

Supplemental Material

CBE—Life Sciences Education

Zuckerman and Lo

Examining the Variations in Undergraduate Students' Conceptions of Successful Researchers: A Phenomenographic Study

Supplemental Material

Austin L. Zuckerman^{1,2,3}, Stanley M. Lo^{1,2*}

¹Department of Cell and Developmental Biology, School of Biological Sciences and

²Program in Mathematics and Science Education, University of California San Diego

³Program in Mathematics and Science Education, San Diego State University

*Corresponding author:

Stanley M. Lo

9500 Gilman Drive #0355

La Jolla, CA 92093-0355

Email: smlo@ucsd.edu

Phone: (858) 246-1087

Table S1. Summary of phenomenographic terminology. Phenomenography is a research approach that examines how individuals think, interpret, or experience a phenomenon of interest. Conceptual terms describe the units or products resulting from a phenomenographic study; methodological terms describe analytical approaches and validity measures in phenomenography. Examples or applications of how each term was operationalized in this study are provided.

Dimension	Term	Definition	Example(s) in this Study
Conceptual	Aspect	Features of the phenomenon that individuals attend to	Process: How researchers approach their work
	Variation	Differences within each aspect that articulate how different individuals conceptualize the same phenomenon	For a researcher's process, Conception II is distinct from Conception I by shifting the focus from the end product to the process
	Conception	Units of description in phenomenographic research that collectively describe the way that a phenomenon can be understood	Conception I describes a coherent disconnection of the researcher from all three aspects of process, interactions, and contributions
	Outcome space	Holistic set of different conceptions of the phenomenon that are distinguished by variations in different aspects of the phenomenon that individuals attend to	Table 2 describing the three conceptions and variations across the aspects
Methodological	Contextualized approach	Analytical approach in which data are treated as individual units of analysis, e.g. individual interview transcripts being treated as units of holistically inter-related meanings that can be related to on another	Each transcript was coded as representing one of the three conceptions by identifying aspect(s) and assigning the conception that described the variation of that aspect in the outcome space
	De-contextualized	Analytical approach in which	Each interview response was treated

	approach	segments of interview transcripts are combined into one pool of analysis to interpret data within the larger interview context	as an isolated segment. These isolated responses were pooled together and interpreted independently of the whole interview transcripts
	Communicative validity	Methods and findings are judged to be defensible and persuasive by relevant research communities	Aspects, variations, and outcome spaces were presented to different communities of STEM and education researchers to verify that the claims were grounded in the findings
	Pragmatic validity	Findings are useful and meaningful for providing practical insights into teaching and learning	Implications for mentorship approaches and research professional development activities as informed by the outcome space; Description of how outcome space can be used in future work to map student trajectories in UREs