Living, Learning, and Leveraging Engineering Skills Learned in Socio-cultural Settings

DeLean Tolbert, PhD (dtolbert@umich.edu)

Department of Industrial and Manufacturing Systems Engineering, College of Engineering and Computer Science
University of Michigan - Dearborn

Background

➤ Diverse pathways and experiences lead to engineering careers

➤ Youth from different ethnic and socio-economic backgrounds have differing access to out-of-school program and activities

➤ Need to understand the intersection between a Black youth's lived experiences and their journey along engineering pathways.

➤ Black males face, educational. racial and professional identity challenges along STEM pathways

Objectives

1. To find **relationships** between **specific activities** and specific **engineering** attributes

2. To identify evidence **of socio-cultural experiences** and access to **Community Cultural Wealth** for **African-American youth & men**

Research Questions

➤ **(RQ)** In what ways do **pre-college out-of-school time** activities and **socio-cultural practices foster** the development of **engineering attributes** in **Black male youth** and impact their engineering pathway?

   (RQa) How do **Black middle-school aged adolescents** and their parents **describe** their out-of-school-time engineering learning experiences?

   (RQb) In what ways **do Black male undergraduate engineering students**' descriptions of their **pre-college cultural practices** and **experiences** align with aspects of **Community Cultural Wealth and Engineer of 2020 Attributes**?

Methods

Methodology: Concurrent Cross Sectional Qualitative Study

Participants: Adolescents & parent pairs (*n = 8*),
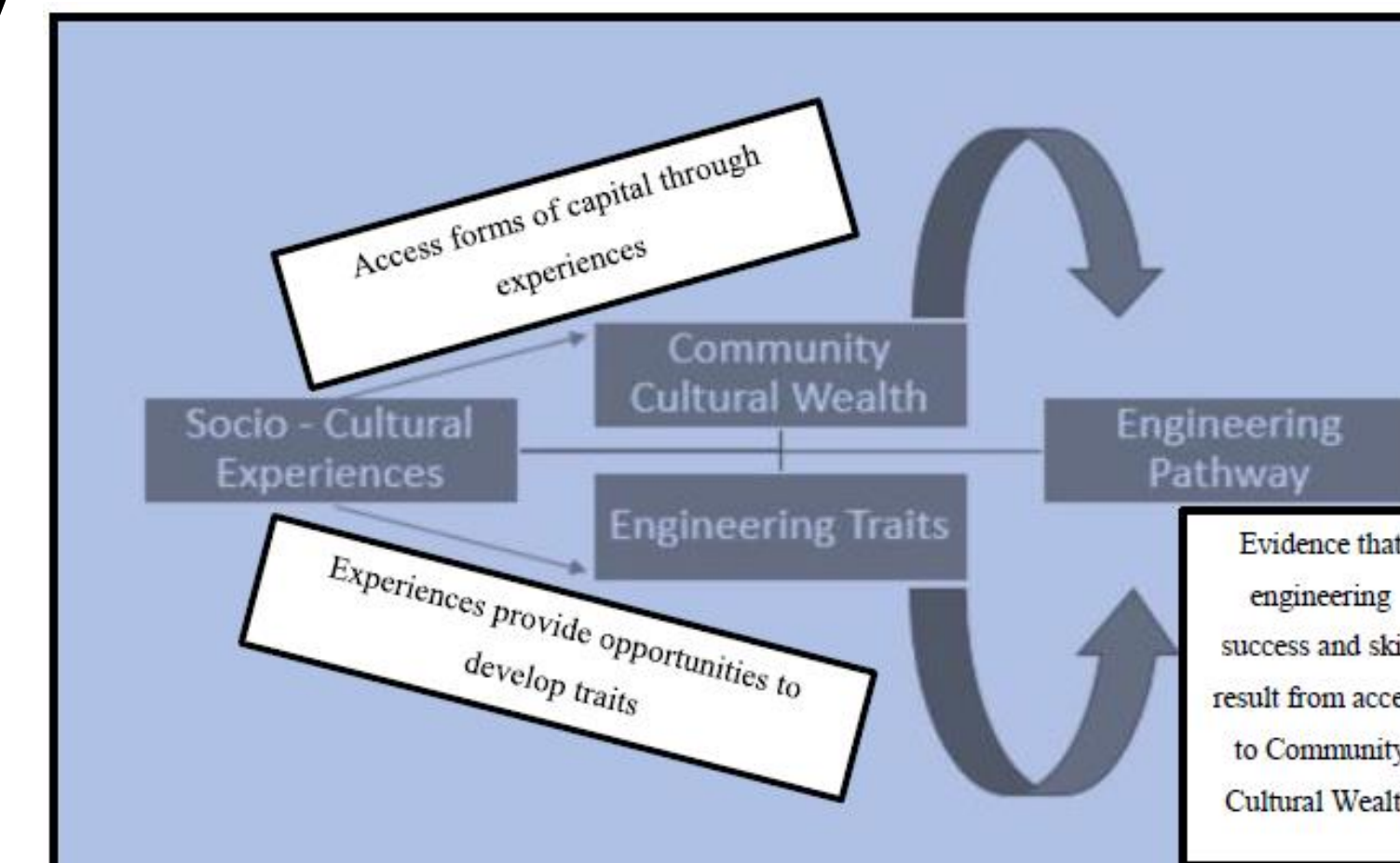
College men (n = 13)

Data Collection: Individual and Focus group interviews

Theoretical Frameworks: Community Cultural Wealth, The Attributes of the Engineer of 2020

**Analysis Methods**: Inductive and a priori coding

Findings

RQa

➤ Learning experiences developed skills and provided access to capital
➤ Adolescent engagement with DBC varied and served different purposes
➤ Parents played active and passive roles in the experiences
➤ Adolescents did not always recognize value of activities or experiences but parents tried to strategically align activities with interest
➤ Experiences occurred in physical and virtual locations and in their imaginations

RQb

➤ Pressure from within and outside of racial community to perform
➤ Activities and experiences mirrored the middle school youth data
➤ Disagreement on the validity of the E2020 attributes for African American men and engineering in general
➤ Parental support and engagement was crucial to success along engineering education pathways
➤ Differing access to capital might impact access to engineering but their experiences demonstrated access to capital
➤ Impact of race and gender on engineering education pathways

Conclusions

➤ The impact of race, class and gender and knowing history

➤ The influence of parental support

➤ Need more accessible engineering programs

➤ Identify and apply knowledge learned from socio-cultural settings to engineering practice

➤ Black youth and men access and contribute to community cultural wealth
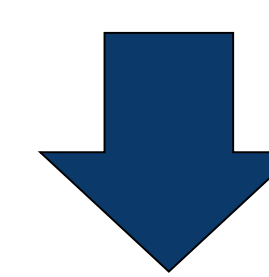
Socio-cultural practices & Stories along the pathway

UNIVERSITY OF MICHIGAN-DEARBORN

Future Directions

➤ Investigate the relationship between having various experiences (raced, classed, and gendered) and engineering design process

➤ Observe how African American engineering students leverage engineering skills learned from socio-cultural settings in more traditional engineering environments

➤ Collaborate with community members to develop curriculum that shares the stories along the pathway with adolescents of color and parents

References

➤ McGee , E. O., & Pearman , F. A. (2014). Risk and Protective Factors in Mathematically Talented Black Male Students: Snapshots From Kindergarten Through Eighth Grade. *Urban Education, 49*(4), 363-393. doi:10.1177/0042085914525791

➤ National Academy of Engineering (2004). *The Engineering of 2020: Visions of Engineering in the New Century*: National Academies Press.

➤ Nelson, I., & Gastic, B. (2009). Street Ball, Swim Team and the Sour Cream Machine: A Cluster Analysis of Out of School Time Participation Portfolios. *Journal of Youth and Adolescence, 38*(9), 1172-1186.

➤ Tolbert, D., & Cardella, M. E. (2016), Engineer of 2020 Attributes and the Black Male Future Engineer: A Review of Literature. Paper presented at 2016 ASEE Annual Conference & Exposition, New Orleans, Louisiana. 10.18260/p.26982. (*Included Conference Presentation*)

➤ Yosso, T. (2005). Whose Culture has capital? A Critical race theory discussion of Community Cultural Wealth. *Race Ethnicity and Education, 8*(1), 69-91.

Acknowledgements