
Questions from Ethnomathematics Trajectories

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The purpose of this discussion paper is to explore and critically reflect on trajectories of ethnomathematics in research practice. This begins with our own narratives followed by an overview of ethnomathematics within MES conversations as empirical data. From these, we raise questions focusing on the place of ethnomathematics research and practice and on what this says about our academic culture/community.

Introduction

Our conversation (David and Annica) about ethnomathematics began at the international conference MES₇, where we attended the same focus group discussing Swapna Mukhopadhyay's (2013) plenary talk, which was based on her ethnomathematical work with ship builders. We noticed that the two of us shared similar experiences of mathematics, culture and (not conducting) ethnomathematical research. We continued our conversation and decided that the place of ethnomathematics in the field warrants more discussion at MES. The questions we asked ourselves initially were "Why are we not doing ethnomathematical research, given our interest in it?" and "In what other ways have we tried to address cultural issues in our 'adapted' or 'accepted' research and teachings?" These questions developed over time. In this paper we draw on our own research trajectories in relation to ethnomathematics and connect these with the trajectory of ethnomathematics research in the field, focusing on papers accepted in the prior MES conference proceedings. We use this as a platform for making observations and raising questions about the research discourses that dominate the research field today.

Narratives of Experience With(out) Ethnomathematics

We begin with the narratives we wrote for each other — accounts of our trajectories in relation to ethnomathematics, including the questions that arose from our experiences. We include accounts of context in our narratives in recognition that our experiences and ideas are culturally situated. The third narrative gives an overview of development of ethnomathematics as expressed within MES conference

David's Trajectory

When people outside the field ask me about my work in mathematics education, I usually position my work in relation to the observations that propelled me into focused reflection on my work as a mathematics teacher. For example, this excerpt comes from my autobiographical statement on my website (<http://davewagner.ca>).

Prior to doing my PhD [...], I taught grades 7-12 mathematics in Canada for six years and in Swaziland for two and a half years [...]. It was the experience of teaching mathematics in Canada, then Swaziland, then Canada that *alerted me to the highly cultural nature of mathematics teaching, which I had thought was culture-free and values-free*. This experience prompted me to leave teaching to investigate the cultural nature of mathematics.

My commitment to investigating the cultural nature of mathematics was strong enough to convince me to take the financially difficult step to become a graduate student, which involved giving up my secure, enjoyable teaching position.

At the outset of my graduate studies, I was most drawn to the work of Ubiratan D'Ambrosio and Ole Skovsmose. D'Ambrosio's articulation of the cultural nature of mathematics bolstered my confidence that this warranted attention, and he gave me words to talk and think more about this ethnomathematics. Skovsmose, a critic of ethnomathematics (though I didn't know it at the time), did similar work to D'Ambrosio in my eyes. He challenged the orthodoxies of

mathematics education (and here I refer to widespread societal views of mathematics teaching and learning but his challenges also applied to the research community).

I come from a rich tradition of orthodoxy challengers. In addition to my mathematics education identity, I self-identify as Mennonite. This is a Christian denomination that emerged after the reformation in Europe. Reformers challenged the authority of the Roman Catholic Church and set up contesting churches, still structured hierarchically but aligned with different political powers. The Radical Reformers, including Mennonites, said that the Reformation did not go far enough because the reformers depended on and sustained political/military authorities. Early Mennonites rejected the shackles of even the new authorities. This ethic permeated my upbringing; my parents regularly questioned traditions vocally in private and respectfully in public. I have also come to realize that academic mathematics carries a rich tradition of orthodoxy challenges. I have written about this in a few places, including my essay “If mathematics is a language, how do you swear in it?” (Wagner, 2009). Here I characterize mathematics as a tradition that questions conventional ways of seeing, invents new spaces with alternative rules, and often finds that these invented spaces have descriptive power in the “real world” (e.g., Wagner, 2009).

I notice that my orthodoxy challenger spirit has continued to underpin my research and writing. But I ask what sidetracked me from my strong interest in ethnomathematics after I observed its tenets myself, and read about it voraciously in my early graduate studies. I blame the charisma of David Pimm for this. “Blame” is probably not the right word. His insightful observations on language practices, supported by his generally attentive, generous, and respectful character, got me seeing that language is the medium of cultural development. While ethnomathematics notices differences among cultures and their forms of mathematics in particular, where and how would these distinctions arise? These forms of mathematics would have arisen in community interaction, which is by nature mediated through language.

Nevertheless, immediately after completing my dissertation research, which was focused on language practices in the classroom, I embarked on some ethnomathematical research. At the same time I continued with my interest in language and communication. I found publishing the work on language much smoother than the work on

ethnomathematics. So I reflect here on the reasons for my difficulties in developing the ethnomathematics stream of my work.

The first challenge I encountered was the need to develop deep relationships with the people with whom I would work. Looking back, I feel naïve for not realizing the (extent of the) necessity of this. Ethnographic work, including ethnomathematics, takes a much larger time commitment than other forms of research. This discrepancy had a significant impact on choices of where to devote my limited temporal resources. Early career positioning, with the expectation to show results, exacerbated this pressure. I was fortunate to have a PhD student (Lisa Lunney Borden) who had a long-standing connection with Mikmaw (an Aboriginal group on the Atlantic coast of North America) communities and who embraced ethnomathematics. Her relationships facilitated my/our ethnomathematical work.

Second, doing the ethnomathematical work, I myself had questions about the validity and appropriateness of it. I found that these questions aligned with some of the critiques in mathematics education literature from people not doing ethnomathematical work. Lisa and I tried to address the challenges in our approach to the work, and also wrote about them from within the work. However, we often felt short-changed because our choices in relation to those tensions cut us off from the data that would have made publishing much easier. In our conversations with elders and teachers, together we chose to encourage community children to interact directly with elders regarding their mathematics instead of us doing this ethnomathematical work and positioning ourselves as mediums of this community knowledge (Wagner & Lunney Borden, 2012). Publication was challenged because we were not the ones doing the ethnomathematics. Instead we wrote about the development of the conversation about negotiating this space.

Third, in Canada and elsewhere there is a view among many First Nations scholars (and argued against by others, including Battiste, 2013) that it is inappropriate for research relating to First Nations communities to be published without a First Nations author. Lisa and I found this frustrating because our submissions to journals that were most appropriate for our work were discounted at the outset by this ethic. We understood the viewpoint and found it somewhat valid, because it is dangerous for outsiders to research and write about a community without the participation of local people. However, in

our work the community leaders wanted us to publish and did not want to co-author (except for one book chapter that is still in process), especially not as a token author! Again, publication was challenged.

Fourth, I have heard scholars, whom I otherwise respected, discount ethnomathematics, saying it has been roundly critiqued. I am disturbed by the weight of these critiques done by people who do not conduct ethnomathematical research.

Ethnomathematics addresses from an equity standpoint the heart of the question that plagues equity researchers in mathematics education: where is the mathematics? Indeed, ethnomathematics turns that question around and asks it of the mainstream. Thus it saddens me to see marginalized this idea that has the potential to strike at the fundamentals we may not feel ready to challenge.

Annica's Trajectory

Yesterday I slowly walked around admiring the beautiful art pieces and handicrafts made by Canadian First Nations artists at the UBC Museum of Anthropology in Vancouver. While I was moving through the museum I reflected on my personal deep interest in culture and anthropology and what impact this interest has on the work I do and have done as a researcher in mathematics education, a teacher educator and a former upper secondary school teacher. I will in this narrative strive to make a reflection of how these different contexts affect my trajectory as becoming researcher, the decisions I took along the way, and why these decisions were taken at particular points of time. Ethnomathematics is part of that story.

During all my years teaching mathematics in Swedish secondary schools there were issues that disturbed me. I met a large number of 15-year old students whom, on the very first day I met them, told stories about not feeling well in mathematics classrooms, disliking the subject, or even hating it. These students had an interest in social sciences, humanities, and language but usually disliked mathematics and did not recognise the possibilities that mathematics knowledge may offer them. I asked myself why so many students had these not-so-good experiences of prior mathematics education. Being a teacher I continued to reflect on pedagogy — why is mathematics not naturally connected to other school subjects or present societal topics?

Especially in the social sciences where there are such rich possibilities to connect mathematics with culture, humanities, and the arts.

At that point in time I strived to develop my teaching whenever possible, and place the mathematics in a cultural or societal context to show the cultural and societal connections. Once I even managed to raise some money to bring two classes to an art exhibition focusing on Australian Indigenous people's maps as art. The students explored different aspects of maps, scales, time, and time flow and how these can be expressed mathematically from diverse cultural perspectives. Social science and language teacher colleagues labelled me "the crazy math-teacher" with a smile. I took that as a compliment, but it also prompted me to reflect: in their subjects teachers are expected to contextualise the subject outside the classrooms, but when done in mathematics, people reacted as though this is strange. I loved the students' comments, such as, "It is actually fun to have a teacher who *knows* something other than maths." Such comments indicated their view both on the subject and on us as mathematics teachers. For me, to be able to reach these students, I explicitly showed and discussed in class that mathematics is a culturally developed subject (as is the teaching), its societal importance, and the power that is connected to the subject. The insight grew in me that mathematics and mathematics education are not values-free.

These insights challenged me to go back to University and hence I became a post grad student. In a master program thesis I further explored relationships between culture, society, and mathematics teaching. With energy and happiness I read the work of Ubiratan D'Ambrosio, who gave me arguments to support ideas I had been developing already. Alan Bishop's book on mathematical enculturation, and Ole Skovsmose's critical writings became food for thought. These readings were eye-openers but also gave me a language to express my concerns of mathematics and for the teaching of mathematics as a culturally developed and situated subject.

My first experiences of mathematics education research hence connected with my cultural interests, anthropology and ethnography. The studies of ethnomathematics, ethnomathematical theories, and the critique of ethnomathematics in combination with a developed way of teaching made me fortunate too. I received two large scholarships within two years. The first made it possible to attend the International Conference on Ethnomathematics (ICEM) in Auckland in 2006. I

was challenged by the deep and honest interest in culture and its connections with teaching of mathematics and the important associated political questions discussed at this conference. I believe that ICEM is the conference that gave me inspiration for continuing into further academic work and research. Second, I got the opportunity to be a research assistant with Kay Owens and spent time with her in remote villages in Papua New Guinea. Her research interest was geometry, specifically area calculations. Hence, we interviewed and filmed house building, gardens/farming, etc. to gather knowledge to be used in Papua New Guinean teacher education to connect the school mathematics with the children's experiences from home. There is a large body of ethnomathematical research with these purposes from all over the world, but also a growing body of critique, especially political critique that is important to recognise. Summing up, for me personally this was the time when I discovered the impact of understanding mathematics teaching as the culturally developed subject it is and the politics of mathematics education.

So, I started to formulate research questions and write research-funding applications. However, I was advised by caring professors in the field to leave my ethnomathematical ideas out if I wanted funding, even though I showed awareness of the political issues and complicated concerns when conducting ethnomathematical research. It seemed that ethnomathematical research was not accepted. When Paola Valero asked me if I wanted to join her research group in Aalborg I decided to leave ethnomathematics for the time being. I was grateful for this opportunity in my life to address the societal and political concerns for mathematics teaching. I became a PhD fellow in Denmark and wrote a thesis focusing students' identities and agency in mathematics education contexts inspired by concerns raised in critical mathematics education (Andersson, 2011b; Andersson & Valero, 2014).

In 2011/12 I had the opportunity to teach in a diploma program for in-service mathematics teachers in Greenland. Again, I worked in a different culture — sharing and discussing research in mathematics education with Inuit teachers. The issues they brought forward were in some cases very different from the ones recognised in “Western” research literature. I would have liked to conduct research with these teachers further; they had a number of ideas on topics they wanted to research concerning cultural and language challenges. However,

in order to do that, administrative support was needed from both Greenland and Denmark, which was not possible for me to get at that time, as a Swedish national, an outsider.

I continue to reflect on the challenges I experienced. First, ideas, results, and discussions originating in ethnomathematical and cultural research are also applicable in “Westernised” mathematics classrooms. I developed these ideas together with Elin, a mathematics teacher who talked about herself as being a “Curling teacher” (Andersson, 2011a). My experiences allow me to argue that there is value in raising discussions in schools and universities about understanding mathematics and mathematics teacher education as culturally developed and situated.

Second, following from point one, I believe that research addressing ethnomathematics from various perspectives should be discussed in teacher education courses *in parallel with* other research that is already prominent and mainstream. Becoming teachers should have had rich and colourful possibilities to reflect on the cultural development of *both* mathematics and mathematics education. This is not the case in the Swedish university contexts I know today.

Third, I reflect more generally on experienced resistance for ethnomathematical research. There seems to be a resistance for granting funding for ethnomathematical research. There is also a resistance to address specific ethnomathematical research in mathematics teacher education courses as discussed above. Ethnomathematical research might be more accepted when rephrased as language research, diversity research, critical/political research, social justice, equity research, etc. The ethnomathematical umbrella covers diverse topics from cultural and anthropological perspectives. The important critique has been heavy and well accepted in our community however the result seems to be a resistance towards ethnomathematics, a resistance I believe neither serves further theorisation, epistemological discussions, nor the critique of ethnomathematics. The resistance does not serve becoming mathematics teachers either. All these are political dilemmas — tensions and possibilities that compel further open and lively discussions.

Ethnomathematics Trajectory at MES

The first MES conference was convened in 1998 (using the acronym MEAS to emphasise the word “and” in Mathematics Education and Society). This was followed by six conferences located in Europe, Australia and Africa. There have been three plenaries that explicitly focused on ethnomathematics; D’Ambrosio’s (1998) plenary at MEAS; Powell’s (2002) reflections on “Ethnomathematics and the challenges of racism in mathematics education” in MES₃ and Mukhopadhyay’s (2013) talk “The mathematical practices of those without power” at MES₇. However, a number of the plenaries addressed ethnomathematical research in an implicit way; cultural aspects of mathematics education and learning are overtly addressed in almost all plenaries. At MEAS there was a symposium on “Ethnomathematics and Critical Mathematics” led by Powell, Knijnik, Gilmer and Frankenstein. This symposium discussed tensions within ethnomathematical research, specifically tensions regarding the “exotical” and the “critical” strands, to use the authors’ words. In a very powerful discursive way, these tensions seem to be underpinning the accepted papers, plenaries and critical discussions throughout the MES conferences.

Regarding the papers accepted for proceedings in the conferences, we first identified the papers that had the word “ethnomathematics” and its various grammatical forms as a way of tracing the development of it within the conference. We found no clear pattern or trend, as the successive conferences had 18%, 5%, 11%, 3%, 18%, 16%, and 10% of their papers including the word or its stem. Nevertheless, these numbers should be read cautiously. A high number of the papers in which we found the word “ethnomathematics” were not focusing on ethnomathematical research in particular; the word was only used once or twice in these papers. In an even higher number of papers the word or a form of it was present *only* in the reference list.

We became increasingly interested in the papers that did not use the word “ethnomathematics” though they might have. In other words, papers that report on work that could be connected to ethnomathematical work but in which the authors did not mention ethnomathematics intrigued us. Thus we considered other words we might search on to identify patterns in such papers as various forms of “culture” and “anthropology”. By contrast to the word

“ethnomathematics”, the word “culture” and/or “cultural” are present in almost all papers. It has been used in a variety of contexts, usually in a nominal way, with no theorization of culture or the place of culture in mathematics. “Anthropology” was hardly found at all.

We took the analysis one step further in those papers where “ethnomathematics” was found more than one time in the text body. Some different possibilities emerged for categorisations. Not surprisingly, the largest number of these papers used ethnomathematical research to justify and/or position their own research, and/or, in a few sentences, show awareness that ethnomathematics exists. Fewer in number specifically grounded the research in ethnomathematical theories. There were also papers that talk *about* ethnomathematical research; they may argue that ethnomathematical research is important, should be done with care and awareness, or raise concerns — for example against possible exoticism or, as in the case of South Africa, concerns about the ghettoization. What we can conclude is that almost all papers raise concerns about cultural aspects and/or particular cultural groups, however, the number of papers addressing, critiquing, or discussing ethnomathematical research explicitly is low at the MES conferences.

Reflecting on the Trajectories

Our distinction between work that is *overtly* versus *possibly* ethnomathematical required consideration of a working definition of the term. We talked about the definitions given by the progenitors of ethnomathematics and the various ambiguities in these definitions. For example, D’Ambrosio (1985) referred to a “defined cultural group” and we noted the challenges of trying to draw bounds around a culture to clarify whether or not a practice is particular to the culture. Though Bishop (1991) does not refer to ethnomathematics explicitly, his list of practices worth investigating to find mathematics is used extensively by ethnomathematicians: counting, measuring, locating, explaining, designing, and playing. We chose to use these categories to identify papers in the category of “possibly ethnomathematical.”

In order to be even possibly ethnomathematical we felt that research needed to address both culturally-specific practices and values. To do this we challenged the boundaries among Bishop’s

categories. For example, we, and our students, have wondered what makes counting distinct from measuring. One way to make a distinction is between counting discrete objects and counting an artificial comparison (i.e., units of measure). Thus categorization is at the heart of counting because we have to decide which objects are “like” each other in order to group them. Categorization can be done in various ways, and it is often (perhaps always) political — Who counts? Who doesn’t? — and thus an expression of some cultural milieu. Measuring is also political because it involves direct comparison among things or indirect comparison to some normative unit. This too is political and an expression of some cultural milieu. Locating requires points of reference; either a normative point such as an origin, or relative positioning (see Wagner & Herbel-Eisenmann, 2009 for this distinction used metaphorically). Positioning then is political because it involves choices of what to use as reference points. These fields of activity cut across values that are expressed in language, which includes language registers (and other forms of representation) in design, which indexes the values of desire (what do we want?), and in play, which indexes the values of aesthetics (what do we find beautiful?). This all relates to local resources that comprise the context of a culture because sensory experiences with landscapes and materials impact choices and constructs.

We use this elaborated definition to reflect on the larger narrative of our research presented in this paper. To analyse ethnomathematics in the field, we *counted* papers that mention ethnomathematics. This was easy enough to do with search engines and thus seemed rather clear ... until we started looking at the papers. We felt that other papers did ethnomathematical-like work without mentioning the word, and we knew that a discussion of these papers is part of the story, just as our individual non-ethnomathematical research (as described in our personal stories) shared common values with ethnomathematics. In order to count papers, we had to categorize in some way and thus distinguish among nominal use of words, significant use, critique, etc. Whatever counting we did could not be objective — it referenced our scholarly values of what is desirable or appropriate. Our counting is situated in an academic culture. It is an ethnomathematical practice.

We do not want to reserve ethnomathematics for the analysis of exotic cultures. Critical mathematics education is also

ethnomathematical in several aspects. For example, Gutstein (2010) reports on his action research in a classroom in which “reading and writing the world — with mathematics — were very much the agenda” (p. 272). He carefully described cultural aspects of the classroom, thus he led a particular form of ethnomathematics. This may be different from analysing ethnomathematics in a culture in which the researcher is not actively taking part. As another example of interpreting culture broadly for potential ethnomathematical work, we would place any work on language register as ethnomathematical. For example, Zolkower & de Freitas (2010) “guided [teachers in the] deconstruction of whole-group interaction texts selected as paradigmatic instantiations of this genre” (p. 509). Their attention to a genre, which is a part of the mathematics classroom register, would seem to place the work in a culture, but their reporting does not connect the language practice to the culture. We wonder whether this omission disqualifies the work as potentially ethnomathematical, or whether it would be more accurate to describe it as a poor example of ethnomathematics (and we note that some of our own work would have to be in that same category).

Our thoughts about the heart of each practice also prompted questions about locating. In particular, we asked where is ethnomathematical work done and where is it critiqued? More accurately speaking, we were interested in who (or what *category* of researcher) was saying what in relation to ethnomathematics. Generally speaking, explicitly ethnomathematical work has been done in colonized settings. By contrast, also speaking generally, the critique of ethnomathematics has been done by people of colonizer cultures (with the exception of people from South Africa, who have raised concerns about the ghettoization of people groups, arising out of their experiences of Apartheid). To save space and face, we will not point to particular papers to justify these two generalizations, leaving the possibility of affirmation or exception in discussion at the conference. Nevertheless, we need not save our own face and thus we point to ourselves as examples of White people of European ancestry interested in and having done ethnomathematics in colonized settings.

Questions for Discussion

Our narratives of our two separate trajectories in relation to ethnomathematics, along with our field's trajectory within MES and our joint analysis of these trajectories lead us to summarize questions that we believe warrant discussion at MES:

1. Looking behind/underneath the critiques, what motivates educators to resist explicit reference to ethnomathematics in the academy and in schools?
2. For mathematics educators and students who are drawn in by ethnomathematics (such as ourselves), how does it satisfy deep needs/values?
3. In what ways do current critiques of ethnomathematics also apply to other mathematics education research (especially socio-cultural research)?

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