

The Future is Teaching: Supporting Gen Z Pre-Service Teachers in Mathematics Teacher Education

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Abstract

Generation Z (Gen Z), birthyears 1997 – 2012, makes up over one quarter of the US population, and is expected to make up 27% of the global workforce by 2025. As Gen Z enters the teacher workforce, what are mathematics teacher educators doing to attend to the specific needs of Gen Z in teacher education programs? Just as researchers in the early 2000s investigated the needs of Millennials as they entered the workforce, we are called upon to consider Gen Z's needs as a generational cohort. This paper explores the ways that the generational characteristics of Gen Z and their experiences in K-12 schooling has shaped their view of teaching and ways that Mathematics Teacher Educators can evolve their practice and engage in research designed to explore approaches to teacher education that will meet the needs of and support Gen Z pre-service teachers to be well-prepared beginning teachers of mathematics.

Keywords: generational differences; teacher education practices

"Each new generation is reared by its predecessor; the latter must therefore improve in order to improve its successor. The movement is circular." Emile Durkheim

Generation Z (Gen Z), birthyears 1997 – 2012, makes up over one quarter of the United States population, began entering college in 2015, and is expected to make up 27% of the global workforce by 2025 (Dimock, 2019; Seemiller & Grace, 2016; Märginean, 2021). Gen Z is attending college in larger numbers than previous generations and expected to be the largest demographic of entry-level employees joining the work force for the next several years (National Center of Education Statistics, 2020; Pichler, et al., 2021). However, this influx of Gen Z into the labor market is not expected to lead to an increase in new teachers of mathematics.

Enrollment in undergraduate teacher education programs has steadily declined in the United States over the past several decades – falling from 200,000 degrees per year in the 1970s to 90,000 degrees in 2019 (American Association of Colleges for Teacher Education (AACTE), 2022). A 2022 survey of American college students conducted by the National Society of High School Scholars (NSHSS) found 17% of participants indicated a prior interest in studying education but that they were no longer interested in pursuing that field of study (NSHSS, 2022). In the same survey, Gen Z students expressed an overwhelming interest in the STEM fields, with engineering, sciences, health, technology, and math (7% of respondents identified math as their intended major) in the top ten intended or current majors and education not making the list (NSHSS, 2022). It appears that Gen Z is interested in working in math and STEM fields, but not teaching them. As the number of PSTs decreases, public elementary and secondary school enrollments are increasing (NCES, 2020). Increases in public and elementary school enrollments are being met with teacher shortages, particularly in high-poverty and high-needs schools and subject areas like mathematics (Balingit, 2022).

Given Gen Z's declining interest in mathematics teaching as a career, we must ask ourselves, what is the field of mathematics teacher education doing to attend to attract Gen Z and attend to their specific needs teacher education programs? How are mathematics teacher educators (MTEs) improving in order to best serve our successors? This paper explores the ways that the generational characteristics and experiences of Gen Z has shaped their view of teaching and

ways that MTEs can evolve their research and practice to recruit and support Gen Z pre-service teachers (PSTs) to be well-prepared beginning teachers of mathematics.

Who is Gen Z?

A “generational cohort” is a group of people who, based on birth year, move through generally similar experiences as they encounter shared historical events at the same points in life (Mannheim, 1952; Strauss & Howe, 1991). For Gen Z, born 1997 – 2012, their cohort is defined by their birth into a post-9/11 world and coming of age amid the 2008 recession; Black Lives Matter movement; and Covid-19 pandemic (Dimock, 2019). Gen Z is diverse, connected, well-educated, tech savvy, socially conscious, and pragmatic (Seemiller & Grace, 2016; Pichler, et al, 2021). They are defined by the political, social, technological, and economic changes that happened in their childhood and adolescence (Pichler, et al., 2021). Coming of age in a world where more people access the internet via mobile and tablet devices than desktop computers, they are not just digitally native, but more specifically, mobile and app-native (Loveland, 2017; Statcounter, 2016). Gen Z’s world lens is “a small screen with multiple apps running simultaneously” (Loveland, 2017, p. 36). They are constantly engaged with smartphones and social media (Twenge, 2018; Seemiller & Grace, 2016), a phenomenon that allows them to be constantly connected, yet experience high rates of loneliness and depression (Pichler et al, 2021; Twenge, 2017; Seemiller & Grace, 2016).

Gen Z’s K-12 school experiences have been defined by the standards movement, No Child Left Behind, and standardized testing (Seemiller & Grace, 2016). They are reported to have increased levels of depression and anxiety as compared to prior generations (Pichler, et al, 2021). Gen Z is more individualistic and less social than other generations, struggling with in-person communication, interpersonal relations, and group work, but despite that, they still find value in face-to-face interaction and crave personalized attention (Cillers, 2017; Mohr & Mohr, 2017; Pichler, et al, 2021; Loveland, 2017). Their unique characteristics have been shaped by the digital world into which they were born (Cillers, 2017; Mohr & Mohr, 2017; Seemiller & Grace, 2016) and they learn and interact in the classroom differently than preceding generations. As learners they are characterized by a lack of tech savviness, preference for digital engagement, desire for personalization, aversion to collaborative learning, and social consciousness (Cillers, 2017; Mohr & Mohr, 2017; Seemiller & Grace, 2016). They are focused on the outcomes of education and the ways in which it is often cost-prohibitive. Gen Z “has indicated a desire to be involved with transformational rather than transactional activities in their world” (Carter, 2018, p. 2) and would prefer careers that enact change rather than simply makes them money, which makes them well suited for careers in education (Seemiller & Grace, 2016).

A Generation Well-Suited to Teach

There are many characteristics of Gen Z that makes them well suited for jobs in education. Gen Z’s perspective on the world is often through the lens of multiple screens, but it has shaped their world view as “we-centric,” recognizing that “societal issues are much larger than just themselves” (Seemiller & Grace, 2016, p. 17). As children they watched and were inspired by the collective efficacy of social movements such as Black Lives Matter and Marriage Equality, and as a result, they are “generally concerned about the welfare of everyone and not just themselves” (Seemiller and Grace, 2016, p. 122). Much like their great-grandparents from the Silent Generation (birth years 1925-1942), Gen Z is proving to be risk-averse and conforming, but also solution oriented with a collective sense of responsibility and a change-agent mindset that they can and should make a difference (Strauss & Howe, 1991; Rickes, 2016). The Silent Generation was the generation of Civil Rights reformers – perhaps Gen Z will “be the source of the next Martin Luther King, Jr.” (Rickes, 2016, p. 28) or the next education reformer!

Gen Z values education, perceives it to be the “foundation for individual success and societal prosperity,” and sees an educated society as a better society while also viewing America’s education system as declining with limited access to quality education (Seemiller and Grace 2016, p. 98). Coupled with their change-agent mindset, perhaps Gen Z is the generation that will force necessary changes in the American education system. The way that Gen Z experienced K-12 education will certainly influence their desire to teach and approaches to teaching and effecting change in that system.

The Apprenticeship-of-Observation for the Lockdown Generation

Gen Z is the first generation born into the standards and accountability movement in education - as the generation of No Child Left Behind (passed in 2002), they were tested and tracked (United States Congress, n.d.). In high-stakes subjects like mathematics, annual testing played a leading role in the experiences of Gen Z students during the early 2000s. In addition to the academic pressure of the accountability movement, Gen Z is the “lockdown generation,” who practiced lockdown drills as regularly as fire drills in a country that averaged 11 school shootings a year between 1999 – 2017, and over 30 since 2017 (Bump, 2023). The ways that Gen Z experienced K-12 classrooms as students is shaping how they see their role as teachers.

Lortie (1975) acknowledged that “teaching is unusual in that those who decide to enter it have had exceptional opportunity to observe members of the occupation at work” and unlike the majority of occupations, “the activities of teachers are not shielded from youngsters” (Lortie, 1975, p. 65). While most students do not learn explicit teaching skills and pedagogical principles in their “apprenticeship of observation,” they do make observations and learn to imitate the teachers they observe, being affected in subtle ways they may not even notice (Lortie, 1975).

The experiences of Gen Z in schools, which were highly standardized, frequently assessed, and on high alert for violence may have a significant impact on the ways novice Gen Z teachers approach the work of teaching. In mathematics, a shift throughout the early 2000s to incorporate mathematical practices alongside and in conjunction with content means that the mathematics teaching Gen Z experienced as K-12 students is often not aligned to the effective teaching practices expected in 2023 (National Governors Association, 2010; National Council of Teachers of Mathematics, 2014). Beginning teachers who are not trained in ways that offset their traditional experiences as student observers may not be hungry for a “shared technical culture” leading to continuity rather than change in mathematics classrooms (Lortie, 1975, p. 67). The Standards for Preparing Teachers of Mathematics published in 2017 by the Association of Mathematics Teacher Educators (AMTE), promote a shared vision for the preparation of teachers of mathematics and remind us that effective teachers must be explicitly taught and not prepared by their apprenticeship of observation as K-12 students. We must consider the specialized needs of Gen Z educators as they transition from students to teachers of mathematics.

Improving Mathematics Teacher Education to Meet the Needs of Gen Z

A challenge in teacher education is the “generational diversity” that exists between faculty and students and causes tensions when, “the common attitudes and tendencies of the undergraduates are not congruent with those expected by the faculty teaching their courses” (Miller & Mills, 2019, p. 79). It is important to remember that “generational research can provide a useful supplement in understanding and more effectively preparing future teachers from the Generation Z” (Carter, 2018, p. 3). There is limited research on pre-service and in-service Gen Z teachers, but these limited findings are relevant because professional needs and desires are heavily influenced by generational cohort (Author, in preparation; Strauss & Howe, 1991) and “generational research can provide institutions with valuable information to design effective policies, programs, and practices” (Seemiller and Grace, 2017, p. 21). It is important that MTEs

conduct and be informed by research on Gen Z as learners, college students, and entry-level employees in order to best support them as they prepare for and enter the teacher workforce. So, what are MTEs to do? How can we consider Gen Z's characteristics, needs, and expectations in our courses and teacher ed practices in order to best prepare them as beginning teachers of mathematics?

Mathematics Teacher Education for Gen Z

The Standards for Preparing Teachers of Mathematics (AMTE, 2017), assert that effective MTEs draw upon their knowledge of social-cultural contexts of mathematics in the preparation of future teachers of mathematics. Generational cohorts significantly impact the social-cultural contexts of mathematics classrooms and therefore should be considered in the design of teaching and learning for pre-service mathematics teachers. To support their professional learning and provide Gen Z PSTs with mathematics teacher education experiences that will leave them well-prepared as beginning teachers, it is imperative that MTEs consider their perspective on the college experience, communication style, learner characteristics, and values.

Gen Z Perspectives on College and Vocational Training

This pragmatic generation sees college and professional training differently than the generations before them. Gen Z is keenly aware and appropriately concerned about the drastic increase in the cost of college over the past two decades - more than 120% since the year 2000 (Kerr & Wood, 2023). They value a college degree but are not willing to spend their adult lives in debt for it. As such, they are choosing STEM majors, like mathematics, but increasingly without the intention to use that degree to teach (NSHSS, 2022).

Regardless of major, Gen Z is forging paths through their undergraduate degrees with fewer costly extras (Seemiller & Grace, 2016). An example of this economical approach to higher education is the prevalence of dual credit coursework in high schools. Students taking dual enrollment courses are earning high school and college credit simultaneously, maximizing their time in high school and reducing the cost and time needed to earn a college degree. As MTEs, we need to consider the ways that dual enrollment coursework fits into the undergraduate teacher education program and ensure continuity and support for those students who begin their teacher preparation in high school.

When students matriculate into undergraduate mathematics teacher education programs, their coursework is both academic and vocational. They are earning a college degree and preparing for a specific job: mathematics teacher. As such, it is imperative that we structure mathematics teacher education programs to produce teachers who are well-prepared upon graduation. In 2023, digital tools abound in K-12 schools and these new technologies require that teachers be trained differently than generations prior. As such, Shaffer and colleagues (2015) call upon us to develop new pedagogical strategies and rethink the function and training of teachers to enable success of K-12 schools in the future.

Communicating with Gen Z

Accepting dual credit courses and redesigning pedagogy are necessary steps to redefining mathematics teacher education for Gen Z but they are not enough. In addition to program level changes, individual MTEs need to consider and evaluate the ways that they work and interact with students. Gen Z sees teachers and professors as role models (Seemiller & Grace, 2016) but needs to know that those teachers care about them. Miller & Mills (2019) identified "faculty caring as an important factor for these Millennial and Generation Z students' motivation and engagement in learning" (p. 78). Communication, feedback, and relationship building can all be considered as MTEs reflect on the ways in which they are structuring support for Gen Z PSTs

simultaneously attending to the PSTs' mathematical identities and modeling how Gen Z PSTs should attend to their future students' mathematical identities, which are essential for effective mathematics teaching and learning (AMTE, 2017).

Gen Z students communicate differently than older generations and MTEs need to acknowledge this in our communication and feedback (Abril, 2022). Gen Z is accustomed to immediacy in communication and often find it difficult to wait for an older colleague or professor to reply during business hours (Abril, 2022). As MTEs, we need to manage PSTs' expectations about when and how often we will communicate by establishing norms for communication at the beginning of a program or course. In addition, faculty should consider the ways in which they deliver important information making changes such as recording a 30 second video to explain a change to an assignment or an infographic to describe the directions for an assignment. These small changes can demonstrate to Gen Z PSTs that they are seen by faculty and that faculty care about their needs as students. This flexibility with communication also relates to the ways that Gen Z prefers to learn and take in new information.

The Gen Z Learner

Research suggests that Gen Z employees from across diverse fields have a desire to use technology to learn (Pichler, et al., 2021). In professional learning, they often question which learning can be done virtually or in more tech-based ways. This should lead us as mathematics teacher educators to consider what formats we are using in our courses and the resources we provide to students. For example, consider assigning a podcast to help students to learn new information instead of or in addition to reading from a traditional textbook.

Since Gen Z began entering higher education in and around 2015, there have been few calls to consider generational research in the design of teacher education practices for their cohort (Carter, 2018 and Shaffer, et al., 2015). Advocates for the consideration of generational characteristics in teacher education call upon teacher educators to prepare novice teachers for the changing educational landscape with digital tools and blended learning environments, in order to explore real-world problems (Carter, 2018; Shaffer, et al., 2015). Gen Z is a group of entrepreneurial multi-taskers, who are quick, efficient, easily shift gears (Chillakuri & Mahanandia, 2018). Collaborative clinical experiences that merge coursework with field work align with the expectations in the Standards for the Preparation of Teachers of Mathematics (AMTE, 2017) and the generational characteristics of Gen Z learners.

Finally, an important part of our role as mathematics teacher educators is to support pre-service teachers of mathematics in their induction into the workforce. For Gen Z, the fit of a job or organization is really important to their satisfaction and success (Pichler, et al, 2021). As teacher educators we need to help Gen Z PSTs see that teaching provides an opportunity to be a part of something bigger than themselves, a strong desire of their generational cohort (Märginean, 2021). To do this, we need to know and understand Gen Z PSTs as a group and build teacher education programming that provides supports and experiences custom made for the generation who will continue to move the field forward.

Research on the Mathematics Teacher Education of Gen Z: A Call to Action

The field of teacher education recognized the need to respond to changing generational conditions when Millennials entered higher education in the early 2000s (see Luke, Luke & Mayer, 2000; Donnison, 2007). Donnison (2007) called upon teacher educators to develop specific teaching and learning strategies for their Millennial PSTs in the early 2000s. While teacher education research focused specifically on the Millennial and Gen Z generational cohorts is limited (Donnison, 2007; Author, in preparation), the research that does exist informs the work of

mathematics teacher educators and researchers to continue to explore and understand generational differences in pre-service mathematics teachers.

Clark and Byrnes (2015) argue that with attrition rates in the teaching profession near 50% within the first 5 years, it makes sense for “teacher educators to consider what pre-service teachers hope to learn in their teacher education programs” (p. 381). Mathematics teacher educators in 2023 must seek to understand their Gen Z PSTs and develop programs and pedagogical practices with their generation at the front of mind (Donnison, 2007; Carter, 2018). Mathematics teacher educators and researchers must work together with Gen Z PSTs to co-construct learning experiences, support their development as professionals, and understand the specific needs of the future leaders of education. The onus is on our generation(s) of teacher educators to conduct research, evolve, and improve in order to improve our successors from Gen Z.

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