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BREAKING IMAGES

ICONOCLASTIC ANALYSES OF MATHEMATICS AND ITS EDUCATION

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10. A performative and relational Ethnomathematics

Aldo Parra

This chapter presents a reconceptualisation of the Ethnomathematics research field, as composed of a series of contingent and purposefully constructed relations between mathematics and culture. This reconceptualisation is useful in formulating a non-essentialist positioning on the nature of mathematics without adhering to cultural relativism. An overview of research experiences on Ethnomathematics is made to illustrate how the reconceptualisation emerged and what are its implications and potentialities, particularly on controversial issues for Ethnomathematics, like mathematics ontology, research validation, and the roles of researchers.

Since its inception as a movement, those working on Ethnomathematics have expressed two of their aims: to question the modernist narrative of triumphalism and uniqueness that surrounds academic mathematics, and to address the geopolitical repercussions that such epistemic prestige has had. Ubiratan D'Ambrosio stated: 'We should not forget that colonialism grew together in a symbiotic relationship with modern science, in particular with mathematics and technology' (D'Ambrosio, 1985, p. 47).

The intense history of definitions and redefinitions of Ethnomathematics is also a history of how the field has tried to achieve those two aims, sometimes providing accounts of mathematical knowledge and its nature. This has created a kind of expectancy towards Ethnomathematics to address and solve an ontological question on mathematics. Such an intended definition would provide a clear-cut characterisation of what is (or is not) mathematical, and would allow us to recognise several cultural knowledge(s) and practices

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as having significant mathematical elements embedded in them. As Ethnomathematics has not reached such a definition yet, it can be discussed to what extent the field has been successful in contesting the narrative of supremacy of academic mathematics through the methods and frameworks that the field employs.

Criticisms of a philosophical nature have been raised against Ethnomathematics. In particular, it has been accused of not having a clear account of mathematical knowledge, and falling into a cultural relativism (Horsthemke & Schafer, 2007; Rowlands & Carson, 2002). It is natural to ask, therefore, if it is possible to reject an essentialist account of mathematical knowledge without adhering to cultural relativism. To what extent does the recognition of multiple and incommensurable forms of mathematical knowledge entail a 'particularism that precludes the possibility of construction of translocal relations' (Savransky, 2012, p. 358)?

Criticisms of a political nature have been raised as well, particularly about the ways of empowering and dignifying populations being discriminated against and minoritised through mathematics (Pais, 2013; Vithal & Skovsmose, 1997). The debate emerges within the tension between the rights of minorities not to be marginalised and their rights to be treated differentially.

Researchers such as Bill Barton (1996b, 2008), and, more recently, Roger Miarka and Maria Bicudo (2011) have characterised the ways in which representative ethnomathematicians conceptualise mathematics and its relation to the field. Such characterisations not only highlight the diversity of backgrounds and positionings of influential practitioners, but also help to prefigure an ethnomathematical approach towards mathematics that can address expectations and respond to pertinent questions.

In this chapter, I attempt to summarise such an approach for Ethnomathematics,[1] asserting that, in order to succeed in its goal of overcoming modernist accounts of mathematics, the field does not need to produce a stable, finished, non-self-referential, and free-of-doubt definition of what mathematics is. I contend that rather than look for a modernist answer, Ethnomathematics can forge a decolonial answer.

1 A fully detailed version of the theoretical position was presented elsewhere (Parra, 2018).

Decolonial studies meet Ethnomathematics in their concern for the assemblages of knowledge and power. Within this chapter, I formulate a particular understanding of the Ethnomathematics program as a decolonising program, that vindicates performativity, interaction, and non-essentialism as values to be promoted in the quest for new insights on mathematics as a manifold of culture-based practices that change over time. An overview of recent experiences of Ethnomathematics research is provided to exemplify how such values operate.

Mirar y no tocar se llama respetar[2]

During the Q&A session at a Colombian seminar on Ethnomathematics in 2020, a concerned student asked: 'As Ethnomathematics aims to extract the mathematics present in a certain community, is it okay to transform it? Should I change it?' His sincere question reveals an underlying assumption that I want to highlight: a certain apprehension about intervening in ancestral or vernacular knowledge that is seen as mathematical. This fear emerges because the ethnomathematician's regular work is supposed to be a recognition of knowledge, wisdom, and practices of mathematical nature, that occur in non-conventional or non-academic environments, and are collected to be reported within academic agoras. Such regular work is visible in two types of studies intensely practiced in Ethnomathematics.

A first type is composed of studies revealing knowledge and practices of the past, through descriptions of the characteristics and circumstances of a past event or issue (e.g., how land was measured in a certain place or how an object or food was manufactured). Such methodological procedures generate products that resemble necropsies or archaeological reports and therefore the work of the ethnomathematician emulates that of the forensic scientist or archaeologist.

The second type consists of the non-participant observation of practices that are currently occurring in some group or community (e.g., the preparation of a typical meal, the mathematical knowledge of a gardener or a locksmith, or the locating practices of blind people

2 This is a popular saying in Colombia that can be translated as 'respect is about watching without touching'.

or Indigenous children). Here the documents are similar to a chronicle issued by a special correspondent who reports 'from the scene'. Thus, the profession of the ethnomathematician is related to that of the journalist, or the classical ethnographer, who brings news from exotic places.

The two types of studies converge in that the knowledge and practices investigated pre-exist the specific research. That is to say, when the ethnomathematical researcher arrives in a community, the emergence of non-classical mathematical ideas has already occurred within that community and he comes *a posteriori* to identify and record that exceptional practice. The event, which is neither scientific nor academic, is mathematical to some extent, in some particular sense. The researcher comes to admire and *contemplate* epistemological diversity, but not to create or extend it.

This bucolic image of contemplative admiration has been taken for granted by many scholars when describing Ethnomathematics. My task in this chapter is to break that image, by noticing some of its limitations and also by presenting: (i) an alternative interpretation of what kind of action underlies an Ethnomathematics research; (ii) an exploration of what things research could make possible by making such actions deliberate.

In order to contest the perspective that conceptualises non-Western rationalities as obsolete and in need of upgrading, by imagining a modernist *I* and an inferior *Other*, ethnomathematicians look for the recognition and appraisal of types of knowledge coming from diverse worldviews. A distinctive feature of contemplative admiration is the set of ways in which assumed knowledge diversity becomes recognised. According to this admiration stance, Ethnomathematics is performed by a 'civilised *I*' that needs to expand their scientific/positivist notions of mathematics and knowledge. Meanwhile, the *Other* (Indigenous, peasant, etc.) is discouraged to engage in the reciprocal move, because they will be harmed in their way of life when coming into contact with disciplinary practices (formal mathematics). They must be confined in a source of epistemic purity, an otherness that is not polluted with Cartesian categories.

Such muted Others and their sublimated otherness are necessary to claim that ethnomathematicians are 'giving voice', 'recognising wisdom', and 'valuing knowledge'. They are also needed to establish the debates

around whether the 'literate *I*' can/should use their mathematical gaze to describe cultural practices and whether the academic audience can trust in their descriptions and representations. What underlies the reflexivity debates unleashed by contemplative admiration is the conception of Ethnomathematics as an academic endeavour, in which local communities gets a social impact due to the in/exclusion led by the scholarly trained ethnomathematician. The latter has the main role, as the one who contemplates, defining the times, methods, goals, and written results of the research, who will represent the targeted otherness and finally grasp the 'emic' perspective, by the ethnographical procedure of 'being there and writing here'.

Besides the reductions of Ethnomathematics to the academy, and of ethnomathematicians to classic ethnographers, contemplative admiration brings us another limitation, namely the framing of the ontology of mathematics. This aspect is also related to the sublimation of otherness and becomes explicit when certain techniques or models are designed to extract and elucidate the mathematical component of a cultural practice (Albertí Palmer, 2007; Uribe Suarez, 2021), as if certain mathematical attributes were hidden in an artefact, ritual, or practice. Therefore, the discussion is ontological, in order to establish whether the studied cultural practice is mathematical or not. No matter if by 'mathematical' we understand a disciplinary object that belongs to a 'near-universal, conventional mathematics' or a notion coming from a local 'system for dealing with quantitative, relational, or spatial aspects of human experience' (Barton, 2008), the central task is to contend that the practice possesses the attribute.[3]

If ethnomathematicians assume that their work is to contemplate an event until they can determine whether it represents 'the mathematics of cultural practices', then they must be very clear which essence they are seeking. Thus, they need to delimitate what qualifies as mathematical knowledge, or, more precisely, what constitutes 'doing mathematics'.

In order to not fall into a quasi-Platonic universalism, some ethnomathematicians have opted to look for an epistemic relativism in which there are several ways of knowing, according to each culture. Then, such ways would be the '(Ethno)mathematics' of the place and

3 This means that the two theoretical views of the Ethnomathematics that Albanese et al. (2017) proposed are just variations of the same contemplative approach.

the field of Ethnomathematics is the study of those many ways of knowing. When trying to explain how different cultures have found similar results, this trend takes the Wittgensteinian notion of 'family resemblances' to avoid a ground zero for mathematical knowledge, and formulates that several forms of life share and communicate some characteristics, and therefore, their ways of knowing can converge in some matters. Although this theoretical displacement is interesting, as it avoids certain forms of essentialisation, it cannot entirely escape a sense of contemplative admiration, since it leaves open the question of how (and why) a family resemblance is noticed. I wonder if Wittgenstein would agree that a resemblance can be discovered.

The last thing to say in this section about contemplative admiration is that even if its two types of studies (archeological and non-participant) seem to represent an important amount of Ethnomathematics research, they hardly cover the vast diversity of approaches and methodologies explored. Many astonishing works (e.g., Alangui, 2010; Borden, 2013; Cauty, 1999, 2001; Knijnik, 1998; Meaney, Trinick, & Fairhall, 2012; Mesquita, 2010; Oliveira, 2013) go far beyond the idea of reporting exotic practices. All of these long-term and well-established research programs share a commitment to working with local communities around mathematics and local knowledge in a creative way that puts communities' interests and agendas face-to-face with academic goals. Interestingly, it is remarkable how critiques of Ethnomathematics do not comment on work of this nature, although authors like Gelsa Knijnik and Mônica Mesquita have been presenting them since the beginnings of Ethnomathematics, and scholars such as Wilfredo Alangui and Tamsin Meaney are increasingly being referenced within the field nowadays. I wonder if these works are left aside because they would be counterexamples to the idea of cultural statism and the sublimation of otherness, which is so much projected onto Ethnomathematics by its critics.

Outsiders at the centre

Considering the handful of experiences that disrupt contemplative admiration, in my search for a different explanation of Ethnomathematics and its affordances, I realise that a salient characteristic has been the

human relationship between researchers and the communities over time. Authors and communities become engaged and collaborate in diverse affairs that are often not bound by the limited scope of an isolated research project; they build and sustain a bond not mediated by reports, deadlines, or institutional funding.

This depth of engagement shapes the researcher's perspective in such a manner that the published research constitutes just a brief part of a broader life experience rooted in partnership. In these collaborations, communities seek to develop and produce a variety of outcomes – such as loan applications to banks for some Movimento Sem-Terra (MST, Landless People Movement) peasants, demonstrations advocating for unpolluted water in Costa de Caparica, or school commemorations of ancestors' arrival by boat in Aotearoa – that demand the use of some academic disciplinary mathematics, prompting the scholar to offer explanations. Scholars do not have a god´s eye view, nor can they alone decide the times, spaces, participants, goals, and outputs of the experience. They need to understand each community´s aims, desires, and ways of thinking about the situation of interest and also the official mathematics it embodies; then, they must translate, mediate, and articulate the two types of perspectives in order to collaborate within a collective learning environment that enhances the community's abilities to participate in social and public debates according to their own organisational style and perspective.

An important point to note here is that scholars do not 'represent' or act 'on behalf of' communities. Instead, they must find out a way to collaborate in the creation of a new, organic communitarian knowledge that can effectively embrace the external (institutional) knowledge required by the situation. They are urged to provide neither a mathematical model of a vernacular practice, to be understood by public officers, nor an insider model of the same practice. Accordingly, concepts such as emic/etic or situated mathematical interpretation seem insufficient, as the tasks are not about representing local ideas for a global audience, or the reverse, and not about one individual acting an enlightened medium. Instead, the focus is on about fostering collective learning, igniting local processes of interpretation, discussion, adaptation, appropriation, and mainly *creation*.

It can be many things, but not anything

If contemplative admiration falls short in describing these styles of research and interaction, and the works are definitely fulfilling the ethical, social, and political call of Ubiratan D'Ambrosio, what is it, then, that they are doing with the knowledge and mathematics involved? Well, by trying to answer this question I have found an idea that can be useful to theorise the activity of the ethnomathematical field, in a way that can overcome some of the limitations and address new challenges.

One guiding notion cuts across these experiences. When the Kwibi Urraga Laboratory in Colombia was trying to translate an algebra book from Spanish to an Indigenous language, and when the Maori Language Commission of New Zealand was engaged in creating a dictionary of mathematical terms in Te Reo Maori, they were not creating meanings for words that would express in a complete way all the formal syntax and semantics of the mathematical formal objects they were dealing with. Rather than hoping to solve the epistemic mismatch between a formal discipline and an Indigenous knowledge system, they attempted to build a mathematical register, a trustable framework of communication within which to negotiate meanings. They did not achieve the submission of one worldview to another 'more complete' worldview. Better than that, they succeeded in establishing *relations* among elements coming from diverse knowledge systems.

In a similar manner, when peasants of the Brazilian MST compare and contrast their own techniques for measuring the volume of wood planks with official techniques (Knijnik, 2007), they put their ways of knowing into *relation* with those coming from 'book mathematics'. Not to substitute one technique with the other, but to 'broaden not only their mathematical world, but also their ways of seeing the complex social relations involved in different *forms of life* that produce such different *language games*' (Knijnik, 2007, p. 16).

To summarise, Ethnomathematics builds relations. Relations among institutional disciplinary mathematics and local ways of knowing. Relations among their languages. Relations among knowledgeable people of diverse traditions and places.

Thus, one ethnomathematical research project is an effort to raise, explain, and share relations among certain objects or practices of two

different knowledge systems. Relations can be traced from the cultural knowledge system of a group to the realm of mathematics, for instance when Alangui connects Philippine rice terracing practices with a system of ordinary differential equations (Alangui, 2010). Relations can also be proposed from the realm of mathematics to the cultural knowledge system of a group, as in the description of geometrical relations made by Miguel Andrés Gutiérrez (2019) through concepts of Colombian folk dancers.

When researchers formulate a relation, they need to engage in a debate on the plausibility, pertinence, and utility of the relation. Debates of this nature demand the interaction of several stakeholders and scenarios that have the legitimacy to sanction the relation as acceptable or useful. During the examination of the potential relation, new kinds of learning emerge, and re-elaborations and translations are needed (an epistemic re-arrangement). New personal relations among people of diverse backgrounds, values, interests, skills, certainties, and foregrounds are also established (a political re-arrangement). These re-arrangements are the most substantial part of the research process, more important than the original relation proposed. Because what is at stake in the process is the power to change cultural and mathematical practices. When the examination ends, whether or not the relation was accepted or rejected, an educational experience has occurred, expanding the boundaries of what is assumed to be meant by mathematics and culture, at personal and collective levels. In short, we are less interested in the prey (an ethnomodel suspected of being pareidolic) than in the hunt (a deterritorialization that certainly happened).

Contemplative admiration has misled us into thinking that Ethnomathematics was about uncovering hidden attributes, an act of discovery, a quest to answer ontological questions like: Is this cultural practice a mathematical object? Is this mathematical practice legitimately cultural? By contrast, a relational approach knows that relations are neither given nor automatic because they live in the realm of potentiality. Their formulation implies a creative act, a performative challenge of what could happen if we operate with this? What understandings are unleashed by accepting this relation?

After this explanation of the main features of a relational theorisation, I will describe some values associated with it that are useful for addressing the limitations of the contemplative admiration approach.

Re-visiting ontology

As stated earlier when describing the question of mathematical ontology, ethnomathematicians have rejected the metaphysics of Platonist accounts by appealing to a conventionalist approach that leads them to assume cultural/epistemic relativism. The growing interest in Wittgenstein (Albanese, Adamuz-Povedano, & Bracho-López, 2017; Barton, 1999; Knijnik, 2012; Vilela, 2010) proves that appeal. The notions of *mathematical language games* and *family resemblances* have emerged as useful to explain the convergence of different cultures to some mathematical results. Barton gives us a key insight here into the role of relations in his resemblances:

> What happens when different mathematical systems meet? Wittgenstein's answer is that there are no 'gaps' in mathematics. Each system is complete at any moment. It is not waiting to be added to with new mathematics. Thus (Shanker, 1987, p. 329), any connection between two worlds is not in the same space as either of the worlds. The interconnections are not waiting to be discovered. We choose whether or not to make connections between systems, and if we do then the connections create a new system. (Barton, 2008, p. 130)

With this excerpt, Barton helps us to understand how family resemblances among mathematical language games work and what they produce. We identify resemblances because we want to do so, because we have the will to find them, the need to use them, and an interest in making comparisons among seemingly unrelated things. The resultant thing is a new system, an expanded version of mathematics, and/or an enhanced cultural practice. This insight is crucial because it stresses how culture and mathematics are historical, an idea that Luis Radford has also stressed:

> There is no regulatory, universal reason. The reason is historical and cultural. Their specific forms, what Foucault calls *epistemes*, are conditioned in a way that is not causal or mechanical, by its nesting in

> the social and political practices of the individuals. (Radford, 2016, p. 36, italics given)

> The concept of culture that Marx elaborates indirectly in his writings is, in fact, profoundly historical and transformative. Individuals create culture and, in a reverse or dialectical movement, culture offers the conditions for individuals to create systems of thought whether scientific, aesthetic, legal, etc., and to create themselves. That is why, from a materialist dialectical perspective, human cultures are much more than reified and static entities. (Radford, 2014, p. 56, my translation)

So, by noticing the historicity of mathematical knowledge we can accept that relations have the potential to become reconfigured mathematics. However, those relations have constraints, as they do not operate freely in a void. Some of these constraints are noted by Barton and Denise Vilela:

> This does not mean that mathematics is arbitrary, and thereby open the way for mathematical anarchy. We are free to construct the grammatical rules of mathematics, but not 'blindly or capriciously' (Shanker, 1987, p. 319). The arbitrariness Wittgenstein refers to is its autonomy. [...] Cultural mathematics' are not arbitrary in the sense that they could be anyhow. They are arbitrary in that any culture is free to make its own sense of the world. Mathematics is the way it chooses to express that sense. (Barton, 1996a, p. 182)

> In particular, mathematics or Euclidean geometry, as a set of grammatical rules, are applied because these rules must have an empirical origin and became rules, or forms of intelligibility. (Vilela, 2010, p. 352)

Is it possible that the 'empirical origin' and the limits of a 'mathematical anarchy' reside in a non-human realm? In addition, how do we explain the universal human capacity for playing language games? There are issues with the post-metaphysical turn that deserve more elaboration and Ethnomathematics needs to address these questions without a return to essentialism. In fact, André Cauty and Barton already warned about the ontological dead-end:

> We defend a thesis based on the observation of the historical construction of mathematics, as well as on the observation of the epigenetic time of the formation of a mathematician. This thesis prevents us from fully adhering to the most extreme doctrines: idealism and positivism. Therefore, neither do we believe only in the reality of ideas (Conceptus),

> like the too much idealistic doctrines do, nor believe only in the reality of things (Res), as the too much materialistic doctrines do. A classic solution consists in considering a third order of reality, the one of signs (Vox) and representations. That is, to address entities that are neither things nor ideas, but substitutes for references, both imaginary and real. (Cauty, 2001, p. 77, my translation)

> There would be no question about whether they [the mathematical objects] exist independently or about how we come to know them. We mathematise, and therefore we create the objects by our thought, and attempt to communicate them to one another. The ontology and epistemology of mathematics simply is not a problem anymore. (Barton, 2012, p. 228)

At this point, it becomes clear how important it is to find a way to blur divisions between ontology and epistemology and escape the dichotomy of essentialism/conventionalism. Scholars from the trend of Science and Technology Studies have developed some insightful ideas on this matter. Inspired by the Latourian interactions among the human and the non-human, Andrew Pickering introduced the idea of disciplinary agency, assumed as the 'agency of a discipline that leads us through a series of manipulations within an established conceptual system' (Pickering, 2010, p. 115). Such agency interacts with human agency, producing a dynamic of accommodation and resistance among agencies. Then, mathematical knowledge would be the result of that dynamic, explaining why mathematics is neither arbitrary nor predetermined.

This is very useful to Ethnomathematics because it explains how some mathematical results have been known by different groups throughout history. It is not due to the existence of some essence or structure, but rather a result of groups responding similarly to a non-human agency that presented constraints. In the same manner that sculptors working with the same raw material produce different statues, cultural groups approach the metaphysical and produce different mathematics. Just as we do not equate sculptures with rocks, because we can recognise and value the human agency in the resultant sculpture, we should not equate mathematics with the metaphysics. That is the crucial point here.

Aligned with that, an understanding of reality as continuously transforming and becoming allows us to see controversies about diversities among cultural/mathematical practices as examples of *ontopolitics* in which entities and worlds are 'shaped, sustained and

transformed by the social, technical and material practices that take place – and make place – in them' (Savransky, 2012, p. 360). If these cultural/mathematical practices are assumed to be inventive practices, then power and knowledge become entangled and human agency cannot abdicate the political responsibility in an uncertain and unstable reality of multiple worldviews colliding and interacting through relations.

Multiplicity and interaction lead Ethnomathematics to the terrain of decoloniality, namely the ecology of knowledges proposed by Boaventura de Sousa Santos (2012):

> Granting credibility to non-scientific knowledge does not imply discrediting scientific knowledge. What it does imply is using it in a counterhegemonic way. This consists, on the one hand, in exploring alternative scientific practices made visible through plural epistemological scientific practices and, on the other, in promoting interdependence between scientific and non-scientific knowledge. (p. 57)

Re-visiting validation

Contemplative admiration is, at the deepest level, an instance of validation: a mechanism by which non-academic and informal practices become certified as mathematical by academic institutions. This is why the Ethnomathematics produced under this contemplative spirit is basically concerned with how the academy can generate conceptions about mathematics that include the cultural and linguistic diversity that societies possess; therefore, its target audience is the academy itself.

The role of scholarly trained ethnomathematicians as validators is highly problematic, since, on the one hand, some of them get confused by the presence of their own disciplinary gaze and struggle to not see 'with their own eyes' (the paradox of Millroy, 1992), while, on the other hand, critics wonder to what extent this certification procedure enthrones even more the modern rationality that the field promised to problematise (Pais, 2013). Such problems are just another enactment of the reflexivity debates deriving from anthropology (Salzman, 2002; Woolgar, 1988), and arise due to the extended use of classic ethnography as the 'natural' method for Ethnomathematics.

Reflexivity issues lose their importance when classic ethnographical methods are problematised and when knowledgeable people,

not necessarily working for (or trained in) academic institutions, are considered Ethnomathematics researchers in their own right, intervening and collaborating in each part of the research experience, being accountable for the results of the research. Within a decolonial perspective, insiders' insights can no longer be made invisible or subjected to the realm of 'Not-being', or impersonated through dubious emic representations. As de Sousa Santos states: 'Non-existence is produced whenever a certain entity is discredited, and considered invisible, non-intelligible, or discardable' (de Sousa Santos, 2012, p. 52).

In decolonial studies, the concept of sociology of absences is used to refer to the type of research that unveils the ways in which denial and non-existence is actively produced. A sociology of absences 'amplifies the present by adding to the existing reality what was subtracted from it' (de Sousa Santos, 2012, p. 56), and for our discussion, such amplification is expected to be a regular procedure for a relational Ethnomathematics.

The reconceptualisation of Ethnomathematics unfolded in this chapter is interested in promoting a broader vision of mathematical knowledge within other social contexts. But what is knowledge other than an interconnected system of people, beliefs, values, institutions, and instances that constitute it in a certain time and space? In that sense, to push the boundaries of what is sanctioned as mathematical is an attempt at intervening in such a system, calling into question the exclusivity of some instances (e.g., the academic ones) as being legitimate.

For that matter, it implies that Ethnomathematics needs to conceive itself as accountable to scenarios other than the academy, otherwise it will not be able to make a strong academic reading of the epistemological/political dimensions of mathematics. A broad idea of validation needs to consider new agents, scenarios, and procedures in such a way that Ethnomathematics become a sociology of absences (de Sousa Santos, 2012).

Knijnik and Alangui envisaged first the agency of local insiders as validators proposed by a relational Ethnomathematics:

> Ethnomathematics offers an arena where indigenous peoples can assert their alternative views and knowledge about the world. (Alangui, 2010, p. 25)

> I use the expression *ethnomathematical approach* to designate *research* into the conceptions, traditions, and mathematical practices of a specific

> subordinated social group and *pedagogical work* involved in making the group members realize that:
> 1. They do have knowledge;
> 2. They can codify and interpret their knowledge;
> 3. They are capable of acquiring academic knowledge;
> 4. They are capable of establishing comparisons between these two different types of knowledge in order to choose the more suitable one when they have real problems to solve. (Knijnik, 1993, p. 24)

More recently, authors like Natalia Caicedo et al., (2012), Cristiane Coppe and Mesquita (2015), and Mesquita (2013) have presented experiences of communitarian research within Ethnomathematics. Those are examples of collaborative research as a co-theorisation process (Rappaport, 2008) that pursues a decolonisation of research methods (Smith, 2013).

Performativity

In order to look for alternative ways to embrace the call of Ethnomathematics to appreciate cultural and epistemic diversity, a useful question emerges: What is the antonym of 'difference'? A quick response would be: 'similarity', but I want to point to 'indifference'. That is the major threat to cultural diversity, as it comes with uncommunication, apathy, passiveness, and inactivity. Conversely, in this line of thought, communication, empathy, engagement, and initiative are values that surround and enhance difference and diversity in an active manner.

To illustrate how this manner breaks the contemplative image, I can mention the Wittgensteinian understanding of mathematics as a social practice and the assumption that the meaning of a word/concept is given by the use of such word/concept within the social practice (Knijnik, 2012). Rather than merely using such Wittgensteinian insight as an analytical tool to describe or interpret mathematical knowledge, we can assume it also as a performative tool, emphasising that people can intervene and operate within social practices; and people can therefore impact what is assumed to be mathematical. The cultural historicity of mathematical knowledge became a place in which we can operate, we can perform.

In the previous two sections we embraced the culture-dependence and historicity of (mathematical) knowledge and appreciated the agency of groups and communities in the constitution of new forms of knowledge. A coherent consequence of that appraisal is to make a reorientation of the regular practices and the expected outcomes of ethnomathematical activity, around a relational perspective that emphasises the importance of interpretation and interaction when proposing connections among different domains. Interpretation and interaction are necessarily performative.

An ethnomathematical work under this relational perspective necessarily comprises a performative condition, in which relations cannot be stated once and for all. They detonate collective processes of meaning-making and, because of that, relations constantly demand rephrasing, reframing, and reassessment. They are to be lived, re-enacted again and again. As the research results are ephemeral and vanish, Ethnomathematics research becomes a type of performance that is different in each instantiation.

Concerns with the agency of communities within the research also entail a performative demand. Agreements, responsibilities, and commitments need to be established differently with each community, every time, and evolve throughout the research process.

This performative character of Ethnomathematics is an enactment of the decolonial notion of sociology of emergence, because:

> The sociology of emergences consists in undertaking a symbolic enlargement of knowledges, practices, and agents in order to identify therein the tendencies of the future (the Not Yet) upon which it is possible to intervene so as to maximize the probability of hope vis-à-vis the probability of frustration. (de Sousa Santos, 2012, p. 56)

This quotation allows me to ask how Ethnomathematics can deserve to be called a proper research program if it does not assume performativity. By revolving around contemplative schemes, it will never be a sociology of emergences.

Finding new places

Although this relational approach was originally built to explain a reduced set of contemporary works that involves communitarian

participation, it turned out to be an entire reconceptualisation of the ethnomathematical field. As I said elsewhere:

> According to this view, ethnomathematical research basically traces connections between cultural practices and mathematical objects, to show how culturally embedded is knowledge production. Any modelling or mathematical description of cultural practices is a connection. Cultural contextualizations of mathematical practices are also connections. (...) No matter if they are defrosting mathematics (Gerdes, 2003), finding a family resemblance among practices (Knijnik, 2012), or describing the QRS-systems of a group (Barton, 2008). (Parra, 2018, p. 215)

This means that Ethnomathematics has always been relational. The crucial point is to what extent we have been aware of that condition and how purposefully we have developed concepts and methodological procedures aligned with relationality. In the same way, there is no doubt that every piece of ethnomathematical research attempts to expand the frontiers of what is accepted as mathematical knowledge and culture. The question is which agents and scenarios have been privileged to establish the success of each attempt.

An open and conscious embrace of a relational and performative approach for Ethnomathematics can change many things for the field. Some political and epistemological dilemmas and critiques get dissolved. Also, many new theoretical and methodological concerns can appear, through notions like translation, symmetry, barter, minga, propio, locus of enunciation (Parra, 2018), deconstructionist therapy, and deterritorialisation (Tamayo-Osorio, 2017). Pedagogical consequences of this perspective need to be developed as well: I am currently exploring them through notions like repertoire and jurisdiction (Parra, 2024).

To close the chapter, I contend that the current image of contemplative admiration needs to be refined by a relational one that is more politically driven and can help Ethnomathematics celebrate diversity by multiplying it, and not merely by registering it.

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