achievement (e.g., grade, GPA, test scores)
- Intentions pursue advance courses, extracurricular activities, and a career in STEM



# RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT





## Methods

- Both qualitative and quantitative approaches
- Pre- and post- self-reported surveys including Likert-scale items, open-ended responses, demographics, and professional background
- Paper-pencil assessments of teachers for mathematical knowledge for teaching
- Interviews
- Classroom observations
- Student achievement data
- Administrative data about teachers



## **RUSMP Research Products**

Teacher motivation and knowledge development

(Corkin, Ekmekci, Parr, 2018; Ekmekci, Papakonstatinou, Parr, & Shah, 2019; Ekmekci, Papakonstantinou, & Parr, 2015)

Impact of Summer Campus Programs on teachers

(Corkin, Ekmekci, & Papakonstantinou, 2015; Ekmekci, Corkin, & Papakonstantinou, 2015a; 2015b; 2015c)

Barriers and facilitators for transfer from PD to classrooms

(Corkin, Coleman, & Ekmekci, 2018; Corkin, Ekmekci, & Coleman, 2017)





## **RUSMP Research Products (cont.)**

Impact of teacher qualifications on student achievement  
(Corkin & Ekmekci, 2017; Corkin & Ekmekci, 2019; Ekmekci & Corkin, *in press*; Ekmekci, Corkin, & Fan, *under review*; Ekmekci, Corkin, & Papakonstantinou, 2015b)

Impact of summer camps on students' STEM motivation  
(Ekmekci & Shah, 2018; Koyuncu & Yildirim, 2019)

Students' STEM outcomes (motivation and achievement)  
(Ekmekci & Cavlazoglu, 2016; Ekmekci & Corkin, 2019; Ekmekci & Sahin, 2018; Sahin, Ekmekci, & Waxman, 2017a, 2017b)



## RUSMP Research Highlights

- Impact of Summer Campus Programs for teachers
- Impact of teacher qualifications on student achievement
- Barriers and facilitators of transfer from PD to classrooms
- Impact of student summer camps on students motivation towards STEM
- Impact of teacher qualifications on students' motivational and achievement outcomes in math (national data)



RICE

RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT  
(RUSMP) - <http://rusmp.rice.edu/>

**THANK YOU !**

Adem Ekmekci  
ekmekci@rice.edu

Anne Papakonstantinou  
apapa@rice.edu

**The studies presented herein are based, in part, on different projects, each partially funded or supported by different sources including Code.org, Spencer Foundation, Texas Higher Education Coordinating Board, The University of Texas at Austin STEM Center, and National Science Foundation.**

