Qualitative Themes for Mathematics Capital: Investigations of Graduates with Dual Majors in Mathematics and Mathematics Education

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Keywords: Mathematics Capital, Science Capital, Bourdieu, Undergraduate Mathematics

We previously defined mathematics capital as "mathematical assets that actively influence a student's capability or power in the field of mathematics education and how the student utilizes these assets to exert power in the field of mathematics education" (Anderson et al., 2024, p. 494) through quantitative work. Here, we aim to operationalize mathematics capital through qualitative work via thematic descriptions, as Bourdieu did in many of his works in capital (Bourdieu, 1977; Bourdieu & Wacquant, 1992). We answer the research question: *How can mathematics capital be qualitatively described?*

Using a Bourdieusian lens (Bourdieu, 1977; Bourdieu & Wacquant, 1992), we view the components of mathematics education as intertwined. Mathematics capital acts as a bridge between other constructs like social factors, cultural capital, emotions, personal experiences to mathematics education (Anderson, 2024, cf., Bourdieu, 1984). In past work, Archer and colleagues (2014, 2015) used a Bourdieusian lens (1977, 1984) to develop a three-part model for science capital. We aim to continue to extend Bourdieu's notion of capital into the field of mathematics education (Anderson et al., 2024, cf. Archer et al., 2014, 2015, Dewitt et al., 2016).

We conducted semi-structured interviews with six recent graduates receiving dual degrees in mathematics and mathematics education. Then, we performed qualitative analyses using a combination of deductive and inductive coding (Miles et al., 2014) where we developed three overarching themes for mathematics capital (through mutual coding consensus).

We take this thematic approach to redefine mathematics capital to deepen our understanding and to clearly communicate its impact on mathematics education. Theme names and summarized definitions for each are: (a) compounded mathematical achievements *(i.e., valued achievements in mathematics (formal and informal settings) altering responses to mathematics)* (b) productive disposition towards mathematics, *(i.e., a growth mindset, a positive, intrinsic relationship with mathematics, and belief that mathematics is meaningful)* and (c) expected mathematical achievements, *(i.e., expected mathematical success and a nonchalant disposition towards mathematics success*.

We developed three primary themes that characterize and describe mathematics capital. In these, we find appropriate amendments to redefine mathematics capital as "mathematical assets and expectations that influence a student's capacity and power in the field of mathematics education, and the disposition that a student assumes to utilize these mathematical assets and expectations and exert power in the field of mathematics education." In short, these themes help capture the essence of mathematics capital, which extends throughout a person's lifetime and influences how a person *interacts* with, *reacts* to, and *responds* to mathematics and their potential mathematical outcomes. These *interactions*, *reactions,* and *responses* can be intrinsic or extrinsic (i.e., what a person believes or how a person close to another may impose their beliefs on another) and have far reaching implications for mathematics learning.

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