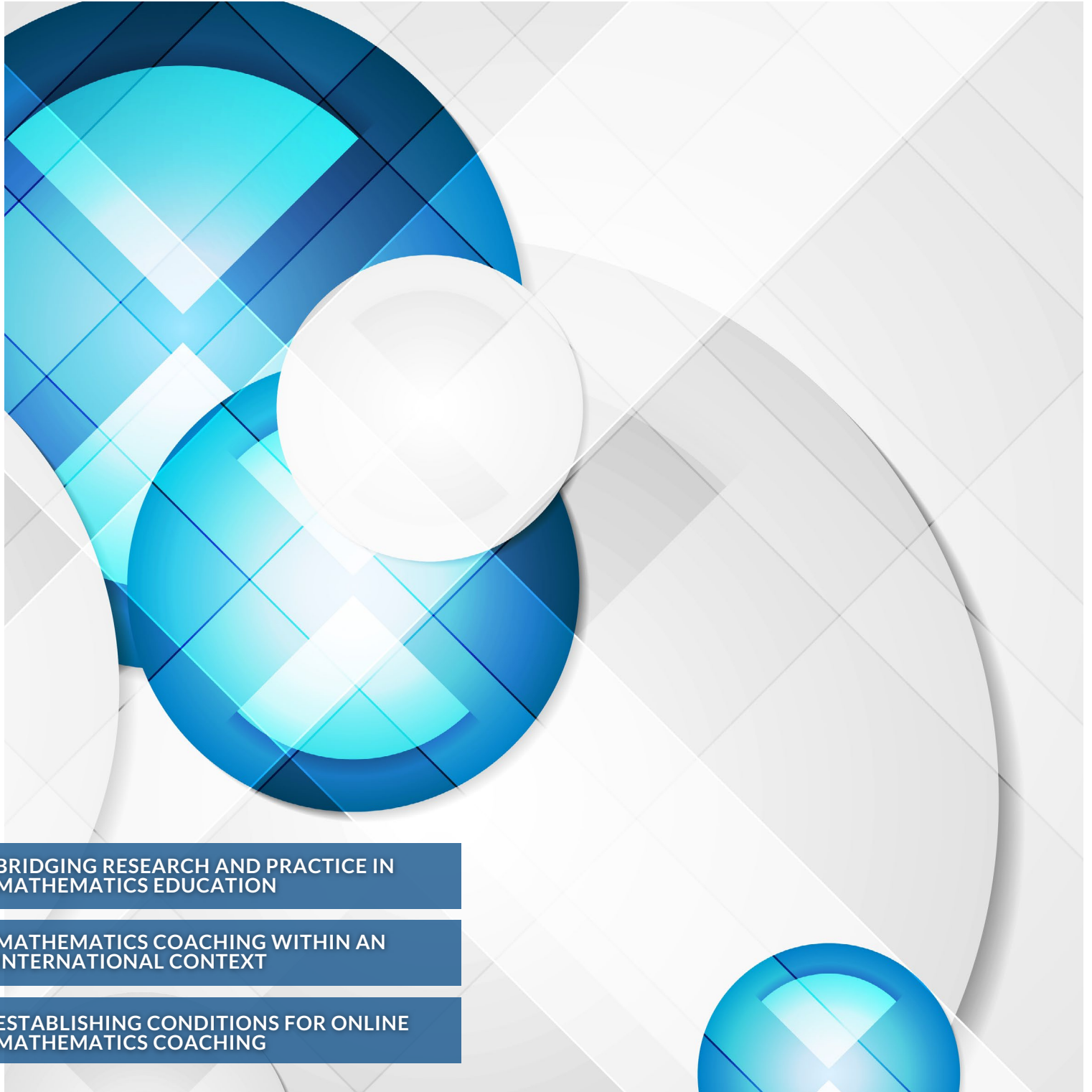


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BRIDGING RESEARCH AND PRACTICE IN
MATHEMATICS EDUCATION

MATHEMATICS COACHING WITHIN AN
INTERNATIONAL CONTEXT

ESTABLISHING CONDITIONS FOR ONLINE
MATHEMATICS COACHING

Table of Contents

04 ABOUT NCSM

05 COMMENTS FROM THE EDITORS

Heather Crawford-Ferre and Chadd McGlone

06 MATHEMATICS COACHING WITHIN AN INTERNATIONAL CONTEXT:

An Intersection of Cultures, Challenges, and Perspectives

by Cory A. Bennett and Kenny Johnson

Across the United States, mathematics teacher leaders often hold similar beliefs and operate under professional norms about the teaching and learning of mathematics. However, teaching in culturally rich and diverse international schools brings unique challenges for mathematics coaches. As such, this qualitative study centered on the 4-year experience of one U.S.-trained educator as they started a new role as a mathematics instructional coach in an international school in the Middle East. Findings highlighted challenges in understanding the interplay between local and school cultures and structural challenges of international schools that impacted the mathematics coach's work. Although the study was situated in an international context, connections to similar challenges in the United States were strong and are briefly discussed. These findings yielded further insight into the considerations leaders of mathematics education should examine when working with and supporting students, teachers, and administrators from culturally rich and diverse backgrounds.

17 BRIDGING RESEARCH AND PRACTICE IN MATHEMATICS EDUCATION:

Exploring District-Level Mathematics Specialists' Responsibilities and Professional Learning Needs

by Courtney K. Baker, Margret A. Hjalmarson, Francis (Skip) Fennell

This exploratory study and related analysis investigated the roles, responsibilities, and professional learning needs of school district-based mathematics specialists (DMSs), who play a crucial role in shaping mathematics education. Despite the potential significance of their influence, limited research exists on what DMSs need to know to influence, support, and lead coherent instructional systems. To address this concern, our research team developed a survey to gather data on DMSs' roles and responsibilities related to professional development and curricular implementation. Findings revealed variability in DMSs' roles, involvement in professional development, influences on goal setting, and professional learning needs. Based on these findings, we offered recommendations for DMSs' implementation of district- and state-wide curriculum initiatives. These state-level insights are generalizable to other areas of the United States and highlight the vital role of DMSs in supporting and enhancing mathematics teaching and learning across school districts nationally.

33 ESTABLISHING CONDITIONS FOR ONLINE MATHEMATICS COACHING:

How Coaches Initiate Partnerships With Teachers

by Ryan Gillespie, Evthokia Stephanie Saclarides, Sarah Tegeler, Kathy Prummer, and Amanda Roberts

This descriptive study examined how 10 experienced mathematics coaches discursively created conditions for one-on-one, online coaching cycles during preliminary discussions with teachers. These coaches were preparing to support teachers in implementing ambitious mathematics teaching practices, challenging work that often requires teachers to make substantial changes to their instruction and coaches to provide customized, responsive support. Using a modified analytic framework from the medical field, we analyzed "getting to know you" conversations between 18 coach-teacher pairs, focusing on how coaches balanced gathering data, sharing information, and building rapport. We illustrated the content of these discursive behaviors and identified key commonalities and differences that shed light on how experienced mathematics coaches initiate responsive coaching partnerships.

44 INFORMATION FOR REVIEWERS

45 NCSM APPLICATION

MATHEMATICS COACHING WITHIN AN INTERNATIONAL CONTEXT: AN INTERSECTION OF CULTURES, CHALLENGES, AND PERSPECTIVES

Cory A. Bennett
Professor, Idaho State
University

Kenny Johnson
K-12 Curriculum Specialist,
Carol Morgan School

ABSTRACT

Across the United States, mathematics teacher leaders often hold similar beliefs and operate under professional norms about the teaching and learning of mathematics. However, teaching in culturally rich and diverse international schools brings unique challenges for mathematics coaches. As such, this qualitative study centered on the 4-year experience of one U.S.-trained educator as they started a new role as a mathematics instructional coach in an international school in the Middle East. Findings highlighted challenges in understanding the interplay between local and school cultures and structural challenges of international schools that impacted the mathematics coach's work. Although the study was situated in an international context, connections to similar challenges in the United States were strong and are briefly discussed. These findings yielded further insight into the considerations leaders of mathematics education should examine when working with and supporting students, teachers, and administrators from culturally rich and diverse backgrounds.

Keywords: international schools, mathematics coaching, teacher development.

Introduction

Instructional coaching has emerged as an important means by which the quality and nature of teaching and learning mathematics can be improved (McGatha et al., 2017). Over the past decade, numerous studies and considerable evidence have led school and district personnel to create coaching positions and, at times, cohorts of coaches to provide timely support for teachers through job-embedded professional learning, curricular and assessment development, and building or district leadership initiatives (Hartman, 2013; Rudd et al., 2009; Russell et al., 2020). Many of the major challenges relating to implementation of these coaching programs and individuals stepping into mathematics coach roles have been well documented (Campbell et al., 2013; McGatha & Rigelman, 2017), although much of the research has focused on models or educational systems based in the United States and has not adequately captured the lived experiences of instructional coaches in international schools in culturally rich and diverse contexts. For leaders

of mathematics, there is a need to deeply understand the lived cultures of students and mathematics teachers who support these students to better understand how these lived cultures both align with and diverge from school culture and intended learning outcomes for all students.

International schools are incredibly diverse in their philosophical designs, curricular structures, student bodies, and teaching faculty (Bunnell et al., 2016). Compared to most schools in the United States, international schools are private schools and operate like their own miniature school district. The director or head of school has all responsibilities of a district superintendent with principals for primary and secondary grades. Globally, there were over 14,000 international schools with nearly 7 million students attending them as of 2025 (ISC Research, n.d.). The students who attend these schools often are children of expatriates from many different countries who work for multinational organizations, ambassadors or other governmental workers, or immigrants. Additionally, international schools may enroll students whose parents are citizens of the host nation but who want their children to have a more globally minded educational experience. For most of these students, they navigate three unique cultures: their parents' home culture, the culture of the host country, and the culture developed from the community of people who are also growing up internationally (Doherty et al., 2023). Mathematics educational leaders who work in these contexts must be aware of and navigate this intersection of cultures to ensure all students have equitable access to high-quality learning experiences.

International schools often adopt a philosophy based on a particular nation; examples include British, American, Australian, and Indian curriculum schools, each of which has their own nuanced ways of approaching teaching and learning. Although some international schools adopt curricular structures and standards from the United States and may seem to operate similar to schools in the United States, they face many different challenges not typically found in U.S.-based schools (Halicioglu, 2015). For example, it is common to have 30 or more different nationalities in a K-12 international school with enrollment of only a few hundred students across all grades. Although some teachers may be local hires (i.e., citizens of the host country), most foreign hires are teachers whose cultural backgrounds are just as diverse as those of their students, but the teachers' cultures are often substantially different from the communities in which they teach.

Collectively, the cultural, structural, and philosophical complexity of international schools shapes the sociocultural

ways of engaging in education, which in turn can impact the ways in which support systems (i.e., use of mathematics coaches) are implemented and received (Pearce, 2013). Likewise, local cultural ways of viewing the work of schools influence how schools are designed, operated, and otherwise supported by the community, regardless of what standards or curricular frameworks they may use. All these factors can impact the work of mathematics leaders, meaning the cultural ways of being for U.S. mathematics coaches and mathematics teacher leaders trained in the United States may not align with the local culture and school culture. When these different cultural ways of viewing teaching and learning intersect, growth in professional learning and attainment of student learning outcomes can be slow to develop. As such, the purpose of this study was to capture the lived experiences of one mathematics coach, new to instructional coaching, who worked in an international American curriculum school to better understand challenges they faced in systematically supporting mathematics teachers in their own work.

REVIEW OF LITERATURE

An ever-growing body of research has suggested instructional coaching can be an effective means for supporting student learning and developing teachers' praxis (Harbour & Saclarides, 2020; Killion et al., 2020; McGatha et al., 2017; NCSM, 2019), which are key priorities of principals and other school leadership teams. Instructional coaching can provide a range of benefits (e.g., targeted support for developing teachers' pedagogical content knowledge, assessment practices, ability to attend to nuances in students' thinking; Russell et al., 2020) as well as a more comprehensive and holistic support for ongoing school improvement (Gibbons et al., 2017). As such, an instructional coach serves a key role in supporting the work of the leadership team while being an advocate and collaborative resource for teachers.

However, becoming an instructional coach is not without its challenges. One of these challenges is ill-defined roles and responsibilities (Chval et al., 2010), which can lead to uncertainty in the details of coaches' jobs. Other challenges include the loss of access to a professional network of collaborators or "thought partners" to understand, develop, and implement initiatives (Ippolito & Bean, 2019) and to build impactful relationships with teachers because there are too many teachers for coaches to work with them in a meaningful, consistent, and reliable manner (Moody, 2019). Furthermore, many new coaches have limited experiences or training in supporting adult learners (NCSM, 2019) and may not know how to engage in collaborative coaching (Placa, 2023) to best support these teachers. When these challenges go unaddressed, they can lead to a decrease in a coach's effectiveness and may hinder their self-efficacy and identity as an instructional coach (Birmingham et al., 2013; Ortmann & Roehrig, 2019), which can functionally lead to the downfall of any coaching initiative.

Given the complexity of an effective instructional coach's work, the cultural context in which this work occurs cannot be ignored. Within an international school context, diversity

and cultural significance are paramount (Hill, 2014); thus, the coach's work takes on an added level of complexity because their own personal beliefs and cultural identities may not align entirely to the local cultures. This review of the literature focused on coaching transitions, school culture, and developing a coaching identity grounded in an international school context. To understand the ways in which these three aspects are impacted by the school context, the nature and complexity of international schools is discussed first.

International Schools

Teaching internationally has a long history, and demand for teachers has continued to increase worldwide (UNESCO Institute for Statistics, 2015). Globally, nearly 5 million students attend international schools, and it has been projected that this number could reach over 8 million students by 2025 (Bunnell et al., 2016). In some regions of the world (e.g., the Middle East), the growth of new schools has been tremendous, with student enrollment growing by nearly 9% each year (Knowledge and Human Development Authority, 2021). Such a continued increase also means teachers from all over the world are being recruited to work internationally, immersing themselves in cultures other than their own home cultures.

Cross-national work experience, like teaching internationally, brings with it a host of benefits that may not otherwise be realized when teaching solely in one's home country. Bodycott and Walker (2000) found teachers who worked internationally often came to understand their own cultures from a different perspective, and Ospina and Medina (2020) found teachers became more culturally aware and developed their pedagogical expertise because they worked with teachers from different countries. Accordingly, working in an international school creates beneficial outcomes for the individual teacher, the school, and the profession (Burman et al., 2006; Moorhouse & Harfitt, 2021). For the mathematics coach and the ways in which they can grow professionally, these potential benefits also mean there are unique opportunities worth considering that come from working in international schools.

However, there are also challenges that some teachers may be unaware of when they first move overseas and begin teaching in a new country and culture. Hutchison and Jazsar (2007) found these issues frequently centered on experiencing culture shock, adapting to school systems unlike their home systems, and encountering different communication barriers and other cultural influences (e.g., religion; Miller, 2018). Additionally, Amaro-Jiménez (2012) found educators teaching abroad were unprepared to meet the needs of culturally diverse students in many instances. Although the excitement and glamour of teaching in a foreign country appeals to many teachers at first, the absence of family and friends from home can make adjusting to a new culture difficult (Ospina & Medina, 2020), especially for many U.S. teachers who lack a broader understanding of what cross-national and cross-cultural work experiences entail.

Being aware of these challenges can be difficult because it is hard to know what one does not know, yet these challenges are very real and impact educators new to working internationally in their personal lives and professional work. To that end, understanding local culture and school culture is critical for mathematics coaches to be successful in culturally rich, international contexts.

School Cultural

A school's culture is the sum of many different variables stemming from leadership practices, faculty and staff beliefs on the nature of teaching and learning, and the values of the local community (Hill, 2014); no one variable is more important than the others. With respect to leadership, a school's culture depends on the levels of trust, respect, and autonomy the leadership team establishes in the building. A school's culture also is grounded in the internal and external influences shaping beliefs of the school and the ways in which all persons in the building interact with each other. That is, a positive school culture is based on a shared philosophy of how best to encourage and support learning (Caskova & Chudy, 2021). Although a school's mission and vision statements hint to its priorities and values, the core of this shared philosophy is in the lived, day-to-day experiences wherein the mission and vision are actualized.

The shared philosophy of teaching, learning, and long-term outcomes for students is not the only way in which a school culture is established. The local community plays an important role in establishing the culture of the school because the school is an extension of the community (Hill, 2014). In the case of international schools, shaping a school's culture also includes shared beliefs and values of the community and host nation. Likewise, a school may have a particular curricular or instructional framework around which they situate teaching and learning (e.g., using standards and curricular resources from the United States, hiring teachers exclusively with experience matching the curricular model). Despite this instructional focus, local and national cultures still impact the school's culture. Given the diversity of teaching staff in international schools and the different cultural perspectives each teacher brings to their practice (Bunnell et al., 2016), it becomes clear that the school's culture is multifaceted, creating a more complex context for instructional coaching. That is, the varied personal experiences, perspectives, and beliefs around teaching and learning mathematics may be vastly different.

Developmental Progression of Instructional Coaches

Instructional coaching is an intricate process requiring an array of different skills. Often, instructional coaches begin as highly effective teachers before transitioning into the coaching role (Chval et al., 2010). When they first begin in this position, many find the transition to be more complex and challenging than they originally expected. In turn, these challenges can lead to inaccurate and negative identities or beliefs about their ability to be a coach (Ortmann & Roehrig, 2019). Recognizing both this transition and the impact it can have on the self-efficacy of a mathematics coach is of particular importance in an international school due to the cultural richness of the students, teachers, administrators, and community because the school often becomes a surrogate family while living abroad.

Challenges for a Beginner Mathematics Coach

Becoming a mathematics coach is not always easy, and understanding the nuances of this work is not always intuitive. Transitioning from a classroom teacher to a collaborative mathematics coach can be difficult for many reasons. For example, if school leadership does not appropriately communicate the roles and responsibilities and continually support coaches (Ippolito & Bean, 2019), mathematics teachers may not understand what resources and benefits are provided through coaching. Likewise, new instructional coaches may not fully understand the differences between working with adults versus children, measuring professional success or accomplishments for teams, and otherwise adapting to responsibilities that often are ill defined or generally not understood by the larger school community (NCSM, 2019). Essentially, hidden variables may exist at an institutional level that impact the success and self-efficacy of new coaches.

Additionally, teachers sometimes resist working with coaches for several reasons. For some, it may be due to a lack of trust; for others, it may be that they are unsure how a mathematics coach can help them in the classroom, or there may be unanswered questions about whose interests the coach has in mind (Moody, 2019). Likewise, teachers may push back and scrutinize coaches for not having pedagogical knowledge across the K–12 spectrum (Hayes & Irby, 2020) or teaching experience working with a particular grade level (Rapacki & Francis, 2014). It may be difficult for an elementary teacher to accept support or feedback from a coach if the coach's teaching experience was at the secondary level and vice versa for secondary teachers. Although an effective mathematics coach will know how to work with adults in this situation to support their professional growth, the reality is that newer coaches often have limited professional experiences to help them do this well (NCSM, 2019).

Furthermore, international teachers from various cultural backgrounds interpret these interactions differently based on their own past cultural experiences (Hill, 2014). This varied interpretation means challenges experienced by new mathematics coaches when working with teachers in an international school may result from different cultural perspectives and understandings, not a lack of trust in the coach. Some international teachers may not fully understand the role and nature of instructional coaching and may unintentionally struggle to work with the mathematics coach even if they already know them well. If instructional coaching has not existed in the schools in which they previously worked, resistance may simply be because they do not understand the context of the coach and do not know which "box" the coaches belong in.

Developing Self-Efficacy as a Mathematics Coach

The potential challenges associated with starting a role as a new mathematics coach with no previous experience can have an impact on the coach's self-efficacy. Depending upon their experiences in this transition, the process can have a tremendous impact on their professional identity, perceived competencies, and self-efficacy as a teacher leader. Furthermore, this transition can be amplified when the cultural context is considered.

To help mathematics coaches develop their self-efficacy as instructional and curricular specialists, a focus is needed on understanding key shifts in their work. For example, Ortman and Roehrig (2019) found some new coaches rely on previous identity constructs, which may not help them when working with adult learners. Attending to the needs of students and adult learners is fundamentally different; thus, how coaches support teachers is fundamentally different from how they support students (NCSM, 2019). Furthermore, if a new coach focuses primarily on teaching effectiveness, they may miss opportunities to examine other aspects of coaching, such as attending to student learning to support nonevaluative conversations around teaching (Bennett et al., 2015). However, and as previously mentioned, cross-cultural awareness is needed when working with teachers from varied cultural backgrounds (Ospina & Medina, 2020). If cross-cultural awareness remains underdeveloped, coaching teachers can become even more difficult, which can result in feelings of professional doubt and incompetence.

To develop stronger self-efficacy, mathematics coaches need to understand culturally relevant pedagogies and teaching practices (Lindsey et al., 2019). As a mathematics coach, recognizing the importance of students' cultural backgrounds in shaping their learning experiences is paramount in fostering academic success and supporting students' mathematical identities (Ladson-Billings, 1995). When teachers link classroom instruction to students' lived experiences, as reflected in the curriculum and other learning experiences, they commit to seeing and recognizing the strengths students bring to learning mathematics and thus help students believe they can be successful in learning mathematics (Thomas & Berry, 2019). As such, understanding the intersection of culture, student learning outcomes, and effective teaching practices is important for the success of mathematics coaches.

METHODS

The purpose of this study was to capture the lived experiences of one mathematics coach, new to instructional coaching, who worked in an international American curriculum school to better understand challenges they faced in systematically supporting mathematics teachers in their own work. Given the substantial role and impact of being in a new country with very different cultural and school-community norms, this study examined the cultural and professional shifts in understanding needed for a mathematics coach within a culturally diverse, non-Westernized context. Ample research has examined challenges faced by mathematics coaches in the United States (e.g. Gibbons et al., 2017; Kane & Saclarides, 2023)), but little research has examined this work in an international context, despite the sheer number of American curriculum schools globally. Thus, this study focused on understanding the human, lived experience as a mathematics coach in an international American school to understand the challenges and nuances of mathematics coaching in these culturally rich contexts.

Methodology

This study used a qualitative narrative case study design (Hussain et al., 2012) to follow the efforts of one mathematics coach and understand their lived experiences as a new mathematics coach within an international education context. This study was grounded in two primary theoretical frameworks centered on narrative research. The first framework was a means to understand non-Western ways of knowing (Overton, 2017), and the second framework entailed understanding the sociocultural impact on developing teachers (Philpott, 2014). Lived non-Westernized experiences create global perspectives and competencies relevant to growing and developing as a professional educator. A narrative design grounded in sociocultural theory was subsequently ideal for connecting and representing the lived experiences of such educators (Moyn, 2006). Narrative designs, related to ethnographic approaches (Creswell, 2018), rely on multiple data sources. This study used narrative descriptions, semistructured interviews and reflections from the mathematics coach, as well as field notes and observations from the researchers collected over a 4-year period as sources of data.

Context and Participant

This study took place at The International American School (TIAS), a private American curriculum school in a small country located in the Middle East. The school was a relatively new school, having been open for approximately 10 years at the time of the study, and served students from preschool through high school. At the primary level, there were about three classrooms per grade with about 1,000 students enrolled across all primary and secondary grades. Even though TIAS was considered an American curriculum school focused on curriculum and standards in the United States, over 40 different nationalities were represented in the student body and approximately half the students were English language learners, meaning English was not their first language.

The teachers at TIAS were classified into two primary categories: lead teachers and coteachers. For the primary grades and generally for all core subjects in the middle and high schools, the lead teachers were U.S. born or had credentials from the United States along with substantial experience teaching in schools within the United States. Coteachers typically came from the Philippines, though not exclusively, but all were certified teachers with substantial experience teaching in their home countries. Although coteachers were assigned to support the primary teachers, in most instances, they simply were used as classroom aids in small group instruction settings, with little to no teaching responsibilities.

Coach Johnson came to TIAS after teaching for 10 years in the United States. He taught eighth-grade mathematics for 6 years at two separate Title I schools in a large urban area of the southeast United States wherein 90% of the student population received free or reduced lunch. He also taught eighth-grade mathematics and Algebra I in a racially and culturally diverse school where 40% of the student population received free or reduced lunch, and then he taught for 2 years at a tuition-free, public charter

school where he taught physical education and eighth-grade mathematics. Prior to transitioning from a middle school mathematics teacher to a mathematics coach at TIAS, Coach Johnson had no prior experience as an instructional coach, though he did serve as department chair and as an informal mentor to new and incoming mathematics teachers at TIAS.

Analysis

Using a case-centred approach (Bruce et al., 2016), narrative descriptions and semistructured interviews were recorded, transcribed, and then independently coded by the researchers. The codes were shared and discussed to develop common themes relating to challenges or other cultural nuances that influenced Coach Johnson's perceived success as a mathematics coach. Field notes were used to triangulate reflective narrative data and provide opportunities for further discussion between the researchers to provide clarity and context to Coach Johnson's highly personal and reflective interpretations (Deggs & Hernandez, 2018). To add a greater degree of trustworthiness, the researchers routinely discussed the findings and interpretations made from these data to ensure the findings were accurate.

FINDINGS

Findings from the data revealed several major themes relating to mathematics coaching in an international school context. Some of these themes included the challenges Coach Johnson faced in learning strategies for supporting adult learners and in helping various grade-level teams implement curricular changes. However, for this paper, two additional themes are discussed because they attended to the unique phenomena within an international context that influenced Coach Johnson's work. These additional themes centered on the intersection of the local culture and the impact it had on the classrooms he supported.

The first theme highlighted the ways in which non-Westernized cultures and perceptions of education influence how a mathematics coach engages in their work. The second theme focused on the structural challenges in the school. These challenges included issues with transient teachers and teacher leaders as well as beliefs around instructional coaching and curricular alignment when teachers used resources they brought with them from other international schools. Collectively, these challenges also impacted Coach Johnson's self-efficacy and identity as a mathematics coach.

The Intersection of Local Culture and Education

The Middle Eastern country in which TIAS resided had a rich culture based on the importance of family, status, and religion. The national government was actively engaged in promoting continuous school improvement for international schools with the government, investing substantial sums of money, but as Coach Johnson indicated, "There is little to no support for expats who lack training in grasping the impact of their cultural values and how these might impact teaching and learning mathematics." For Coach Johnson, this lack of support was a limiting factor in his professional effectiveness. He explained, "There were numerous cultural norms I did not get at first," which meant he lacked the cultural understanding for various professional interactions, often

leading to awkward or uncomfortable moments in the classroom.

Family Structures and Norms

Coach Johnson also learned about common traditional family norms while at TIAS. In the host nation, family norms and traditions were quite different from what Coach Johnson originally expected or was used to experiencing in the United States. In the host nation, family structure played a major role in the daily lives of the people and was central to the culture of the community and the nation. Coach Johnson did not initially realize how family norms impacted the country's culture. He said, "[Here], family structures and traditions are based upon family cohesion, paternal authority, and pride of origin," and shared that it was common for members of the extended family, like cousins, to live in the same household during their childhood. Coach Johnson explained, "At first, this was confusing because I wasn't always sure who the parents were." Also, the family name played an important role in social and economic influence in the community; the royal family lineage and other prominent names were easily recognizable, which mattered greatly in the culture. Coach Johnson said, "A child's family name gives off an incredible amount of social information about the person," and a person's status and prestige in the community depended greatly on this family name, especially if the family was from the royal line (i.e., one of the original families that established the modern country). Coach Johnson recalled one instance where his way of working with students was not culturally appropriate at TIAS, but he was unaware of his cultural misstep. He recalled:

Early on, I had a class with four different students, all with the same name. I was like, "Okay, since I have four Mohammads with the same first, middle, and last names in my class, I will develop a way to distinguish you all by visual characteristics." What I didn't know was that this was a major cultural problem. I just wanted different ways to tell them apart, but family lineage is very important and can be offensive if mishandled. Even the prefix "Al-" before a name is used to mark the prominence of all the ruling clans, and I didn't know how important it was to say when calling on a student.

In another instance of not understanding family cultural norms, Coach Johnson was in a classroom when one student wanted to know how much it would cost to get a "B" for their grade in mathematics. The teacher did not understand the cultural importance of having high grades and the extent to which families would go for students to have these high grades; deserving or not, high grades were part of the identity of local families. It was customary for families to hire external people to create dioramas for history projects; build highly detailed models for an Earth science project; or, in this case, for the student to ask for the price of a "B" because he wanted to show off his grades in mathematics and make his family proud. Coach Johnson recalled responding to the student, "\$5,000!" only to have the student set their debit card on the teacher's desk and say, in all seriousness, "Just return it when you are done." Needless to say, Coach Johnson did not take the card, but it made him aware that he did not fully understand family expectations with respect to school.

At first, when Coach Johnson began working at TIAS, it was easy to think of this American curriculum school as a U.S. school; the textbooks, standards, assessments, and instructional frameworks all came from the United States. Furthermore, most teachers were from the United States. However, the local culture was not American, and not knowing cultural nuances hindered the way in which Coach Johnson developed relationships with students and families. He explained, “What expats need to understand is the massive role religion and family play in [this] society. When they do, they are able to better understand how the local culture and norms greatly impact teaching and learning.” Thus, being a mathematics coach also meant attending to the intersection of religion and families’ cultural norms and the influence they had in and beyond the classroom learning environment. For example, during Ramadan, some teachers would eat snacks or have their lunches out in front of the students who were fasting. Not being aware of this cultural faux pas meant the teachers were not considering the ways in which culture impacted learning. It was hard for students to think about learning mathematics when they were only thinking about the teacher’s food.

Structural Challenges in International Contexts

As is often the case in instructional coaching positions, the breadth of challenges is substantial, and they are often unique to the individual context. For Coach Johnson, some challenges he faced may have been like those faced by teachers in U.S.-based schools, but many challenges he encountered also stemmed from the structural nature of international schools. Some of these challenges dealt with frequent turnover of teachers and principals, confusion around the nature of coaching, stalled efforts to create a unified curriculum, and the impact these challenges had on his self-efficacy as a mathematics coach.

Frequent Turnover

The success of coaching often begins with building relationships. However, from an international context, building relationships with teachers and people on the leadership team can be challenging because there is rather high turnover among teachers and administrators. Coach Johnson indicated teachers sometimes simply left overnight. One day he would see them in the school, only to come back the next day to learn the teacher had packed their apartment, gotten on a plane, and left the country without saying anything to anyone. Coach Johnson said, “You get started on something and you are making progress with the math teachers, and then one is just gone. How am I supposed to work with that?” Although this example was somewhat extreme, it happened more than once during his tenure at TIAS. He stated, “It just feels like you are constantly starting over sometimes.”

Furthermore, teachers were not the only ones for whom there was high turnover. Principals rarely stayed long, which also made it a challenge for Coach Johnson to build working relationships with school leaders. Coach Johnson explained, “We’ve had more leader turnover than we’ve had teacher turnover; no principal has been in the job more than 2 years since I’ve been here.” This frequent change in leadership also

made it difficult for him to work with teachers. Teachers might have gone along with some of the initiatives from leadership, but they knew these initiatives would not last. He said, “Once the principals left, the teachers were like ‘Well, we don’t have to do that anymore,’” which created a culture that inhibited collective efforts at school improvement. Simply stated, the teachers knew, as Coach Johnson said, “If you wait long enough, it will change,” which made him question the effectiveness of his work as a mathematics coach.

Confusion and Resistance to Coaching

Related to school leadership and supporting leadership structures, no previous mathematics coaching position existed at TIAS, and the school principals and teachers, many of whom had a rich history working at international schools, were not familiar with the roles and responsibilities of any kind of instructional coach, let alone a mathematics coach. Coach Johnson indicated this lack of familiarity was common in international schools based on his interactions and discussions with colleagues in other international schools and countries. He said, “When I would tell them I’m a coach, it was like, ‘So you’re, like, the assistant principal? Like, what do you mean? You coach basketball?’”

Furthermore, Coach Johnson indicated it was hard to connect to other school leaders and teacher leaders around coaching because the role of a mathematics coach was not well understood; he was viewed as an administrator because there was no other context or schema to which the other teachers could relate. Even regarding international job postings, he explained, “This is something that’s fairly new to the international world. I don’t see a lot of coaching positions.” Although many international schools had coaches or people who served in “instructional support” roles, according to Coach Johnson, many more did not have such positions in their schools. Collectively, the rarity of coaching positions internationally meant his work as a mathematics coach was often misunderstood because of confusion around the nature of his role. High turnover in instructional and leadership staff also meant he had to redefine and explain his role every year.

Curriculum Alignment

Within international contexts, common curricular issues result from frequent and ongoing teacher turnover. Even with a well-developed curriculum that includes up-to-date textbooks, pacing guides, scope and sequence documents, and assessment guides, Coach Johnson explained, “Many teachers bring their own patchwork curriculum with them.” Because of this structure, teachers often teach whatever they like based on what they taught at their previous school(s), creating vastly different teaching and learning experiences within and across grades. The resulting curriculum, Coach Johnson said, “was just totally discombobulated.”

Furthermore, it can be common for teachers in the same grade to not only teach different content at different times throughout the year but also to use different standards from different countries, or even no standards at all, despite clear messages from leadership regarding expectations in

the school. Even though most teachers were from or were trained in the United States, Coach Johnson explained that many began their teaching careers before the adoption and implementation of the Common Core Standards for Mathematics, which meant they were unaware of how to even consider these standards in designing instruction and measuring learning outcomes. Coach Johnson explained:

Whatever part of the world you are from, you just kind of introduced those concepts that you are most comfortable teaching for that particular grade. So, someone in third grade, that is from a totally different country, although teaching the curriculum from Common Core, everyone was pulling from different things, different assessments across the grade levels, things of that nature.

Even within the same grades, teachers did not align their curriculum. Coach Johnson said, “What they’re doing is totally different; it’s not even where they might be a week or 2 ahead. [One teacher is] in Unit 2, and another teacher is on Unit 6 because she just prefers to teach it right now.” From a coaching standpoint, this curricular fragmentation created substantial challenges trying to support individual grade levels, unify the mathematics curriculum, and collectively understand effective teaching practices in mathematics across the school. Coach Johnson stated, “There’s no opportunity for team building or vertical or horizontal alignment at all.” At times, and in multiple elementary grades, he recalled that there were three different instructional programs, one for each teacher’s classroom.

To compound issues with the varied curricular resources at the classroom level, other challenges beyond Coach Johnson’s control also impacted curricular choices. Namely, teacher and administrator turnover were constant, which caused a shift in priorities as to what curricular resources and pedagogical approaches should be used to support teachers and students. Coach Johnson noted, “When I look back, it was like, okay, we did what we needed to. But then, it was like, all right, big brother is no longer watching, we can go back and do what we wanted to do.” It was all but impossible to sustain academic programs and instructional initiatives with so much turnover and shifting priorities in the leadership. Coach Johnson said, “[It] is not a good thing, definitely for the kids, but for the school as well.”

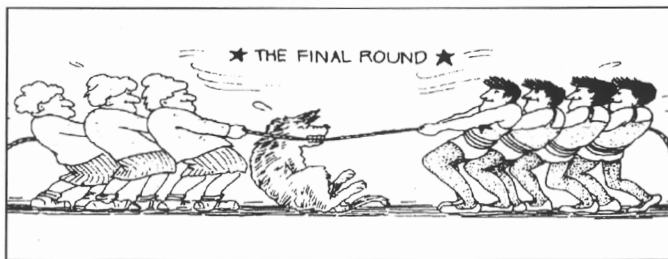
Culturally Relevant Learning Experiences

As is the case in many schools in the United States, classrooms at TIAS were culturally and linguistically rich. However, these cultural differences were rarely considered when developing lessons and selecting mathematical tasks or other explorations. For example, Coach Johnson worked with a group of secondary mathematics teachers to reduce the amount of direct instruction and lecturing during class; he wanted teachers to find ways for students to debate, create arguments, or otherwise learn to develop their reasoning through more discursive interactions.

To help secondary mathematics teachers understand what this approach might look and sound like in the classroom, Coach Johnson decided to model the process for this group of teachers. Coach Johnson met with them prior to the lesson

to discuss the standards, learning objectives for the lesson, and the types of formative assessments he would use to gauge student understanding. He chose a task, a *mathematical tug-o-war* (Burns, 1996), that required substantial algebraic reasoning but without numbers or any formal symbolic representations (see Figure 1). This task showed three rounds of tug-o-war and asked students to determine who would win the final round. The first round had four acrobats against five grandmas, and this round was a draw. Round 2 had Ivan the dog against two grandmas and one acrobat, and this round also was a draw. The final round had three grandmas and the dog against four acrobats; the task was to determine which side would win. Coach Johnson even developed and shared with the teachers a set of potential mathematical misconceptions students might have and accompanying questions or probes to help them navigate their thinking without telling students what to do mathematically. What he did not consider was the role students’ cultures would play in preventing them from even beginning to consider the mathematics involved.

Figure 1
The Third Round of Burns’s Mathematical Tug-O-War



Note. 50 Problem-Solving Lessons: Grades 1–6 (p. X), by M. Burns, 1996. Copyright 1996 by Math Solutions Press.

With the teachers watching, Coach Johnson told students what they would be working on for the day, how it fit with what they had been learning, and how it would help them develop mathematical habits of mind and interaction. He then presented the task to the students, ready for them to dive in. In reflecting on how he felt going into the lesson, Coach Johnson said, “I was so excited to try this task because I just knew these algebra students would love it; [the task] is so accessible and creates so much discussion.” What happened was not what he had anticipated.

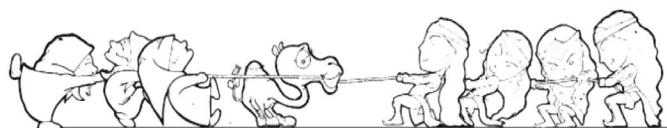
Coach Johnson told students to open Google Classroom and find the task; open it; and then, with their small group, come up with some ideas as to who would win. He also instructed them to be ready to defend their thinking; the students needed to have “because” statements for their claims as to who would win the tug-o-war. Students opened the assignment and read it, but many did not even finish the whole prompt; they were confused about Ivan the dog. Coach Johnson recalled, “My students kept asking me, ‘Coach. Why is there a dog?’ and I was like, ‘What do you mean? It’s just a dog’; I couldn’t figure out why that was a problem for them.” After several minutes, and after Coach Johnson checked on several groups, he stopped the class and asked them why the dog was such a big deal. One student commented, “Coach. It doesn’t make any sense to have a dog in the middle of the desert; they could die.” At that

point, Coach Johnson stopped the exploration and asked the regular classroom teacher to continue with the lessons from the day before; he knew the students were so stuck on the context that they could not yet consider the mathematics.

In this situation, Coach Johnson had not considered how the task he presented did not fit with the cultural context of the students' lived experiences. What seemed like a simple problem was not culturally relevant for the students; thus, it prevented them from considering the mathematics involved. From Coach Johnson's past experiences, he was unaware that such a misunderstanding could happen and had not scrutinized the accessibility of the task from a cultural standpoint. Coach Johnson commented, "This must have happened before, before I moved internationally, but it just never occurred to me that pictures could stop kids from doing math." In his discussions with the other secondary teachers, it was clear they also were confused as to why students struggled with this task. Many of the other teachers indicated it did not make sense that the dog should be the idea stopping students from exploring the mathematics; again, this sentiment was an indicator that the teachers hired by the school, who were not from the local community and did not share the same cultural perspectives, were potentially equally unprepared to consider the intersection of culture and instructional resources in learning mathematics.

To remedy this issue, an illustrator and artist was consulted to modify the illustrations to fit the local culture (see Figure 2). The grandmas remained but were drawn in attire typical of the Middle East. Ivan the dog was replaced with Omar the camel, and the acrobats were replaced with warrior princesses based on Middle Eastern historical figures.

Figure 2
Culturally Appropriate Modifications to M. Burns's Illustration



Note. Adapted by Keith Amano from *50 Problem-Solving Lessons: Grades 1–6* (p. X), by M. Burns, 1996. Copyright 1996 by Math Solutions Press.

Once the modified illustrations were completed, Coach Johnson presented the problem to the same group of students. This time, there was no discussion about the people or animals in the task, but the students engaged in rich discussions about who would win and why, with multiple means of representation from the students. Coach Johnson said, "I never thought in a million years how important it would be to have a context or drawing that was culturally appropriate"; yet, from this experience, he knew and said, "I have to always take this into consideration no matter where I am."

DISCUSSION

This study sought to capture the lived experiences of one mathematics coach, new to instructional coaching, who worked in an international American curriculum school to

better understand challenges they faced in systematically supporting mathematics teachers in their own work. Despite the wealth of research and resources on instructional coaching, the study highlighted that there is still much to learn and do for schools in culturally rich contexts. This work is especially salient considering the cultural nuances in international schools (Bunnell et al., 2016).

Mathematics coaches can play a substantial role in creating meaningful change in international schools, but an understanding of the nature and complexity of cross-cultural work environments, and, in this case, the dynamics of coaching in culturally rich settings with colleagues who have equally rich, relevant, and professionally diverse backgrounds and experiences, is also critical. Ospina and Mediana (2020) outlined the importance of understanding these cultural implications and international school norms. Within a more global context, mathematics coaches are faced with challenges that may not be evident, even when school leaders have good intentions (Halicioglu, 2015). This study supported these challenges and highlighted how such an awareness may better support coaches in developing their professional skills and self-efficacy as mathematics teacher leaders.

This study also revealed areas specific to coaching internationally that should be considered. Namely, the effectiveness of mathematics coaches in international schools is minimal if their roles are not well understood across leadership teams and among teachers (Hashim, 2020; Killion et al., 2020). This ambiguity in their role can be problematic if there are no internal structures to overcome the impacts of frequent turnover in leadership roles and if coaches are not supported in learning about cultural implications of teaching and learning in the host nation. Ortmann and Roehrig (2019) and Moody (2019) have indicated that these structural issues are key to developing a mathematics coach's effectiveness, and the findings of this study supported this.

When considering the findings of this study and their relation to coaching contexts in the United States, it was not hard to see similarities. For example, developing a viable and coherent mathematics curriculum is central to the work of a mathematics coach (NCSM, 2019). This work has continued to emerge as a priority in school districts across the United States because equitable access to learning is a key pillar to student success. Likewise, when mathematics teachers do not understand local community and/or school culture (e.g., a teacher who has never lived in a highly urban area or whose race is different than most of the students they teach), they may not understand fully how to create empowering mathematical learning experiences based on their students' cultural knowledge (Seda & Brown, 2021). Across the United States, there have continued to be substantial differences in the number of teachers whose culture or race is different from the students, families, and communities they serve (Howard, 2016). For mathematics teacher leaders in the United States, this widening demographic gap should be a call to consider and reevaluate the resources, training, and perspectives their coaches have and bring to their work as they support teachers and students in culturally rich settings. For both domestic and international schools, this

persistent cultural disconnect may serve as a reminder of the importance of continually developing and revisiting practices that develop cultural competencies for mathematics teachers and teacher leaders. It is not only content knowledge or years in the classroom that matter when it comes to being an effective mathematics coach. The intersections of culture, student learning outcomes, and effective teaching practices must be recognized and purposefully navigated to support mathematics teachers systematically.

Unless a more coherent, comprehensive culturally focused approach to developing and nurturing effective mathematics coaches begins, the potential benefits of the coach may not materialize as intended. However, understanding these challenges and nuances can provide opportunities for self- and collective reflection; bridge important conversations with purposeful action; and, more broadly, help mathematics teacher leaders frame conversations around mathematics coaching in more inclusive non-Westernized contexts and ways of thinking.

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