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**Original Article**

## **When School Feels Like Home, and Home Feels Like School: Exploring Motherly Mathematics Education**

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### **Abstract**

This article introduces the concept of motherly mathematics education, which establishes a meaningful and validating space common to the home and school environments, facilitating learners' ability to transcend the constraints of traditional mathematics instruction. The author describes the basic features of motherly mathematics education based on his personal experiences and classroom practices. The study employs a multi-paradigmatic transformative education method that incorporates art-based (auto)ethnographic enquiry and philosophical analysis rooted in transformative learning theory. Co-generative enquiry is used as a research tool to explore both implicit and explicit aspects of learning mathematics. The overarching research question guiding the study is, how does the author conceptualise key features of motherly mathematics education in instructional practice? The study argues that a motherly mathematics pedagogy supports equity and the diversification of student interests and participation, interpreting the curriculum as the dance of a mosaic of diversity and portraying assessment as an ongoing developmental process.

**Keywords:** *Motherly Mathematics Education. Dance of Mosaics. Masculine Nature of Mathematics. Legitimate Space. Art-based (Auto)Ethnography*

*Dear reader!*

*Sometimes*

*I ask myself*

*Who am I?*

*Identifying as a mathematics teacher*

*I position myself as a shepherd of young minds*

*The Master of geometry, algebra and statistics*

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*Sometimes  
I ask myself  
What do I live for?  
Identifying as a guru figure  
I position myself as a messenger of love, peace and harmony  
Among students*

*Other times  
I ask myself  
Have I lived my values?  
The value of a mathematics teacher?  
The value of a guru figure?*

*And here,  
The very questions  
Let me reflect on my  
Own life  
And make meaning out of it*

## **Introduction**

In 1997, I began my teaching journey as a mathematics instructor at a public school in Kathmandu, Nepal. With my bachelor's degree in science, I was qualified to teach junior high school students. However, as time passed, I realised that effective teaching requires more than just mastery of the subject matter. I prioritised continuously searching for ways to capture my students' attention and engage them in meaningful learning experiences.

After a few years of teaching, I realised that my bachelor's degree in science was not enough to allow me to present myself as competent in addressing the needs and interests of the diverse students in my classroom. Therefore, in 2004, I enrolled in the Kathmandu University School of Education to pursue a Postgraduate Diploma in Education (PGDE), majoring in mathematics teaching. There, I earned my Master of Mathematics Education, which became a turning point for my career in many ways.

During my master's studies in 2006–2007, I had an opportunity to get involved in the research project 'Developing Culturally Contextualised Mathematics Resource Materials: Capturing Practices of Woman and Disadvantaged Communities'. At that time, I aimed to explore cultural, social and individual activities through ethnographic research. In my experience, research sites and schools are battlegrounds for mathematics in the children's textbooks and everyday lives of Indigenous peoples, such as the Gopali and Tamang (Poudel, 2010). I noted that authentic mathematics was manifest in their daily lives. For example, a village girl usually kept teacups in a fixed pattern in her kitchen but struggled to represent the corresponding concepts in mathematics classroom. It was a turning point for my research journey when I encountered fascinating tensions, contradictions, regrets and aspirations centred on mathematics. This opportunity prompted me to start thinking about motherly mathematics education (MME), conceived as a participatory, inclusive, agentic, strength-based and meaning-centred enterprise of learning that could be helpful for many students, if not for all.

In my master's thesis, I attempted to challenge the masculine nature of mathematics, or what could be called anti-motherly mathematics. This viewpoint treats mathematics as one-dimensional, exclusive, hegemonic, culture-free and pure body of knowledge. Through this research, I discovered my interest in developing gender-sensitive and culturally responsive

approaches to learning and teaching mathematics. I became aware of cultural practices and theories that suggest that mathematical thinking is rooted in people's activities (Poudel, 2010). By rejecting the notion of mathematics as a pure body of knowledge, I began to consider it a tool for empowering individuals and communities.

Upon examining the nature of mathematics, Luitel (2013) and Taylor et al. (2012) propose decolonising epistemologies of educational enquiry to address the shortcomings of culturally decontextualised mathematics education. Luitel (2009, 2013) introduces the metaphor of 'soil' to depict the nature of mathematics, viewing it as an impure knowledge system that illustrates the interactions between people, culture and land. In my master's thesis, I recorded the stories of students, teachers and novice researchers to shed light on their 'in'- and 'out'-of-school knowledge of mathematics. Moreover, I advocated MME, which encourages individuals to transcend the boundaries of anti-motherly mathematics in learning and teaching, enabling them to appreciate contextualised (i.e., local, artefactual, communal, gender-sensitive, ethnic and Indigenous) mathematics (UNESCO, 2008).

Through my research, I came to understand that mathematics is not immune to cultural influence (Bishop, 1988). Despite a few attempts to address the gender divide in mathematics education, mainstream mathematics education in Nepal remains culturally exclusive, gender-insensitive and masculine. Although progress may be gradual, I aspire to promote culturally responsive, contextualised and gender-sensitive approaches to mathematics education by promoting 'motherly mathematics' as a relevant approach (Poudel, 2010). This philosophy has been a guiding principle in my journey as a mathematics educator, helping me uncover the loopholes in contemporary mathematics education.

### ***Loopholes in Contemporary Mathematics Education***

What are these loopholes? Many of us agree that our educational systems are largely built on a perspective that emphasises subject matter being "taught and retaught until we [see] students getting correct answers" (Rhine et al., 2018, p. 2). It has been frustrating to see that most mathematics teachers I have worked with are solely focused on finding the correct answers in students' texts. Mathematics educators may need to unlearn this false mission and understand that "correct answers are not a safe indicator of good thinking" (Sowder, 1988, p. 22). There is no alliance in place among teachers, students and parents to create a better learning space in the mathematics classroom. The traditional approach also embodies the masculine nature of mathematics, coming across as mere one-way information delivery. For instance, the teacher rarely listens to students' voices, questions and doubts. Against this backdrop, I ask questions such as the following: What constitutes good mathematics teaching? How can good mathematics teaching be directed towards supporting a student-centred learning environment? How can I develop my pedagogy in accordance with a culturally responsive and gender-sensitive approach? How does the currently dominant pedagogy act as an agent of exclusion in Nepali schools?

There is a need for a paradigm shift in our schools' mathematics pedagogy. Such a shift would favour an inclusive whole, not just the interests of a few. Additionally, it would consider cultural heritage a strength in learning and understanding mathematics. I ask myself, How can I bring culture into the mathematics classroom? For example, I could relate geometrical shapes to my mother's work. To hold and heat a cooking pot, she constructs a triangular base and loads firewood on three sides, which illustrates rich mathematical concepts (Poudel, 2010). These questions spark reflection on the role of culture in developing my pedagogies. Additionally, I contemplate the social, historical, political, economic and moral components of inequality that obstruct learning in the mathematics classroom (Ladson-Billings, 2013). Finally, I reflect on

my role by evaluating my cultural strengths to understand the place of cultural experiences in the preparation of themes for school and beyond.

### **Study Aims and Derivation of Research Questions**

This paper is designed to highlight the crucial features of MME as I understand and practise it. By embracing the concept of MME, a teacher can assume leadership under a new model for learning partnerships between students and teachers, ultimately aiming to achieve broader learning goals. Therefore, I begin with a few stories, which may help you experience MME and direct your attention towards exploring the possibilities of a culturally contextualised mathematics education – and beyond.

To make this journey appealing, in the following section, I illustrate how I interpret the teacher/educator/researcher role through a conception of Radha-Krishna, a teacher figure who raises their voice in resisting oppression and inequality. I envision Radha-Krishna as offering the symbolic companionship of an inclusive guru who plays an agentic role in envisaging how *school can feel like a home, and home can feel like a school*. The concept of MME emerges through this enquiry and supports equity so that learning is continuously nurtured and encouraged. Through this process, my thoughts are challenged, and my heart and mind are collaboratively exercised.

My enquiry focuses on three aspects: (a) mathematics education as supportive of equity and the diversification of student interest and participation, (b) the mathematics curriculum as a dance of mosaics and (c) assessment as an ongoing developmental process. Throughout the development of these multifaceted epistemic practices, I have continuously wondered, *how have I been conceiving the key features of MME in my practice?*

### **Theoretical Background**

In this paper, I explore the transformative potential of culturally contextualised and socially responsive mathematics pedagogies, curricula and assessment practices. How can such tools fulfil the educational needs and aspirations of a diverse student population? I draw on transformative learning theory because it is idealised, intellectual and grounded in human dialogue (Taylor, 1998). As a proponent of transformative learning theory, Mezirow defines learning as an ‘organized effort to assist learners who are old enough to be held responsible for their action in acquiring or enhancing their understanding, skills, and dispositions’ (Mezirow, 2012, p. 89). This mirrors Taylor’s (2006) interpretation, which suggests that transformative learning empowers learners to recognise their role and environment, akin to how fish gain insight into the water they inhabit. This theory empowers teachers and their educators to critically examine their assumptions and those of their collaborators (Mezirow, 1997).

I embrace Taylor’s call to critically reflect on my role as a teacher educator and consider mathematics education’s historical role in serving political and economic interests. Taylor (2006) suggests that we should examine the extent to which modern educational reforms facilitate the dissemination of Western-style modernisation. In this paper, I aim to uncover the tension between the dominance of Western mathematics and the preservation of local knowledge and practices. This marks a first step towards dismantling Western narratives and a singular concept of mathematical knowledge and truth. My aim is to illuminate the path that leads to reconstructing MME in a postcolonial way by challenging anti-motherly mathematics and integrating marginalised voices. Embracing the postcolonial approach creates a collaborative space to empower researchers and research participants to critique and adopt disruptive practices to counter hegemonic Western-Eurocentric thoughts, paradigms, epistemologies and educational practices (Lamichhane & Luitel, 2023; Thambinathan &

Kinsella, 2021). With this study, I seek to contribute to the critical examination and deconstruction of mathematics education within local contexts.

### Methodological Accounts

Upon completing my master's degree in 2010, I aspired to further develop my professional expertise within my field of interest. With this goal in mind, I enrolled in a Master of Philosophy (MPhil) programme in mathematics education to broaden my research scope. As part of my MPhil studies, I conducted an (auto)ethnographic enquiry using structured sociological self-examination and expressive recall to understand my personal experiences (Poudel, 2016). Autoethnography has proven to be a potent method for comprehending and reconnecting with individuals and the environments they inhabit (Adams et al., 2015; Ellis & Bochner, 2000). It also offers space for both critiquing and appreciating cultural practices and experiences.

In my MPhil studies, I conducted multi-paradigmatic transformative education research via art-based (auto)ethnographic enquiry that accounted for the cultural situatedness of my professional position. This approach allowed me to critically reflect on the practices I employ as a student, teacher and teacher educator (Taylor et al., 2012). To achieve this goal, I adopted the dialectic of Leela and Rita, a magical realist vision in which humanity is caught in a sparkling theatre performance. According to Hindu mythology, Leela represents the chaos and unpredictability experienced by people living in a *mythos*-centric world, while Rita is equivalent to the order and predictability associated with a *logos*-centric imposition. As such, interpreting the artful world of experience through the dance of Leela and Rita gives rise to a multi-epistemic space (Luitel et al., 2012; Mahony, 1998).

In this multi-paradigmatic transformative space, I embraced (auto)ethnography as a foundational methodological and philosophical form of enquiry. This enabled me to uncover educational practices in the mathematics classroom in the Nepali context. I employed multiple genres, including stories, dialogues and performances, to vividly capture the pivotal moments of my educational journey as a teacher, educator and researcher in the form of narratives. Specifically, I used narrative logic (stories), poetic logic (poems), imaginative logic (letters) and metaphoric logic (use of metaphors) to express “contextual tales inextricably related to people, places, times and events, thereby helping readers to generate meanings” and understand the pedagogical realities depicted through my texts (Luitel, 2009, p. 41).

In my work, I use acts, letter conversations, poems, posters, artifacts as art-based participatory activities. These comprise exemplary tools for my research because of the participatory opportunities they offer and the evolution of consciousness and wisdom they dramatise (Morey, 2012). To do so, I strategically employ artful co-generative enquiry to engage in a creative endeavour aimed at advancing mathematics education through the integration of agentive thinking, caring relationships, nurturing pedagogy and other elements.

I have embraced a multi-logic perspective to generate an inclusive view of mathematics education relevant to students' interests, ensure their participation, acknowledge the mosaic of student diversity and recognise learning as a developmental performative enterprise. For instance, the postmodern paradigm has helped me envisage a participatory pedagogy that can be used in mathematics teaching and learning in Nepali schools. Everything I do in mathematics teaching can be represented as performance. It is worth considering the value of ‘relating to oneself as/being related to by others as/performing as a speaker, a dancer, a writer, a learner, a human being’ (Holzman, 2009, p. 30). The performances I and others create are always evolving and changing. This includes, for example, my pedagogical strategies, curriculum planning and designing of non-threatening assessment methods. Moving beyond mere essays, adopting an ethos of performance as a teacher and researcher in tandem with art-based (auto)ethnography

enables me to use scientific self-examination and expressive recall to understand my personal experiences as stories.

This journey has been a spiritual awakening, as I have learned to think and act in multifaceted ways. By embracing transformative educational practices in teaching, learning and researching, I have become a negotiator between the knower and the known as a mathematics teacher, teacher educator and researcher (Palmer, 1998). I believe in teaching by establishing a collaborative relationship between the learner and the teacher, the participants, the leader, the collaborator, the vision maker and the performer (Luitel, 2009, 2017). Through my research, I have gained a deeper understanding of the complexities of mathematics education and its impact on individuals and communities. My responsibility as a teacher and educator has shifted from imparting knowledge and skills to developing individuals. With each student, my focus is on developing a whole person, including their social and emotional well-being and academic growth. I strive to create a learning milieu that supports diversity, equity and inclusion, where every student feels valued and empowered to learn.

### **The Underlying Notion of Motherly Mathematics Education**

I was born into a Hindu family in the 1970s and grew up worshipping *Aama* (mother) as *Shakti* (a divine female power). Her presence is threefold, conveyed through her words, the status of *Shakti* in the temple and the figure of *Guruama/Guru*<sup>1</sup> (David, 2009). Despite this cultural upbringing, as a mathematics teacher, I was not initially sure how to incorporate these cultural aspects of knowledge from my local-cultural heritage into my mathematics teaching. However, inspired by my grandmother's edifying stories, I envisaged Radha-Krishna as a representative guru who exhibits both feminine and masculine natures. As a performing teacher and researcher, I repeatedly ask myself, how can I bring the possibilities of Radha-Krishna, an inclusive guru, into the mathematics classroom so that they can play an agentic role in visualising how *school feels like a home, and home feels like a school* for 21st-century children? With these questions in mind, I propose the concept of MME, which envisions mathematics education as supportive of equity, students' diversified interests and participation; the curriculum as a dance of mosaics; and assessment as an ongoing developmental process.

I experimented with using the image of Radha-Krishna, an inclusive mathematics teacher, in a few sessions in my classroom. As a practitioner of MME, I became a leader in new learning models that establish partnerships between students and teachers, aiming to achieve broader learning goals. I learned that teaching requires the rejection of the old hierarchical ordering of relationships in the classroom, which is characterised by the 'teacher as a star' model and involves a one-way information transfer from teacher to students. As a performing teacher and researcher, I began to look for a creative, inspirational and transformative figure within myself. I found ways to encourage my students to engage in discursive processes of imagining, poeticising, romanticising, idealising and collectively negotiating to create a new vision of MME while embracing a conception of knowing as constructing, creating and contesting (Luitel et al., 2010; Luitel, 2019; Taylor, 2015).

I was curious about what motherly mathematics teaching would look, sound and feel like in a Nepali classroom. During my classroom visits, fellow teachers expressed their interest in the motherly pedagogical approach, designing and performing a motherly curriculum and implementing non-threatening assessment practices. I sought clarification about how to guide them in MME. Throughout this experience, I deliberately emphasised the role of the teacher educator as a Radha-Krishna-like figure to uncover the complex nuances of the mathematics

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<sup>1</sup> This Sanskrit term refers to an individual who possesses expertise, acts as an instructor or mentor and has mastery in a specific domain of knowledge.

classroom in the form of artful performance. This performance embraces the live, intimate, real-time nature of ethno-theatre to showcase a story representative of my audiences, including students, parents, teachers and teacher educators, fostering a sense of ‘being here’ rather than just ‘being there’ (Saldaña, 2005). By theatrically using artful co-generative enquiry, my colleagues and I collaboratively co-created a story representative of their experiences and hopes, facilitated by the character of Radha-Krishna – *an inclusive, holistic teacher*.

### **An Inner Call: Radha- Krishna as an Inclusive, Holistic Teacher**

As a teacher educator based in the Kathmandu District, I have had the opportunity to travel outside the city to train fellow teachers. I have always dreamed of finding an inclusive guru who believes in learning collaboratively with students, teachers and parents. This research led me on a journey of self-exploration as I looked for this character within myself. I questioned whether I am an inclusive teacher and educator who can lead my students from darkness to light, recognising that the notion of a guru must be extended to my current teaching practices.

As I am inspired by the voices of transformative educators who strive for a more holistic approach to learning, I am left pondering whether a guru can embody a motherly figure. According to Lavy and Shriki (2008), a good teacher is a motherly personality whose primary focus is to minimise scenarios of mathematical anxiety and offer opportunities for students to appreciate the beauty of mathematics. However, a motherly mathematics educator is more than simply a comforting presence that assures students that mathematics is not tedious.

To investigate deeper into this topic, I imagine Radha-Krishna as a divine entity that fights for humanity and motivates transformative efforts. The teachings of the sacred Hindu text, the *Gita*,<sup>2</sup> emphasise that good actions lead to good results; I interpret action in this sense as a pathway linked to performance. According to Aurobindo and Ghose (1995), the result of an action is usually a belief, except that, in this case, the action leads to knowledge, allowing the divine knower to discover their true self. In the Eastern spiritual context, the symbolic companionship between Radha-Krishna and the *Gita* is a participatory and inclusive partnership between the human and the divine soul, which leads to a quest for knowledge and enquiry. Can a teacher emulate the all-encompassing portrayal of Radha-Krishna, and can the teacher’s approach to teaching and learning be performance-driven and inclusive? What kind of teacher would such a figure be in a mathematics classroom, and what role would mathematics play in a holistic education?

I am worried by the narrow view of mathematics education that solely emphasises the academic components and disregards its inclusive spirit. Dewey (2004, p. 8) postulated that education should be perceived as a nurturing and cultivating process. *The Courage to Teach*, a book by Palker Palmer (1998), has motivated me to think about transformative mathematics education in Nepali classrooms. From Parker’s (1998) viewpoint, the fundamental problem in Nepali mathematics classrooms is the absence of enquiry-based activities; instead, the dominant approach is to simply impart abundant information about the subject matter.

The absence of a pedagogical environment that fosters developmental learning and teaching is disheartening. I staunchly advocate for establishing a developmental learning milieu through student-centred pedagogies. Previous research has identified three types of pedagogical approaches: informative, reformative and transformative (Sayer, 2014; Taylor & Luitel, 2019; Wink, 2011). Teacher-centred pedagogy is characterised as an informative approach in which teachers have the keys to the best solution strategy, while students play the role of receivers of knowledge. In reformative pedagogy, the teacher incorporates some

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<sup>2</sup> The *Gita* is a Hindu holy text conveyed within the narrative framework of a dialogue between Arjuna and his guide Krishna, with whom Arjuna rides in a chariot.

student-centred approaches to engage and promote knowledge construction. Transformative pedagogy, on the other hand, stresses the importance of reflective and critical-thinking skills. In this approach, the teacher and students embark on a shared journey – their goal always in sight across the horizon – and learning is depicted as a ‘landscape of learning’ (Fosnot & Dolk, 2001). Fosnot and Dolk (2001) use the learning landscape as a metaphor to illustrate teaching and learning as a collaborative process aimed at achieving students’ goals. In this sense, a motherly mathematics teacher can help students reach their goals on nonlinear paths while keeping their eyes fixed on the horizon. As a teacher, I recognise students as fellow mathematicians and encourage them to explore what it means to be a mathematician. In this context, ‘When mathematics is understood as mathematising one’s world—interpreting, organising, inquiring about, and constructing meaning through a mathematical lens—it becomes creative and alive’ (Fosnot & Dolk, 2001, p. 18). Consequently, teaching becomes a collaborative endeavour that promotes learning and development.

As a motherly mathematics educator, my goal is to cultivate love, joy and happiness in mathematics lessons. I aim to see both *male* and *female*, *mind* and *heart*, *reason* and *emotion*, and *prose* and *poetry* fully embraced in the mathematics classroom. I envision a teacher in the image of Radha-Krishna, striving to be a motherly mathematics educator who transforms the classroom into a collaborative meaning-making space (i.e. a theatre). In addition to teaching the curriculum, such a teacher would help students discover who they are and who they aspire to be.

### **Collaborative Meaning-Making: A Participatory Interactional Texturing of Motherly Mathematics Pedagogy**

In the following narrative, I have chosen Radha-Krishna as a composite character to represent an educator and Gita to represent a teacher educator. My aim is to depict our experiences as teachers and educators of mathematics and associate them with emerging local, social, political and cultural perspectives on mathematics education. Through artful co-generative enquiry, Radha-Krishna and Gita collaborate and put their collective efforts towards enacting tools such as pedagogy, curricula and assessments. This approach offers an opportunity to reflect on educational praxis (Martin, 2006; Roth & Tobin, 2001; Tobin et al., 2003) and make sense of mathematics teaching in real-world settings. As the author, I assume the role of narrator, storyteller, tutor, education activist and teacher. Through the following exchange of letters between the teacher and teacher educator, I aim to create a collaborative space that fosters dialogues between teachers, teacher educators and researchers to intergrade theory and practice (Martin, 2006).

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Dear Radha-Krishna Sir,

I tried to call you, but unfortunately, I was unable to reach you. Perhaps you are out of town attending another training programme. Regardless, I feel compelled to send you a quick email to say, ‘Happy New Year 2015’.

Our discussion about teaching mathematics, including the contents covered by student textbooks and the purpose of teaching abstract algebraic equations, was enjoyable. I am intrigued by the critical aspects of MME and whether such a pedagogy is limited to female teachers. However, I have observed a dominant culture at my school, and I concur with Palmer’s (1998) view that academic culture discourages us from living connected lives. Despite this realisation, I still feel hesitant about having lunch with my students. The association of education with fear has persisted since the beginning of my schooling, and this fear is affecting my professional growth.



I am having difficulty incorporating technology into my lessons, which has been a challenge for me, as my students might be more adept at using computers, software and applets than I am. This makes me anxious about effectively engaging them in class and concerned about my reputation as a teacher. Additionally, I have been struggling with classroom management despite my six years of teaching at Capitol Hill School.<sup>3</sup> I lack the necessary skills to create compelling lessons that capture my students' attention. I would appreciate your insights on effective classroom management, especially since I am teaching Grade 7 mathematics in seventh period, and many of my students do not appear interested in the subject. Keeping them physically and mentally engaged has proven to be a challenge.

In your previous training session, you noted that teaching mathematics encompasses more than simply solving algorithmic problems; it also helps unfold various human activities (Poudel, 2010). I am intrigued by this idea and interested in learning how to apply it in my own classroom. When I was studying for my Bachelor of Education degree, I used to feel intimidated by philosophical discussions and neglected the practical applications of learned theories in a real-world setting. Instead, I spent countless hours memorising statements. However, I am now comfortable acknowledging my shortcomings as a teacher and committed to improving my practices.

I am intrigued by the concept of incorporating philosophy into mathematics education, particularly through the motherly approach you described during your visit to our school. However, planning daily lessons is a significant challenge for my colleagues and me, and I would like to know whether there are alternative methods for implementing the existing curriculum. Could you recommend any models for effective and practical learning that align with the goals of education (Van Brummelen, 2009)? Additionally, one of my colleagues, Satya, who teaches Grades 1, 2 and 3, is struggling with the district education office's decision to set no formal exams until Grade 4. What is your opinion on eliminating exams in relation to motherly pedagogy? Can you suggest alternative ways of evaluating students' progress that prioritise learning?

I am currently grappling with a predicament regarding our school's emphasis on English-medium education as the primary approach. I am interested in exploring how MME can enhance students' learning outcomes and the specific roles students can play in this process. Can you elaborate on how motherly mathematics aligns with the philosophy of mathematics education in the 21st century? Additionally, I would appreciate hearing your insights on the role of philosophy in teaching and how it can benefit educators such as me and my colleague, Satya.

Thank you!  
Your student teacher,  
Gita.

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**'School feels like a home, and home feels like a school' – Do you agree?**

Dear Gita,

I was delighted to receive your e-mail. I appreciate your interest in discussing pedagogy, curricula and assessment practices in Nepali mathematics classrooms. It is also refreshing to hear from a student teacher, as this is the first email I have received from one in my five years as a teacher educator.

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<sup>3</sup> A pseudonym for the author's workplace in Nepal.

Ms. Gita, let us begin by discussing the meaning of pedagogy. I find it fascinating that I first encountered the term in my PGDE class in 2004. According to Wink (2011), pedagogy refers to the overall process of teaching and learning that takes place both inside and outside the classroom. You may also have questions about critical pedagogy. For instance, does this imply criticising others' teaching? People often develop misconceptions about critique, which is not as narrow as we might assume. As a critical educator, I primarily endorse dialectical theories, which allow us to recognise societal problems (McLaren, 1989). Currently, you and I share problems with establishing participatory enquiry among individuals and in the culture of mathematics education. Critical pedagogy is an educational philosophy coupled with a social movement, where the movement seeks to implement the critical theories and paradigms developed by the philosophy. By engaging with critical pedagogical perspectives, I, as a teacher educator, can seek opportunities for learners to become active, critical citizens who adopt "the ethos of re-examining and reconstructing existing curricula and pedagogy and assessment practices" (Luitel et al., 2022, p. 1).

Motherly pedagogy is rooted in critical pedagogical perspectives that strive to transform mathematics education. You also asked about how you and your colleagues can incorporate philosophy into your teachings and how philosophy works in practice. This is an excellent question that, although seemingly simple, has the potential to significantly impact your teaching philosophy. You have already initiated the journey towards your destination by asking these questions.

Philosophers are known for their love of questioning and their ability to answer difficult questions (consider Socrates, for example). Up until now, you have likely asked your students questions that are confined to their textbooks. But have you considered reversing the scenario? For instance, you can encourage your students to ask at least two open-ended questions at the end of every session. This is an investment in their future as philosophers. It is natural to feel apprehensive about questions that do not have clear answers, but you can set them aside for later and answer them when possible. Alternatively, you can accept them and present difficult questions that need time to ponder. Most importantly, when your students start asking questions, they will begin to approach problematic situations by questioning them. Their questions will help them explore possible solutions to their problems and will not require a single correct answer. However, they must ask the right questions. Ultimately, this habit will lead them to develop multiple versions of their questions and solutions.

According to Russian psychologist Lev Vygotsky, a child's behaviours are primarily governed by their parents or caregivers, who provide guidance on what to do, how to do it and what not to do (Vygotsky, 1978). Similarly, a teacher can be seen as a second parent who embodies the cultural values and norms that a child learns through education. MME aims to encourage the active creation of knowledge among learners, in contrast to the traditional 'banking concept' of education (Freire, 1970), which treats learners as passive recipients of knowledge. Rather than viewing knowledge as power, motherly pedagogy emphasises conceiving 'enquiry as power', thereby promoting critical pedagogical practices in the pursuit of knowledge and mutual learning between students and teachers.

Contemporary educator Nel Noddings posits that teaching is a unique moral and ethical relationship that involves caring for students (Noddings, 1994). She emphasises that teachers' relationships with their students shape their 'professional being'. As your mentor, I want to evaluate myself based on how much I care about you and your colleagues, thereby expressing my professionalism. However, I respectfully disagree with the term you used to address me: 'Dear Radha-Krishna Sir'. It comes across as overly formal and creates a distance between us. Instead, I would prefer to be called 'My Dear Friend Radha-Krishna', as it puts us on equal footing and encourages us to exchange ideas freely without hesitation or fear.

My dear friend, I urge you to assess your classroom environment. Is it a warm and supportive space in which students are encouraged to collaborate and provide mutual assistance? Or is it a chaotic and aggressive setting, akin to a zoo, where students compete against each other? I use the zoo metaphor to illustrate the traditional mathematics classroom environment.

I recommend that you review your school's prospectus to identify how you can contribute to achieving the school's goals, mission statement or motto. If I were in your position, I would endeavour to create a mathematics classroom that resembles a garden – a nurturing and developmental environment in which the teacher acts as a gardener, nurturing each student based on their cultural strengths and abilities. This entails designing classroom activities that celebrate the cultural strengths of the students and leveraging the resources available within the local community (Borrero & Sanchez, 2017).

School should be a welcoming and collaborative space in which students feel at home, just as home is a place of learning and growth, much like a school. This analogy perfectly encapsulates the essence of motherly mathematics pedagogy, which seeks to establish a nurturing environment for each student to learn, grow and develop their mathematical capabilities. I hope this idea leaves you pondering how *school feels like a home, and home feels like a school*. That is all for today, and I will send you an email over the weekend to continue our discussion on other topics.

With best wishes!

Radha-Krishna

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### **Why and how should we educate the mind or heart – or both?**

Dear Gita,

In my previous email, I concluded with the statement that *school feels like a home, and home feels like a school*, intending to highlight the importance of valuing every child as if they were at home. I argue that a motherly pedagogy strives to establish a caring and inclusive learning environment, which is crucial for meaningful learning.

Today, my argument centres on whether we teach our children to educate their minds, hearts or both. It may seem like a big question, but we can discuss it by defining the terms. Teaching a child by educating the mind emphasises the acquisition of knowledge, skills and mindsets that enable them to solve problems, think critically and achieve academic success. On the other hand, educating a child's heart involves nurturing students' socio-emotional development, including empathy, effective communication and collaboration, to achieve their goals. According to Grossi (2007), both types of education – educating the mind and educating the heart – are equally important. Grossi argued that engaging in research-oriented tasks can create an environment that motivates children to learn and develop their abilities as foundational skills for their future careers. This approach involves five essential criteria that encourage students' active participation: affirmation, contribution, purpose, power and challenge. Affirmation ensures that the child is accepted and valued, while contribution fosters their sense of being an individual who is also an important part of a team. Purpose plays an important role in creating exciting and meaningful learning experiences; power provides a sense of progress and growth. Finally, challenges push students to stretch their abilities while still feeling confident that they can succeed. As Whitaker (2012) succinctly puts it, "Touch the heart and then teach the child" (p. 116). In the following paragraph, I will share examples of how my colleague, and I attempted to engage our students in a context that embodied MME.

*It could be any day in August 2015 when I found myself in the southern part of Lalitpur. The schools had only recently reopened after being closed for 45 days due to the devastating Gorkha Earthquake. The aftermath was evident, with damaged houses and broken walls of classrooms serving as a constant reminder of the catastrophe that had occurred. Our students' hearts were understandably broken, and one of my fellow teachers was particularly concerned about their psychological states, home conditions and learning progress.*

*According to the teacher's report, the students were not motivated to be in the classroom or participate in the curriculum. They were not involved in rebuilding their community after the earthquake. After a lengthy meeting, we came up with a plan to start a local museum in the community as an innovative task to engage the students. Two teachers, Ranjeta and Jivan, were thrilled to design the project and connect the classroom, school and community. The students took it upon themselves to gather old artefacts from their damaged homes, and the project quickly gained momentum. Seeing that every teacher volunteered to help build the school museum was inspiring, which further encouraged the students. The students learned to work collaboratively towards their collective goals during this project. Now the school boasts a small museum, a testament to the students' creativity and willingness to take ownership of their learning.*

My fellow teachers began using the artefacts collected by the students as resources for teaching various school subjects, including mathematics, science and social studies. They also realised that the museum could generate income by attracting visitors. Following the earthquake, students, teachers and parents saw the museum as a collaborative space for education. Taylor (2006) refers to this collaborative room as a 'third space'. This space allowed them to deconstruct the old hierarchy along with the boundedness, homogeneity and authority of the established schooling structure (Taylor, 2006). The museum served as a *space for performance*, bridging the gap between new knowledge and the existing or dominant knowledge taught in the classroom. By integrating multiple disciplines, art and a culture-responsive curriculum, the museum illustrated the enormous potential for creating new knowledge. Additionally, the third space – a shared space, in this case – helped learners see the connections and contradictions between how privileged individuals perceive the world and how others view it (Lewis, 2007).

The school museum project exemplified how creating a shared space can result in innovative, student-centred learning experiences that foster critical thinking and creativity. By establishing such a space, students can be encouraged to take ownership of their learning and engage with subject matter in a meaningful way. This approach is at the core of MME and has the potential to foster more collaborative and student-centred learning experiences.

My dear Gita, this example will give you and your colleagues insight into how we can create an alternative shared space in which students, teachers and parents work together to experience MME. Through this collaborative effort, students encounter cultural artefacts that are deeply rooted in their household activities. For instance, a fellow mathematics teacher brought a traditional weighing tool to his algebra lesson and let students talk about how to use it. These types of artefacts provided an opportunity for the teacher to show that 'mathematics is not simply something they learn in school. It is instead something they *do* as an intrinsic part of their everyday lives' (Barta et al., 2014, p. v). This opportunity may help students understand how mathematics and culture are interconnected, encouraging them to explore mathematics connected to their own local cultural heritage or identity (Desai et al., 2021).

Your task now is to develop pedagogical strategies that create learning opportunities based on individual strengths. These options can also help you interpret students' positioning in classroom participation.

With best wishes!  
Radha-Krishna

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In the email conversations above, I have provided an example of how a teacher can create a collaborative space that mediates the construction of knowledge and connects curricular activities with societal needs. Such an approach allows students to think and act meaningfully while valuing themselves as a valuable part of their learning community. By creating such a collaborative learning space, teachers can encourage students to explore their interests and passions, leading to more engaging and personalised learning experiences. This approach also helps students cultivate enquiry, critical thinking skills, problem-solving abilities and a sense of ownership over their learning journeys. As educators, we are responsible for providing opportunities for creativity, joy and realisation beyond curricular boundaries. Students should be prompted to grapple with the opportunity for love, joy and realisation, as exemplified in the previous example.

MME has the potential to improve students' learning outcomes through performative learning opportunities, innovative curriculum design and non-threatening assessment strategies. Classroom learning activities are like art, drama or theatre, and designing solutions to local problems can accommodate dynamic and vibrant learning experiences that recognise each child's unique potential. By adopting this approach, mathematics education can become more than just a series of formulae and equations, which can create new kinds of responses to loopholes in present mathematics education.

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Dear Radha-Krishna,

Thank you for sharing examples of how a teacher can create an alternative shared space to help students, teachers and parents understand motherly mathematics pedagogy. Creating a performative curriculum that connects abstract mathematical concepts to daily life can be challenging in existing curricular frameworks. How can mathematics curricula be performative in nature? You mentioned somewhere that curriculum is a dance of mosaics.

I appreciate your insights and look forward to exploring new ways to implement MME in the classroom and create student-centred, collaborative learning experiences.

Best regards!  
Gita

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### **Motherly mathematics curriculum as a *dance of mosaics***

Dear Gita,

The Nepali mathematics curriculum often portrays mathematics as a purely symbolic and abstract knowledge system that is disconnected from daily life. However, the challenge with this singular and unidirectional view of mathematics curricula is that it fails to recognise Nepal's mosaic of social diversity. The country is home to 142 ethnic groups, and 124 languages are spoken as mother tongues (CBS, 2024). By undermining this cultural diversity, the singular view can impede students' motivation and engagement in relevant learning experiences that prepare them for success in future life opportunities.

Kin Robison (2008) believes that the current education system is modelled on the interests and image of industry. As a result, students are treated as products, and educated batches are grouped by age. Robinson questioned the reasoning behind this approach and argued that schools prepare students to be products based on the types of products they have seen marketed in the bazaar.<sup>4</sup> Schools in the 19th century valued a ‘one size fits all’ curriculum, preparing learners for an industrialised economy structured by mass production and rigid social layers. However, this approach does not promote democracy and creativity, and it does not encourage students to become critical citizens. To address this issue, mathematics curricula must offer an inclusive approach that reflects the student population’s diversity of cultural backgrounds and incorporates real-life examples.

Luitel (2009) contends that the current mathematics curriculum in Nepal presents mathematics as culture-free, fragmented and abstract. This approach has several consequences, including leading students to repeat procedures and formulae without understanding their meaning, yet avoids opportunities to apply mathematical concocts in real-life contexts. To address this issue, have you considered incorporating multiple perspectives and methods in designing and developing curricula that cater to diverse needs (Taylor et al., 2012)? As a curriculum designer, you could prioritise students’ unique learning processes, interests and aspirations and value their lived experiences (Schubert, 1986).

Schubert (1986) notes that the traditional image of the ‘curriculum as discrete tasks and concepts’ emphasises teaching subjects without considering their relevance to students. For instance, our curriculum mainly values objective-based content, tasks and concepts. Schubert’s ‘curriculum as *currere*’ approach is participatory, dynamic, transformative and strength-based, empowering individuals to redefine their life stories (Schubert, 1986). *Currere* refers to a runway or direction, with the goal leading to individual success.

Integrating this approach into curriculum design can help students connect their knowledge and values with their personal growth and development. It is worth noting that, in Schubert’s account, curriculum images are not mere definitions but serve as lenses for conceptualising different curriculum practices.

Dear Gita, as an approach to designing and developing curricula, I prefer thinking of the curriculum as *a dance of mosaics*. This approach embraces conventional and contemporary curriculum images, such as ‘curriculum as *currere*’; ‘curriculum as subject and content, a set of learning outcomes, discrete tasks and concepts’ (Schubert, 1986); and ‘curriculum as the reconstruction of experience’ (Dewey, 1902). The idea of the curriculum as a dance of mosaics can help us create an authentic shared space for a contextualised mathematics education that considers the diversity of students’ lifeworlds and the multiple features of Nepal’s cultural and spiritual worlds (Luitel, 2009). Thus, the mosaic image provides

a great deal of potential for incorporating multiple knowledge systems arising from diverse cultural and spiritual traditions, thereby accommodating sometimes opposite views of the nature of mathematics as a body of pure knowledge and mathematics as a pure knowledge system. (Luitel, 2009, p. 323).

This approach can lead to a more inclusive learning milieu by offering a curriculum that accommodates students’ diverse cultural backgrounds and experiences. An inclusive view on curriculum practices should reflect performative learning opportunities within an experiential, transformative, participatory and meaning-centred enterprise, thus embodying the ethos of MME.

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<sup>4</sup> A common Nepali term used to represent a market.

I will write back next week to further discuss the features of the curriculum as a dance of mosaics that facilitates MME.

Best regards,  
Radha-Krishna

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Dear Gita,

It seems that you are interested in exploring a comprehensive approach to curriculum design that acknowledges the diverse needs of students. This approach would involve careful planning of the content's scope and sequence, balancing of different topics and themes and exploration of instructional methods that enable all students to engage with the material. As a teacher, your role in this process would involve creating a yearly plan, unit plans and lesson plans as well as delivering activities aligned with these broader curricular goals (Farr, 2010). By staying attuned to the needs and interests of your students, you can ensure that each lesson is engaging and relevant to their lives while meeting broader learning goals.

A curriculum is not merely a set of predetermined activities or outcomes (Dewey, 1902). In mathematics education, means and ends are inseparable parts of a single process – experience – and it is the teacher's role to facilitate students' personal growth through the curriculum (Hansen, 2006). As a facilitator, you can design meaning-centred curricula by offering students meaningful learning experiences that cultivate a sense of purpose and direction. To do this, it is important to engage in deep, meaningful dialogue with students, teachers and parents (Schubert, 1986). The dialogue deepens when you open yourselves to an 'eternal dance of intimacy and distance, of speaking and listening, of knowing and not knowing' (Palmer, 1998, p. 106).

Dewey (1902) and Freire (1970) emphasise that education's importance lies in more than just a set of curricular activities that ignore students' experiences, purposes and goals. For Dewey, education is about fostering a democratic society and thus goes far beyond educational outcomes, while Freire emphasised that learners can be liberated and become better human beings who can get active in their communities (Bruno-Jofré, 2019). Thus, MME rejects the view of education as the transmission of information in a curriculum, which portrays students as passive vessels, in favour of meaningful experiences that enable learners to become leaders in their communities and better individuals. By promoting a sense of curiosity, creativity and critical thinking, teachers can help their students develop the skills and knowledge they need to be active participants in a democratic society.

You may be wondering how to implement this approach in your school. In that case, one exemplary practice I have encountered involves creating a team of students, teachers and parents who work together to embrace performative praxis and ethos.

*It could be any day in August 2016. I found myself in a mathematics classroom where my fellow teacher taught the topic of sets in arithmetic. As a teacher educator, I always preferred being in the classroom with the students. The theme of the lesson was sets and their application in real life. In the middle of the lesson, the teacher allocated a few minutes to talk about the themes they had covered that week and planned to conduct a review of the unit through guided questions. To begin the activity, she asked the students to think, pair up and share their thoughts for 10 minutes. The teacher then asked, 'What did you learn? How do you envision the application of sets in your daily life?'*

*One of the girls seized the opportunity to share her learning and discuss how she could apply the concept of sets in her daily life. Interestingly, her mother ran a small grocery store, and she often helped her sort out the purchase list by creating a list of items that are out of*

*stock or restocked. She explained, ‘Whenever my mom asks me to note down goods that need to purchase from wholesalers, I usually find a set of items that her customers purchase. My mother organises her shopping list in accordance with set concepts, such as overlapping, intersecting and disjointed sets. I found that few items are common for Dashian and Tihar festivals’<sup>5</sup> The teacher drew an illustrative picture to make her point more visible and said, ‘This is an excellent example of how the concept of sets can be applied in our lives’.*

Dear Gita, in this brief vignette, we can see students and teachers engaging in a cycle of conversation around the perspective of curriculum goals that appear on the horizon. With the curricular goals in mind, the teacher taught her planned lessons and encouraged her students to connect the curriculum’s objectives with broader goals. When teachers collaborate with young mathematicians, they can successfully connect abstract concepts related to sets to the students’ daily lives. Rather than explaining the application of sets in the real world, she makes students responsible for constructing meaning through their own examples. She is aware that, as students explain their thinking to each other, they are reflecting deeply on the application of mathematics in real life, which can lead to an ‘aha moment’.

I interpret this ‘aha moment’ in two steps. On the one hand, the set-related concepts that the students studied in the arithmetic lesson no longer seemed abstract. On the other hand, when students share their meanings, it provides evidence for the teacher to reflect on the effectiveness of the lesson. That is why Brueggemann (1982, p. 73) recommends an “object which contains wisdom in the world, that create[s] order”. This approach reflects the idea of the ‘curriculum as a dance of mosaics’, or a shared journey towards wisdom, and the view that true wisdom is found in the experience of the real world rather than in static texts. In other words, the teacher should be aware that wisdom cannot be found in the content of the curriculum itself but rather in the students’ performative process of connecting it to the real world via institutional activities.

According to Fosnot and Dolk (2001), students do not discover the idea of a set; rather, they invent it as they mathematise their lived worlds. As used by Fosnot and Dolk, mathematisation involves viewing, organising and interpreting the world through the lens of mathematical models. Like language, these models may start off as basic representations of situations or problems among learners. By keeping the idea of sets on their horizon, students and teachers share their journeys and traverse landscapes of learning. Additionally, the teacher encouraged her students to perform vertical mathematising (i.e. to generate relationships in the world of numbers and symbols) and horizontal mathematising (i.e. to interpret their lived world mathematically) (Fosnot & Dolk, 2001).

The well-known educator Reuben Harsh, in his book *What is mathematics really?* (1997), distinguished between the front and back sides of mathematics. For example, when we go to a restaurant and order food, we receive only finished food via the waiter. We are not aware of how the food was prepared, who made it or what ingredients were used. As customers, we only taste food that we cannot replicate at home. Similarly, the front and back of mathematics are symbolic spaces that mathematics curricula offer to our students. We teach mathematics as it appears from the front and is finished, and we knowingly or unknowingly neglect to offer space for our students to perform, act or experience. Therefore, the mathematics curriculum should strike a balance between these two sides of mathematics. Mathematics in the front is formal, symbolic, precise, ordered, abstract, purely demonstrative and masculine, and it is often represented by a capital ‘M’ (i.e. elite mathematics); this aspect is often insensitive to disadvantaged communities and cultures (Hersh, 1997; Luitel, 2009; UNESCO, 2008). In

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<sup>5</sup> Dashian and Tihar are the biggest festivals celebrated by Hindus in Nepal. Dashian is celebrated for victory over evil, while Tihar is the festival of lights, celebrations and relationships.



contrast, the backside of mathematics is fragmentary, informal, artefactual, tentative, local, communal, Indigenous and contextual, often represented by a small ‘m’ (i.e. folk mathematics); the back perspective accepts multiple mathematics and is situated in motherly nature and culturally inclusive (Hersh, 1997; Luitel, 2009; Poudel, 2010). If they want to achieve these goals, the role of the teacher becomes even more demanding, as they must act as negotiators, facilitators, collaborators and performers.

To practice performative teaching, it is crucial to present the curriculum as an integral part of pedagogic living (Sameshima, 2008). Kliebard (1975) viewed the educational experience as a journey of exploration for the learner. As the journey progresses, the teacher may act like a guide or companion, taking into account the nature of the road and the learner when determining the course of the experience. As Baptist (2002) noted, ‘As guide and companion, the educator is concerned less with a need to anticipate the exact nature of the effect on the traveller and more with providing a rich, fascinating and memorable journey’ (p. 20). I interpret the curriculum as a journey towards wisdom in which students are accompanied by a guru and other actors. Thus, the curriculum is not only a matter of content but also a matter of reorganising knowledge and relationships, as well as a process of growth, as noted by Reyes-Guerra & Bogotch (2011). Metaphorically, students can be depicted as plants, and the curriculum is a garden that requires constant cultivation. Their lived encounters within the curriculum and garden synthesise orchestrated phenomenological experiences.

My dear Gita, the motherly education framework treats the curriculum like a garden that can be meticulously planned, tended and nurtured. Badley and Van Brummelen (2012, pp. 69–70) noted the following:

The garden and curriculum as garden connect us to ourselves, our communities, and to the earth. Curriculum as garden is a dance of control and release with shifting interactions between teacher, learner, and text that opens up possibilities. It is a garden that encourages and celebrates multiple ways of knowing and that educates students to live well where they are.

Personally, I prefer the ‘curriculum as garden’ view, because a teacher can be like a gardener who consciously nurtures individual students’ growth and cultivates their potential. More importantly, by identifying individual students’ needs, teachers can find space to adapt their teaching methods to meet those needs. Metaphorically, the teacher plays instruments at her students’ pace and lets them perform as if following a mosaic dance.

Baptist (2002) similarly suggests that our role is to ‘generate compassion for the curriculum that welcomes dreams and vision; a curriculum that honours the senses, that engages our bodies; and a curriculum that connects to ourselves, our communities and the earth’ (p. 20). Dance and music are the vibrations of human senses originating from the heart of every community. By engaging with these artforms, we can feel connected to the core of Mother Earth. As performers, we are merely mediums that channel these profound energies. What do you think?

In this manner, MME envisions the *curriculum as a dance of mosaics*, a realm of possibilities, a happening that cultivates meaning-making processes. In this approach, students, teachers and the environment converge with intention and enactment and collide with one another. The curriculum invites them to participate through intellectual engagement and creative imagination.

With best wishes!  
Radha-Krishna

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## Motherly Assessment Practices as a Nurturing Model for All Mathematics Classrooms

Traditional assessment design emphasises ‘one precise solution’, creating an exclusionary effect in the school system while upholding the established social order (Boistrup, 2017; Nortvedt & Buchholtz, 2018). I have realised that current assessment practices tend to focus solely on high-stakes assessments without considering students’ learning beyond that summative testing episode (Koh & Yeo, 2011). I envisage assessment practices that enhance learning beyond the immediate formative context. Assessment involves gathering data to evaluate students’ achievement of learning outcomes. A transformative teacher interprets and evaluates these data to make informed judgments and decisions on that basis. For example, an eighth-grade mathematics teacher might collect evidence to identify a child’s strengths and weaknesses and set goals to ensure their success. A progressive educator believes that the primary purpose of mathematics education is to nurture the individual and instill skills and concepts relevant to their needs (Wright, 2012). I firmly believe that a motherly mathematics teacher would carefully observe student patterns and outcomes and start implementing pedagogical strategies to support students in their day-to-day quest for increased effectiveness.

Dear Radha-Krishna,

I hope you are doing well. It has been a month since my last message because I was busy with midterm examinations and festivals. I have been trying to incorporate the motherly mathematics pedagogy you envisioned, but I sometimes need further guidance. Today, I would like to discuss assessment practices in the mathematics classroom. How can I ensure that my assessment and grading practices are compatible with the teachings advocated by MME? During our in-person meeting, we discussed tailored instruction, and I started introducing tailored learning objectives and strategies in my lessons. However, I am still struggling with how to implement assessments that link effective teaching with students’ learning, learning outcomes and goals. As a motherly educator, how can I make my assessment practices non-threatening, inclusive, participatory, contextual and learning-centered based on my beliefs, values and practices? Additionally, are there any other opportunities to demonstrate mastery and improve performance through ongoing assessment? What are your thoughts on year-end evaluations? Finally, could you share your view on the best assessment practices in the Nepali classroom?

Best regards,

Gita

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Dear Gita,

It is great to hear that you are eager to implement the assessment practices recommended by MME. MME envisages a comprehensive approach to assessment, emphasising students’ active participation, performance, understanding and progress along with an adaptive teaching methodology to promote student progress and inclusion. A teacher can employ different assessment approaches to achieve curricular goals. Checking for understanding comes first, followed by assessment for learning. For example, you can offer students independent practice opportunities in every lesson, and you can mention that you will likely check their work. This becomes an integral part of the assessment cycle: gathering information, setting goals, teaching and learning, reviewing progress and implementing further assessments (Briggs et al., 2008). In my experience, the way students’ performance is assessed becomes the core of my own self-assessment, which always informs my teaching plans at all levels (Fosnot & Dolk, 2002). In MME, assessment is not just about assigning grades or marks. Instead, assessment is a continuous process that involves gathering students’ viewpoints, progressing towards learning

goals, providing feedback and adjusting instruction methods based on their performance. One way to align your current practices with MME is to use multiple assessment forms aligned with learning objectives. These include summative assessment to ensure the assessment *of* learning and formative assessment to ensure that assessment is *for* learning (Havnes & McDowell, 2008).

Assessment *for* learning indicates how students have progressed in achieving lesson objectives. Listening to students' responses and understanding their learning strategies help teachers assess their students' performance. A progressive teacher collects data daily to understand how students' progress, providing insight into the effectiveness of the teaching strategies used. This allows teachers to evaluate and review their methods to identify gaps and improve through a developmental, progressive ethos. Recently, I introduced mini-math conferences in the classroom to encourage productive mathematical discussions among students (Fosnot, 2002; Picha, 2022). Engaging students in conversations provides an opportunity to understand their thinking, as students' heads are often black boxes. The mini-math conferences have proven a powerful strategy for understanding students' thinking, learning and understanding. More importantly, these conferences promote reasoning and argumentation among adult mathematicians in my classroom. In your case, you can achieve comparable outcomes among young mathematicians.

Gita, if you can identify the unique needs of an individual student, they are often best addressed through one-to-one support. Through such support, the student may develop effective solutions to their specific problems. Assessment for learning involves keeping a portfolio record of every student, which provides evidence of their daily, weekly or monthly learning goals (Far, 2010). Over the course of the year, you will gather entries that serve as evidence of student learning and progress. This allows you to create specific plans for those who are not performing well by using differentiated strategies. As a progressive teacher, you may need to come up with a remedial plan for struggling students. In addition, you can use medium-term written assessment strategies that test different ideas and skills linked to upcoming unit objectives.

Paper-and-pencil assessments can provide useful information about students' learning progress as summative assessments, providing snapshots of children's learning achievements at a specified time. However, while summative assessment is valuable and necessary, it is not enough on its own. To ensure rigorous, varied and focused progression, formative assessment is necessary (Black & Wiliam, 2018).

Gita, you can consult students' work to analyse their progression and identify obstacles. If your students are struggling, it would be very superficial to conclude that they are simply 'dummies'. Instead, ask yourself, 'How can I adjust my teaching to better support their learning?' If one of your students appears directionless, you ought not jump to conclusions and label them ungrateful and unmotivated (Dyk, 1997). Instead, ask yourself, 'Why is this child unmotivated? Is there something in their background that I am unaware of? Is my teaching style not resonating with them? How can I make lessons more relevant and engaging for them?' Learning and teaching dynamics require constant attention and cultivation from multiple perspectives.

Alternative assessment practices can be very helpful in departing from traditional assessment methods and promoting educational outcomes, as noted by Buhagiar (2007). In the Nepali context, Rai and Shyangtan (2020) recommend alternative assessment methods, including performance-based assessments, portfolio-based assessments, written examinations, tasks that require interpretation and critical thinking, and assignments that prompt students to analyse assigned resources. Performance-based assessment allows us to evaluate the acquisition of knowledge and skills and the student's ability to apply them in real-life situations (Buhagiar, 2007). One way to make your students self-assess their performance is to

incorporate rubrics that outline scoring criteria based on pre-established student performance standards. By doing so, students can be prompted to engage in mathematical problem solving through contextually rich tasks. This is because mathematics is no longer recognised as a mere body of abstract knowledge but is also seen as a collection of human sense-making activities and a manifestation of human inventiveness (Ernest, 1991).

Gita, another form of testing is portfolio assessment, which involves evaluating students' work through their self-reflections and learning goals, written assignments, videos, photographs, artefacts, drawings or any other creations that can be considered assessment tools that demonstrate that they faced challenges and are learning to solve problems. Successfully implementing portfolio-based assessments in your lessons can help students become more self-reliant and better equipped to assess their hard-won progress in acquiring knowledge and skills (Janisch et al., 2007; Pope, 2005; Tan, 2004). For the other types of alternative assessment approaches (such as tasks that require interpretation, critical thinking and analysis of assigned resources), I recommend consulting additional resources, such as 'Developing culturally contextualised mathematics resource materials: Capturing local practices of Tamang and Gopali communities', published by the UNESCO office in Kathmandu. I believe that, by taking the initiative to change how you teach mathematics, you could inspire other teachers to rethink their approach to developing mathematical competency.

Based on an analysis of rigorous research from the last 25 years, Erik De Corte (2004) identified five categories of mathematical competency that students should acquire. First, students need flexibly accessible domain-specific knowledge, including facts, symbols, rules, concepts and algorithms. Second, heuristic methods, which are experience-based systematic approaches to problem-solving processes that involve modelling, analysis, informed predicting and intuition (Koichu et al., 2007; Schoenfeld 1985). Third, meta-knowledge enables students to access both mathematical knowledge and knowledge about their own mathematical functioning (Trouche, 2005). Self-regulatory skills are also crucial. These skills pertain to self-regulation of cognitive process, whereby students are expected to be "metacognitively, motivationally, and behaviourally active participants in their own learning process" (De Corte, 2004, p. 290). Finally, beliefs about mathematics, mathematical learning and the social context in which mathematical activities occur are essential for student development.

By adopting this understanding of mathematical performance and a shift in teaching approaches, we can create effective mathematics education to ensure that many, if not all, students can learn. Here, I want to share an exemplary practice from my partner school in Eastern Nepal.

*In August 2016, I had the opportunity to attend a school exhibition at Bagh Secondary School. This event was eagerly anticipated by the students, teachers, parents and invited guests, as it provided an opportunity to showcase their work and share their learning experiences. The school exhibition was a collaborative effort involving students, teachers, parents and members of the local community. It aimed to make learning joyful, meaningful and relevant to students' lives.*

*During the exhibition, I was struck by the creativity and ingenuity of the eighth-grade students, who had created a stall using locally made bread to illustrate the concept of pi. Using three loaves of bread of different sizes, Chameli and Batuli measured the circumference and radius of each loaf to calculate the ratio of the circumference to the radius. They also created a poster in their own language to demonstrate the proof.*

*What was even more impressive was the message these students conveyed through their work. They concluded that the ratios calculated in Kathmandu and Janakpur were equal, and that people in Terai, Hills and Himal are also equal, just like the value of pi. These students advocated for equality and spread a message of brotherhood and harmony. They were thinking*

*beyond the curriculum to which they had been exposed in their mathematics lessons. This sent a message about how students can demonstrate leadership in their learning, classrooms, community and society.*

Dear Gita, I believe that the above-mentioned scenario illustrates how assessment might work in MME. I invite you to consider the following questions to interpret the above narratives:

1. Did the students demonstrate knowledge of concepts, symbols and algorithms through their presentation?
2. What were your thoughts on the model they created to champion social inclusion and exclusion?
3. Did they employ knowledge of mathematics in their approach?
4. Does the activity encourage them to re-evaluate their beliefs about mathematics?
5. How would you compare the students' performances when they integrate curricular competencies with their real-life mathematical knowledge and skills?

Chameli, Batuli and Chandra Kanta are representative characters from disadvantaged communities in Nepal who have consistently demonstrated a desire for culturally contextualised and socially inclusive mathematics education. Additionally, they expanded learning goals beyond the textual form of the mathematics curriculum (i.e. vertical and horizontal mathematics). These learning experiences showcased students' developmental progress and performance in learning and endorsing organic knowledge, enabling them to champion social equity and foster a sense of unity and leadership in their community.

What are your thoughts on this?

Happy Tihar!

With best wishes!

Radha-Krishna

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## **What I Have Learned**

In this discussion, I have focused on MME, which embodies curiosity, fosters a passion for learning, encourages questioning and enlightens the heart and mind. Through my educational journey, I have realised that nurturing, compassionate and spiritually awakening lessons can help children learn mathematics while promoting sustainable mathematics education in Nepali classrooms (Luitel et al., 2013; Palmer, 1998; Poudel, 2010, 2016). MME envisions an overlapping space shared by home and school in which students, teachers and parents empower themselves through tools such as pedagogy, curricula and assessment practices. Furthermore, MME promotes an inclusive, global and participatory pedagogy, fostering meaningful interactions between teaching and learning in the classroom and the real world. This approach encourages reflecting on, negotiating with and transforming classroom teaching within the broader community, society and state. In summary, MME is likely to be beneficial for a) transforming mathematics pedagogy by supporting equity and diverse students' interests and participation, b) curricula that integrate dance of mosaic approaches and c) assessment as an ongoing developmental process.

A motherly mathematics pedagogy serves as a tool of empowerment for mathematics teachers who seek opportunities to help their students become active and critical citizens by re-examining and reconstructing curriculum and assessment practices. Furthermore, this pedagogy rejects the traditional 'banking model' of education (Freire, 1970) and aims instead to actively foster 'enquiry as education', with an emphasis on building knowledge through

collaborative learning between students and teachers. By operating within the shared space of home and school, a motherly pedagogy views students as young mathematicians, philosophers, collaborators, actors, leaders and advocates for equity, peace and harmony.

The goal of MME is to address the curricular needs of students from diverse social backgrounds and bridge the world of classroom mathematics with the real-world applications of mathematics, rejecting the idea of a one-size-fits-all curriculum. Additionally, the curriculum as a dance of mosaics creates space for students to engage in both vertical and horizontal mathematizing, as suggested by Fosnot and Dolk (2002). MME aims to provide a mathematical education that illuminates a shared space in which students may be empowered to challenge the notion of anti-MME by encouraging multiple ways of knowing, being and valuing (Adams et al., 2008; Luitel, 2019). This is achieved by offering a balance between mutually complementary entities, such as home and school, individual and community, formal and informal, and symbolic and artefactual. Achieving this balance requires teachers to take on a demanding role as negotiators, facilitators, collaborators and performers, and to embrace the notion of the ‘curriculum as currere’. This approach emphasises the dynamic potential of curricula to enrich mathematics education and equip students with a tool that will prove valuable in their daily lives.

MME regards assessment as an ongoing developmental process. It advocates for non-threatening assessment approaches that provide diagnostic, formative and summative assessments to ensure students’ success. In this context, assessment becomes a continuous process involving collecting information about students’ comprehension and achievement of learning goals, offering feedback and adapting instructional strategies based on performance, rather than as a one-time event. Furthermore, MME is open to alternative assessment practices, such as assessing students’ work through their self-reflections, fostering learning goals, and collecting written assignments, artefacts, drawings or any other creations, either individually or collectively. Opportunities for alternative assessment practices include performing mathematics as part of various activities, such as engaging in mathematical dialogues, exploring and questioning mathematical concepts, listening to mathematical stories and inventing new mathematical ideas. Moreover, within the MME framework, assessments require students to perform mathematics as part of their lives to foster understandings, rather than only getting correct answers. Assessment in MME extends beyond evaluating children’s performances; it also includes teachers’ self-assessments, which inform teaching plans at all levels.

The challenge of dysfunctional mathematical literacy, which pertains to low-level curriculum skills, may contribute to maintaining the status quo in society, forcing primary school and university graduates to accept low-paid jobs serving dominant groups. I suspect that, because of anti-MME approaches, Nepali workers often must migrate to Gulf countries for low-paid jobs. As an alternative, I envision that MME could serve the curriculum by highlighting ways to solve contextual problems and create better learning opportunities for all children.

Being political – and thus acting politically – I have raised concerns about educational practices in Nepali schools’ mathematics classrooms. To achieve this, I collaborated with representative characters, such as Radha-Krishna, Gita, Chameli, Batuli and Chandra Kanta,<sup>6</sup> who prefer to express themselves through singing, acting and street drama to illustrate their emotions, movements and awareness. Perhaps my collaborators and I prefer to act through arts-based media, which can even teach oppressors to implement MME practices. That is why I choose arts-based enquiry, which enables me to visualise and challenge hegemonic perceptions (Keifer-Boyd, 2011). In this study, the artful use of co-generative enquiry serves as both a

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<sup>6</sup> These are common names for Nepalese girls and boys.

pedagogical and research tool, helping myself and my colleagues (Radha-Krishna and Gita) uncover the explicit and implicit aspects of teaching mathematics by re-evaluating our roles (Adams et al., 2008; Tobin et al., 2003). Art-based (auto)ethnography theatrically invites participants to imagine a transformative teacher development programme in Nepal, creating empowering academic environments rather than training teachers without engagement.

Throughout my journey, I have been cautious about the question, “How can scholarly knowledge production be made reliable by incorporating research as transformative learning?” (Taylor et al., 2012). Transformative learning theory has served as a theoretical framework that has enabled me to question the deeply rooted hegemony of anti-MME tendencies and provided a suitable framework for my research contexts. Using tools such as drama, letter conversations, poems, posters and artefacts, I have encouraged critical reflection on my practices as a teacher and teacher educator while acknowledging epistemological pluralism. These tools resonate with the multidimensional nature of human and the cosmic lifeworld in the Nepali context (Morey, 2012; Taylor et al., 2012; Luitel, 2009; Wagle, 2022), and they add a critical dimension to reforming learning environments, improving and transforming learning practices and outcomes in favour of the learners. Drawing on my own cultural background, I have embraced my mother’s mathematical activities as a source of knowledge about the facts (i.e. mathematics with a small ‘m’) and the inner logic of my society. This has inspired me to conceptualise MME as an inclusive, participatory, strength-based and meaning-centred enterprise of learning that can be helpful for many – if not for all.

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