



Teaching Elementary Mathematics for Access and Equity in Appalachia



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Introduction

- Most research examining how to support pre-service teachers (PST) develop practices for teaching mathematics for access and equity are conducted in urban, racially, ethnically, and linguistically diverse settings.
- We argue that this work is also needed in rural spaces in which racial, ethnic, and linguistic diversity might not be as prevalent.
- Many of our PSTs view access and equity only from racial, ethnic, or language perspectives.
- Such views ignore the diversity that does exist, even in seemingly homogenous communities, with respect to socio-economic status, family structure, sexuality, and gender identity.
- In addition, these views do not facilitate spaces for questioning and challenging deficit views of students from rural, low-socioeconomic backgrounds or the neo-liberal discourses that perpetuate these perspectives.
- PSTs must become aware of the cultural, institutional, and societal discourses, in which they are or have been situated, how these discourses inform the assumptions and biases they hold and how their preconceptions influence what they notice and how they create opportunities for teaching and learning in their classrooms that is responsive to the needs and identities of their students.

Appalachian Context

- West Virginia is unique as it is the only state that is entirely in Appalachia. Appalachia is a geographical region and a cultural enclave often characterized as a "rural, normatively white population" (Anglin, 2002, p. 566) and often defined by poverty and the working class. There is an assumption that its people are in need of assistance and intervention (Catte, 2018).
- Deficit views of Appalachians often made by those in power, who are outsiders to the region, ignoring the nuance and diversity of lives in the region, including Black lives (Catte, 2018). Yet, there are real issues present in West Virginia and rural Appalachia (e.g., few educational opportunities, lack of economic growth, opioid crisis). Despite these challenges, there is a strong sense of community in rural Appalachia which often binds its people to the place.
- Outmigration of young people has become a norm in Appalachia. Wright (2012) found that Appalachian students often seek education outside their home communities in order to return and do transformative work in the places their families live and to which they have connections. Students in rural schools are sorted based on ability, and those who are labeled as high-achievers tend to be the most likely to leave their communities and not return (Petrin et al., 2014). Students who succeed in school have been socialized to leave for greater opportunity, even when they feel a strong sense of place in their community.

Theoretical Perspectives

The Equity Literacy Framework: The foundations of equity literacy are: (1) a commitment to deepening individual and institutional understandings of how equity and inequity operate in organizations and society and (2) the individual and institutional knowledge, skills, and will to vigilantly identify inequities, eliminate inequities, and actively cultivating equity.

Five Abilities of Equity Literacy

- The ability to **recognize** even the subtlest biases and inequities,
- The ability to **respond** skillfully and equitably to biases and inequities in the immediate term,
- The ability to **redress** biases and inequities by understanding and addressing them at their institutional roots,
- The ability to **actively cultivate** equity by applying an equity commitment to every decision, and
- The ability to **sustain** equity efforts even in the face of discomfort or resistance.

- **Neoliberal discourses** contribute to a focus on high-stakes testing, accountability, standards and school choice (Hursh, 2007)
- These discourses embrace a deficit lens that positions teachers as technicians (Kincheloe) and students, communities, and families as lacking the assets and resources necessary to take their place in the global economy and other neoconservative projects.
- Such **deficit discourses** have been "socially, culturally, and historically produced" (Louis, 2021, p. 96) and have long been a part of the educational system in the United State.

Research Questions and Methodology

Research Questions

1. In what ways do prospective teachers take up teaching mathematics with access and equity and mind?
2. What influences the ways in which prospective teachers take up mathematical teaching practices that promote access and equity?

Design-based Research (DBR)

- Rather than attempting to isolate and study individual variables, DBR focuses on "understanding and improving interventions" by studying "specific objects and processes in specific contexts..." (van den Akker et al., p. 5)
- DBR can support the development of "innovative learning ecologies in order to develop local instructional theories on the one hand, and to study the forms of learning that those learning ecologies are intended to support on the other hand" (Gravemeijer & Cobb, 2006, p. 17).

Participants (Iteration 1)

- 34 elementary PSTs enrolled in a mathematics methods course.
- PSTs take course in the Fall of the year before full time student teaching.
- PSTs spend several hours per week in a school placement.

Data Sources (Iteration 1)

- Mathematics autobiography.
- Analysis of cases of mathematics teaching and learning, examining issues of access and equity in the teaching practices. (2 sets of cases)

Findings (Iteration 1)

- Most of our PSTs' perspectives of access and equity "fit" within the dominant perspectives of mathematics teaching and learning (e.g., focus on answer, students are inherently good at math or not); few challenge these notions.
- Therefore, our PSTs use this lens to describe access and equity and suggest use of practices.
 - Access means that have access to perform and demonstrate knowledge in "standardized" or "accepted" way (dominant way); students who don't "get it" need to have more time and support to conform.
 - Students demonstrate knowledge by getting the correct answer.
 - Some emphasis of process over answer, use of dialogue.
 - Some focus on mindset, but situated as a personal characteristic (have it or don't).
 - Yet, few PSTs challenged the nature of the mathematics or the teaching occurring in the cases. Instead the changes they suggested were aligned with the status quo.
- Influenced by:
 - The neoliberal discourses in which PSTs are situated
 - Deficit perspectives of students—those who "got it" or were "advanced" and those who struggled
 - Students who did not understand, need additional help and support in order to be able to meet the expected way of performing.
 - Did not challenge the nature of the mathematics or the teaching.
 - Suggest students should not struggle during learning; remove agency
 - Personal experiences as a student of mathematics.
 - Viewed practices from very personal perspective.
 - Attributed characteristics and practices to teachers who are not evident in the case; interpreted the cases through the lens of their past experiences (apprenticeships of observation).
 - Institutional discourses: what they observe/experience in schools during practica.

Implications

- Teachers need to "build richer perspectives on issues of equity within the context of their routine, everyday classroom practices" (Aguirre, Mayfield-Ingam, & Martin, p. 6).
- Two keys: "attending to issues of identity and competence in relation to and through mathematics" and "understanding how students are positioned as mathematics learners" (p. 6).
- Encourage critical reflection & praxis:
 - "What mathematics? For whom? For what purposes?" (Aguirre, Mayfield-Ingam, & Martin, p.5).
 - Who is served? Who is not?
- Recognize that teaching and learning are not politically neutral activities; political discourse and climate influences how success is defined.
- PSTs must be equipped challenge dominant discourses concerning "success," "proficiency," "achievement gap," even "mathematics." Teachers must become activists, who can successfully challenge and transform the status quo (dominant syntax).
- Broaden PST perspective to consider identity, power, positioning - a critical lens in teaching and learning mathematics.