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# Cultural Immersion and Mathematics Teacher Education: Explorations in Morocco and South Africa

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## Synopsis

This article examines the first author's personal experiences as a mathematics educator studying ethnomathematics and indigenous knowledge systems (IKS) through immersion in indigenous cultures. In describing these encounters, we highlight the importance and impact of cultural immersion experiences on educators' perspectives regarding the nature of mathematical knowledge. We argue that cultural immersion not only builds a well-rounded individual, but also provides educators with the necessary tools to maintain relevance in the diverse and constantly evolving landscape that is the classroom. Insights gained from this study have direct implications in our teaching practices as they remind us to be mindful of the fact that children from diverse backgrounds have different modes of thinking, possess diverse perceptual abilities, and spend differential efforts on tasks depending on personal criteria which they deem useful.

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## 1. Introduction

This article intends to enhance our understanding of the influences of cultural immersion in shaping the perspectives of mathematics teachers. We will facilitate this by a descriptive account of the first author's personal experiences during two study-abroad programs in Morocco and South Africa.

The study-abroad programs were part of course work focusing on ethnomathematics and indigenous mathematical knowledge systems in indigenous contexts.

In this paper we offer a new outlook on what it means to be engaged in learning mathematics outside the confines of the classroom. The reader can trace the development of this outlook in our account of the first author's experiences and our accompanying analysis.

Engaging with local communities and exploring the ways in which they solve daily problems has confirmed our belief that all people are capable of knowing in their own unique and personal perspectives. Exploring indigenous knowledge systems (IKS) via everyday tasks makes learning relevant concepts more meaningful. Another critical consequence of being immersed in IKS practices is that such experiences sensitize us to the delicacies of what it means to be part of a different cultural fabric. This has direct implications in our teaching practices as it reminds us to be mindful of the fact that children from diverse backgrounds have different modes of thinking, possess diverse perceptual abilities, and spend differential efforts on tasks depending on personal criteria which they deem useful.

### *1.1. Background*

In our society today, it is vital for educators to not only engage students in learning, but also to ensure that what they are learning is applicable to their lives. Teacher education must attend to the constantly changing environment that teachers must maneuver in order to maintain their relevance (and that of the content they are to deliver) in the classroom. Odora Hoppers [9] indicates that contemporary education is currently facing many challenges due to the ever evolving landscape. To address these challenges, we must consider shifting our focus from knowledge produced within disciplines to multidisciplinary research and thus reaching beyond traditional limitations of disciplines.

It is necessary to create culturally relevant activities that will engage students in hands-on explorations of meaningful learning, providing opportunities for teachers to practice culturally responsive teaching. Gay [5] describes culturally responsive teaching as utilizing the cultural knowledge, previous experiences, and performance styles of diverse students to make learning more appropriate and effective for them. Students face many challenges with mathematics; the hope is that with a more student-centered teaching prac-

tice, these challenges can be addressed. In order for educators to develop the abilities to successfully connect to students culturally, it is imperative that they are immersed in cultures relevant to their lessons in an effort to experience learning in situ.

According to Villegas and Lucas [13], in order to effectively move the field of teacher education beyond the disjointed and narrow treatment of diversity that currently exists, teacher educators must express a vision of teaching and learning in a diverse society and utilize that vision to thoroughly guide the infusion of multicultural issues throughout the pre-service curriculum. Villegas and Lucas also suggest that “[a] central task of teachers who are culturally responsive is to create a classroom environment in which all students are encouraged to make sense of new ideas—that is, to construct knowledge that helps them better understand the world—rather than merely to memorize predigested information” [13, page 29]. In order for this to occur, educators need to support students’ construction of knowledge by encouraging their involvement in inquiry projects that are meaningful to them. We can think of no better way to approach engaging students in this kind of active learning other than by equipping educators with the tools and experiences necessary to ensure that this connection is made.

### *1.2. Indigenous Knowledge Systems and Education*

The notion of an *Indigenous Knowledge System* (IKS) is defined in the literature as the sum of the knowledge and skills which people in a particular geographic area possess, which enables them to obtain the most out of their environment [9]. The study of indigenous knowledge systems has been recently established by UNESCO as a top global priority for locally empowering traditional cities in their efforts towards improved, sustainable development. For details readers can check out the UNESCO web site on Indigenous Peoples, with specific focus on Cultural and Linguistic Diversity, Education, Social Inclusion and Sustainable Development: <http://www.unesco.org/new/en/indigenous-peoples/>, accessed on June 29, 2013. Another source we recommend is [6], a recent text focusing on IKS as it applies to education in the Asia/Pacific and Africa contexts.

The growing interest in integrating cultural practices into teaching and teacher education as legitimate bodies of knowledge is portrayed in a final report by the NCTM Achievement Gap Task Force dated October 2004 [10]. The task force recognized that:

[T]he achievement gap is not a result of membership in any group, but rather is the result of the systematic mistreatment of learners caused by racial and class bias—conscious and unconscious, blatant and subtle, personal and institutionalized. There is plentiful evidence of deep structural injustices [especially in high-needs, urban settings] [10, pages 2–3].

To address these problems, the task force offers a range of recommendations, among which is to:

Promote curriculum and pedagogical efforts that make connections to ethnomathematics specific to the communities of learners to whom the education is offered [10, page 14].

The impact of using cultural practices and techniques in the urban classroom is far from speculative. Research has shown the importance of integrating cultural practices that resonate with students' ethnic and background experiences in everyday instruction. For instance, Kohl documented the stories of Harlem students in his classic narrative *36 Children* [8]. An impressive body of research on teaching children in city environments exists, see for instance [2, 7, 11, 14].

On the other hand, extensive research has urged the use of cultural immersion experiences as a means of increasing cultural sensitivity for students across disciplines. Particularly in teacher education, the value of using community-based learning has been heightened in light of the diverse demographics that thrive in most schools today. An IKS immersion experience can sensitize teachers to the delicacies of what it means to be part of a different city fabric, leading them to appreciate various modes of thinking across cultural city boundaries. To provide an example, in what follows, as we trace the account of the first author's IKS experience while studying abroad, we carefully point out and reflect upon how his personal epistemology was continuously revised as he witnessed the application of this knowledge in solving everyday problems encountered by indigenous communities.

### *1.3. Oral Cultural Transmission*

Throughout this journey, the first author has documented many of his interactions with the local people through journals, videos, pictures, and more importantly, conversations, demonstrations, and/or workshops with the craftsmen. These methods not only facilitated his knowledge acquisition, but

they also aided him in discovering and identifying the thought processes of the local craftspeople. These thought processes in turn demonstrated how these local craftspeople utilized their understanding of mathematics and related applications to sustain a living. The workshops in particular illustrated explicitly that knowledge, cultural, mathematical, and otherwise, was typically transferred orally in the form of story-telling and apprenticeships. It is evident that these oral-transfer traditions are pervasive throughout many cultures. As many of the locals we encountered functioned orally, we saw that they learn primarily through apprenticeship, discipleship, and systematic strategies to support the memory. Orality, therefore, creates an ontology based on interrelating forces rather than on tangible objects [12].

## **2. Cultural Immersion Experiences**

The cultural immersion experiences we recount in this paper were part of course work offered to graduate students in the Doctor of Philosophy in Teaching and Learning Program in the Middle-Secondary Education & Instructional Technology Department at Georgia State University. The purpose of these courses is to expose students to scholarly research activities by focusing their apprenticeship on studying Indigenous Knowledge Systems (IKS) through cultural immersion in indigenous contexts [3]. The primary objective is to examine how different cultural groups produce diverse epistemologies and knowledge systems in their daily practices.

The courses comprised two components: class work and cultural immersion. Class work was carried out on campus and included an examination of the theoretical and epistemological background underlying ethnomathematics and IKS. The second component included immersion experiences in Morocco and South Africa, where students were afforded first-hand field exposure to IKS as it transpired in the authentic daily experiences of master craftspeople and knowledge holders of vital indigenous technologies. During the site visits, students explored the integration of hand and mind tools that indigenous communities continually employ to plan, conceptualize, visualize, and execute myriad activities as part of their daily practice.

In the following, the first person pronouns always refer to the first author, whose experiences this paper builds upon. We use italics and quotations to emphasize the personal account and differentiate it from the ongoing descriptive analysis which interprets it.

*“Having experienced two such study-abroad programs, I (the first author) can attest to the importance of the quality of the experience and how it impacts teachers in particular. I have always dreamed of traveling to the African continent but never thought that this dream would materialize so soon. As a doctoral student, I thought my role was to change the world and make my unique contribution to the field of mathematics education, but I did not think that I would need to change in order for that to happen.*

*“My study-abroad experiences have contributed to changing, not only my perspective on mathematics and culture, but also how I see and value the world, its peoples, and the importance of trans-cultural communication. As a result I can now embrace culturally empowered teaching, which I believe contributes to an increase in learning and participation in the classroom. Being from Jamaica, I have always appreciated the value of diversity and believed that cultural awareness is a necessary skill for educators in the classrooms of today. My study-abroad experiences have afforded me the privilege of experiencing first-hand how cultural immersion is beneficial to the teaching and learning of mathematics, a subject that is often viewed as the most privileged and privileging topic in school curricula.”*

### *2.1. Fez, Morocco*

The first author’s trip in Fez, Morocco, centered on experiencing ethnomathematics. According to Achor, Imoko, and Uloko [1], ethnomathematics is the study of mathematics taking into consideration the culture in which it arises. It is therefore possible to obtain a greater understanding of the subject if educators examine how mathematics arises and is used in various cultural settings. The term *ethnomathematics* was first introduced by Ubiratan D’Ambrosio in 1986 and is deeply rooted in the philosophy of Paulo Freire. D’Ambrosio [4] views ethnomathematics as a practical approach to teaching and learning mathematics which builds on students’ existing knowledge, background, and environment. In this instance, the participants of the study-abroad program, all mathematics students and mathematics educators, were provided with the opportunity to observe mathematical concepts that emerge in cultural activities as creative expressions of human thought.

*“This allowed us to examine how different cultural groups interpret mathematics, in stark contrast to the way we are accustomed to viewing it, for example through textbooks, standardized tests, and the classroom setting. We explored the impressive integration of powerful hand and mind tools that the craftsmen were continually using to systematically conceptualize, plan, and execute innumerable design projects as part of their daily practice.”*

A major objective of this experience was to observe how mathematical concepts are embedded in the practice of the various craftsmen.

*“Our first stop was at the tile production complex where craftsmen were designing by hand, using a makeshift compass to construct circles and semi-circles. We were able to see the raw materials, the work in progress, and the finished products ready for sale. We also had the opportunity to ask questions about the entire production process. One of the craftsmen showed us exactly how he created a design, creating the circles using his compass and then drawing the various patterns by hand without any mistakes (see Figure 1). Once the design was complete, the next craftsman would take over the tile and add in the various colors. ”*



Figure 1: A demonstration of mathematical applications used in tile designs in Fez, Morocco (original pictures taken by the first author).





Figure 2: An example of a fountain in construction and the completed design in Fez, Morocco (original pictures taken by the first author).

*“A similar process was performed for the vases and cups and we also encountered a craftsman who was constructing a fountain by hand (see Figure 2 above). He indicated that he had been doing this type of work for thirty years and that it generally takes him several months to years to complete the design depending on the detail required. This attention to detail is a painstaking task and requires diligent and focused effort, but one that produces unrivaled work.*”

*“One of the most impressive things we encountered was a carpet manufacturing store. These carpets were all hand-made and constructed by craftswomen who had mental images of the carpet designs without the aid of printed patterns or pictures. Using powerful hand and mind tools was obvious as these women created the carpet designs with only the thread and their imagination. The craftspeople had so much experience that they could engage with us (as much as they could) and still manage to accurately complete the woven carpet. They would knowingly select a particular color thread and count the number of strings that were hanging from the wooden loom used to create the carpets, and then place the thread in the appropriate place so that the desired configuration of the pattern is produced (see Figure 3 on the next page).”*



Figure 3: Carpet making in progress and the finished product in Fez, Morocco (original pictures taken by the first author).

*“My time in Morocco has been unforgettable, in part because this was my first ethnomathematics learning experience. My perspective of the world was enhanced through exposure to culturally relevant mathematics which allowed me to immerse myself in a new culture, exploring its cuisine, language, and people, and provided the impetus for my personal and professional development. I was able to establish a deeper connection with mathematics, and I garnered a greater appreciation and awareness of other cultures.”*

## 2.2. Johannesburg, South Africa

The second cultural immersion experience took place in Johannesburg, South Africa. In this program, participants investigated indigenous knowledge systems thriving in the daily activities of the community members. They could recognize an assortment of implicit and explicit mathematical knowledge and skills among the community members which were enabling them to make the most out of their environment. The villages visited, the Lesedi and Ndebele villages, preserve the authentic traditions of ancient civilizations and their inhabitants attend to a number of artwork forms. The significance of geometric designs in particular became apparent by an examination of a wide range of arts, crafts, and buildings (see Figure 4 below).



Figure 4: Unique designs of the Ndebele People in Johannesburg, South Africa (original pictures taken by the first author).

*“Through engaging master craftspeople in dialogues that involved description of their artwork, we discerned particular patterns or methods which they seemingly utilized to create their design. We also learned by being immersed in the practice of bead working and carpet weaving. This is evident in Figure 5 where I am engaged in constructing beadwork and am being taught the process of weaving carpets from the local expert.”*



Figure 5: The first author attended workshops demonstrating the construction of beadwork and carpet-weaving in Johannesburg, South Africa (original pictures taken by the second author).

It is important for educators to engage in these types of activities, learning from expert craftsmen. Such situations often involve growing pains as we strive to learn something foreign to us. As a result, we can better empathize with our students when they have a difficult time grasping a new concept.

### **3. Reflections**

The context in which traditional knowledge is produced and preserved is important to its meaning, and reflects the internal cognitive categories of the particular community [9]. These experiences not only have a positive impact on the institutions that sponsor study-abroad programs, but they also affect the perspectives of the teacher educators who participate. A pathway can then be created to facilitate the transfer of these perspectives to the classroom environment. As participants in immersion programs, individuals will feel better prepared to more appropriately interact with culturally diverse students, informing others in the wider community about the significance of broadening cultural awareness and perspectives.

Mathematics was evident everywhere, not only in overt ways like counting and using a compass to create the different arts and crafts, but also in the buildings and in the mental skills that some of the craftspeople exhibited. Mathematics was evident in the embroidery work as the artisan has to have a concept of space because she creates her perfectly symmetrical design from scratch (see Figure 6 on the next page). For these craftspeople, the mind is the extension of the hand and so thinking is doing and immersing themselves in the creation of their arts. These craftsmen and women exhibit great skill, skill that has been developed over a long period of time; several years and or decades in fact. The older craftspeople are considered masters and have been working with their craft since they were children (working as apprentices).

As a result of our cultural immersion experiences, we were able to recognize IKS as a well-founded research model delineating the cross cultural endeavours which are directed toward investigating and understanding the physical world. In our studies, we were afforded the opportunity to explore a broader conceptualization of what constitutes IKS in trans-cultural settings. We witnessed a myriad of practices dovetailing intellectual structures and techniques that are practiced by indigenous communities in the cause of survival. By observing the community dynamics in action, we experienced upfront the unfolding of those culturally embedded competences which em-

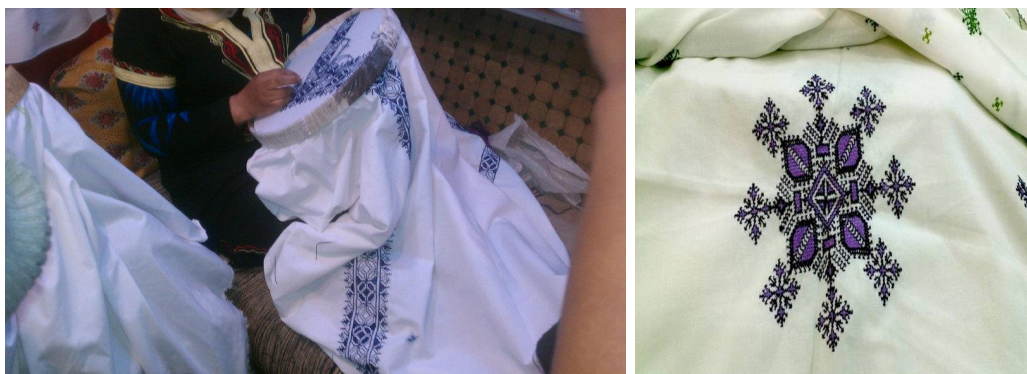


Figure 6: Symmetrical designs of the embroidery work in Fez, Morocco (original pictures taken by the first author).

power the marginalized societies and grant them opportunities for survival and self-development. Exploring indigenous knowledge systems via tasks which come from everyday settings, it was easy to learn relevant concepts in a more meaningful way. Engaging with local communities and exploring the ways in which they solved daily problems confirmed our belief that all people are capable of knowing in their own unique and personal perspectives.

Most critically, our experiences of being immersed in IKS practices sensitized us to the delicacies of what it means to be part of a different cultural fabric. Such insight has direct implications in our teaching practices as it reminds us to be mindful of the fact that children from diverse backgrounds have different modes of thinking, possess diverse perceptual abilities, and spend differential efforts on tasks depending on personal criteria which they deem useful.

Overall, the cultural immersion programs were challenging and exciting experiences which incited growth, maturity, and development.

*“Surely my perspective on mathematics and culture has been transformed, but also changed are how I see and value the world, its diverse people, and the importance of communication among all of us. This experience has equipped me with the tools necessary to significantly contribute to the ever-evolving environment that we are a part of.”*

Not only were we able to identify mathematics in different cultural settings, but this cultural immersion afforded an opportunity to participate in indulging in the dress, food and language that may be unfamiliar, but allows a better appreciation of the various cultures that surround us. This will no doubt inform our process as educators and allow us to incorporate various culturally relevant methods and activities in our classroom.

*“I was already sensitive to cultural differences because I now live in a very different culture from where I grew up and so I understand and value the significance of not only being aware of other cultures, but respecting them as well. Reflecting on my experiences, it is apparent that this combination of awareness and immersion has left an indelible mark as I make my contribution to the mathematics education community.”*

Thus we are left with the now-obvious conclusion that study-abroad experiences can be a significant part of teacher training. We surmise furthermore that such experiences should be used as a vehicle to incorporate various culturally relevant pedagogies, and to ensure that we acknowledge and support the diversity resulting from our globally connected world.

## References

- [1] E. A. Achor, B. I. Imoko, and E. S. Uloko, “Effect of ethnomathematics teaching approach on senior secondary students’ achievement and retention in locus,” *Educational Research and Review*, Volume 4 Number 8 (2009), pages 385–390.
- [2] D. Brown, *Becoming a Successful Urban Teacher*, Heinemann, Portsmouth NH, 2002.
- [3] Iman C. Chahine, “An ethnomathematical encounter: A cultural immersion of mathematics teachers in the daily practices of craftsmen in the Old City of Fez-Morocco,” *International Study Group on Ethnomathematics Newsletter* (ISGEm), Volume 5 Number 2 (2011), pages 11–13.

- [4] Ubiratan D'Ambrosio, "What is ethnomathematics and how can it help children in schools?" *Teaching Children Mathematics*, Volume 7 Number 6 (2001), pages 308–310.
- [5] G. Gay, *Culturally Responsive Teaching: Theory, Research, and Practice*, Teachers College Press, New York, 2000.
- [6] D. Kapoor and E. Shizha, *Indigenous Knowledge and Learning in Asia/Pacific and Africa*, Palgrave Macmillan, New York, 2010.
- [7] J. Kincheloe and K. Hayes, *Teaching City Kids: Understanding and Appreciating Them*, Peter Lang, New York, 2007.
- [8] H. Kohl, *36 Children*, Penguins Books, New York, 1968.
- [9] C. A. Odora Hoppers, *Culture, Indigenous Knowledge and Development: The Role of the University*, Center for Education Policy Development, Johannesburg, South Africa, 2005.
- [10] National Council of Teachers of Mathematics (NCTM), *Achievement Gap Task Force Final Report*, October, 2004. Available at [http://www.nctm.org/uploadedFiles/About\\_NCTM/Board\\_and\\_Committess/achievement\\_gap.pdf](http://www.nctm.org/uploadedFiles/About_NCTM/Board_and_Committess/achievement_gap.pdf), accessed on June 28, 2013.
- [11] B. Schultz, *Spectacular Things Happen Along the Way: Lessons from an Urban Classroom*, Teachers College Press, New York, 2008.
- [12] K. G. Tomaselli, ed., *Writing in the Sand: Autoethnography among Indigenous Southern Africans*, AltaMira Press, Plymouth, UK, 2007.
- [13] A. M. Villegas and T. Lucas, "Preparing culturally responsive teachers: Rethinking the curriculum," *Journal of Teacher Education*, Volume 53 Number 1 (2002), pages 20–32.
- [14] B. Wilson and H. D. Corbett, *Listening to Urban Kids: School Reform and the Teachers They Want*, State University of New York Press, Albany NY, 2001.