

Ethnomathematics: Why, and What Else?

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Abstract: Ethnomathematics — we all have some notions of what it is, but should it be influencing school mathematics? This paper considers a justification for the influence from a constructivist perspective, and considers the implications of enactivism and other ways of thinking on ethnomathematics. My conclusion is that the influence should be broader — that different cultural groups may have different ways of knowing, that we may be asking the wrong questions, and that we might need to consider 'ethno-education'.

Kurzreferat: *Ethnomathematik: Warum, und was weiter?* Wir alle haben eine Vorstellung davon, was Ethnomathematik ist, aber sollte sie die Schulmathematik beeinflussen? In diesem Beitrag wird dies aus einer konstruktivistischen Perspektive heraus bejaht. Außerdem werden Auswirkungen des Enaktivismus und anderer Denkweisen auf die Ethnomathematik betrachtet. Meine Schlussfolgerung ist die, dass der Einfluss umfassender sein sollte – dass unterschiedliche kulturelle Gruppen unterschiedliche Denkweisen haben können, dass wir die falschen Fragen stellen dürfen, und dass wir eine "Ethno-Erziehung" in Betracht ziehen sollten.

ZDM-Classification: D30

1. Introduction

Since ICME at Adelaide when D'Ambrosio (1984) used the word ethnomathematics, notions related to it have gained considerable popularity with various interpretations being used by different authors. Within this context many people have been concerned with what might be done to include ethnomathematics in school programmes. It is interesting to note that this concern is such that the National Council of Teachers of Mathematics editors of „Teaching Children Mathematics“ have called for papers so that one issue next year can focus on „mathematics and culture“. My concern is that we justify this inclusion in our work, and address the issue of whether ethnomathematics is enough.

For me ethnomathematics implies mathematics of cultures and my definition of cultures (and sub-cultures) not only refers to ethnic cultures, but also to „any sets (or subsets) of people who share common experiences such as languages, beliefs, customs, or history“. Using this definition obviously an ethnic group forms a culture. Similarly a religious group, a group involved in a sport, a group of people who cannot hear, an artistic community, a gender group, or the residents of a district, all form either a culture or a sub-culture.

2. Justification

Initially a justification of ethnomathematics is likely to be based on a simple notion about education such as „the need to start where the learner is“ and the assumption is made that the student is likely to be more familiar with mathematics from their culture than mathematics from outside. Another notion might be that one should „start with the interests of the students“, and therefore we might

assume that the students are more likely to be interested in what others from their culture do rather than things that they are not aware of because they belong within foreign cultures. A third notion might be that „mathematics needs a human face“ and we could believe that using ideas in mathematics from the immediate environment and from the histories of the students' cultural groups are likely to result in more meaningful links with people being made.

Such justifications usually lead us to consider whether ethnomathematical topics or activities are intended as ways into traditional Western mathematics, or as enrichment material. Alternatively we might envisage such topics and activities together as redefining an appropriate mathematics for the cultural group that we are considering. This second alternative has to be considered beside the fact that the culture may want access to Western society, see Western ways as desirable for progress, and not see their own 'mathematics' as being sufficient.

The next step in such a discussion is likely to involve the question, what is the mathematics of the culture under consideration? This may lead to the conclusion that mathematics is part of a Western partitioning of knowledge that does not occur in the same way in other cultures. Rather than assuming that ethnomathematics is suitable as a way into school mathematics and for enrichment, we might consider two other options. One is to think about the six activities that Bishop (1988) sees as pre-conditions for mathematics — counting, measuring, locating, designing, playing, and explaining, and use these to introduce mathematics into elementary schools. However, these may be inadequate for more than starting points if the goal in high schools is Western mathematics. A second option is to concern ourselves with a holistic curriculum that is not divided into subjects.

3. Constructivist justification

Over the last two decades in education constructivism has become a dominant theory. One phrase that is common to many recent mathematics curriculum documents that reflects this dominance is „making connections“. For me the phrase making connections implies making connections with:

- the everyday world of the student,
- the prior knowledge of the student,
- the familiar contexts both within school and outside,
- other topics within mathematics,
- other school subjects, and
- the past and the likely future.

My meaning of making connections also includes the construction of knowledge 'schemas' (or mental maps) where links are made between 'bits' of knowledge and that the relationships between these bits are as important as the bits themselves.

From this perspective one sees a justification of ethnomathematics based on starting where the students are, starting with the interests of the students, and giving the subject a more human face, as being theoretically justified. These notions 'make connections' with prior knowledge, with the world of the student, and with the people of that world. The perspective which includes

making connections with other subjects, can also be used as a justification for a holistic curriculum. However, having a justification based on theory does not remove the two questions:

- What do we think of as mathematics within each culture? and,
- Is including ethnomathematics going far enough?

4. Connected knowledge

The term „making connections“ also resonates for me with what feminist writers such as Gilligan (1982) and Belenky, Clinchy, Goldberger and Tarule (1986) have called „connected knowledge“ as distinct from „separated knowledge“. In broad terms they see separated knowing as how males think, and connected knowing as how women think. I believe that there is considerable evidence for their conclusion within ‘white’ society (in Anglo-American and European cultures), but in my experience there is evidence of connected thinking within many non-Western and indigenous cultures.

In this context notions associated with „making connections“ in mathematics may be further justified as making the subject more female-inclusive. If my hypothesis is true then ‘making connections’ is also likely to make mathematics more inclusive for some people from other cultures. Again the two questions — what do we think of as mathematics within each culture? and, is including ethnomathematics going far enough? — remain unanswered, and the option for a holistic curriculum remains a sensible one.

5. Enactivism

Enactivism (Davis, 1996; Sumara & Davis, 1997) is an emerging theory about learning that moves from constructivism and takes a more holistic view of knowledge. Enactivism has been influenced by interrelated aspects of

- phenomenology (Merleau-Ponty, 1962),
- ideas about Cartesian dichotomies (Damasio, 1994),
- consideration of non-cognitive knowing (Maturana & Varela, 1987), which includes ‘mindful awareness’ from Theravadin Buddhism (Nhat Hanh, 1987), Zen Buddhism (Batchelor, 1999), and Eastern thinkers (Krishnamurti, 1956),
- neural biological work which emphasises evolutionary or Darwinian notions (Edelman, 1987; Plotkin, 1998; Sacks, 1995; Varela, Thompson & Rosch, 1991),
- systems theory (Bertalanffy, 1968), and
- ideas of embodiment (Varela, Thompson & Rosch, 1991; Lakoff & Johnson, 1999).

One aspect in enactivism that may appear strange to some is the inclusion of Buddhist and Eastern ways of thinking. We from the West have been conditioned to undervalue the Eastern contribution, but this has started to be recognized more generally in other social sciences, for example in psychoanalysis (Suzuki, Fromm, & De Martino, 1960; Molino, 1998), and in sociology (Bell, 1979).

I can only give a hint of what enactivism means for me and will do this by providing some ideas from Dawson (1999), but I suggest that we need to familiarise ourselves

with this theory. Enactivism involves becoming aware of what you are doing without judging it, and it moves „from a culture based on judgement to one based on possibility“. It requires us to see knowledge not as independent of individuals and their environments, or as something that can be tested/matched against external standards, but rather as embodied action with all of us being responsible for our actions. Enactivism and embodied action mean we maintain the yin-yang of self and world, and of ideas „out there“ and „in here“. From this perspective the aim in teaching is not to link learners’ experiences to some external curriculum, „but to view the curriculum as being occasioned by the learners’ experiences in their school environment“. Such ecological perspectives are located within a complex web of relations with all „decisions and actions being both constrained by and influencing all nodes of the web“. The enactivist classroom could be construed as a dynamic system with „the teacher listening not to check or model the students“, but „to participate with them“ (Kieren, 1995).

For me, enactivism provides a different perspective from the usual constructivist one in that it assumes that the separation of self from others, and the separation of knowledge into subjects are false. In rejecting these traditional Western thinking patterns that depend on Cartesian dichotomies, enactivism emphasizes „being connected“ which is even stronger than the notion of „making connections“. It raises new issues for some of us including how might one emphasize being connected when considering different ways of knowing including non-cognitive ways that are not thought about in Western education. In assuming the error of separating mathematics from other subjects it highlights the need to address the issue of the Western partitioning of knowledge.

6. Challenges

Coming from constructivism, connected knowing, and enactivism, three main challenges emerge for me. The first is a mathematical concern while the other two are related to education in general and not only to mathematics education. The three are:

- What elements of knowledge from any culture might be regarded as mathematical?
- Should we assume that people from all cultures learn in the same way and that Western schooling is the most appropriate form for all?
- Should we separate knowledge into different subjects, and if not, what would be a more appropriate way of organizing curriculum?

7. Mathematics

The first of these challenges — what elements of knowledge from any culture might be regarded as mathematical? — seems to me to be a question that the people of the particular culture(s) will need to consider. The answer should not be determined by those of us who are steeped in the traditions of Western mathematics. That is not to say that we do not all have a role to play. We can encourage consideration of the question and affirm its

importance. We can support the decisions that are made. We can ensure that the dominant curriculum documents allow space for the inclusion of other topics. We can legitimize the claims of the culture and help by working alongside the people and ask questions as to whether particular topics might be considered. Having said this, it is important that we do not dominate — in my experience it is very easy for us to do so. We find it very easy to make assumptions that are bound up with our own language and culture, to undervalue profound issues of the other culture, and to expect decisions to be made within our time-frames.

8. Education

The other challenges — do people from all cultures learn in the same way, is Western schooling the most appropriate form for all, should we separate knowledge into different subjects, and what would be an appropriate way of organizing curriculum, suggest the need to consider what might be called ethno-education.

If we wish to „make connections“ with aspects of learners' background, culture then it is not only mathematics we need to look at. The evidence that other educators are considering ethnic issues includes the increasing emphasis on first languages, the acknowledgement of different perspectives within history, and the emergence of ethno-science and ethno-technology. The more that other subjects address these issues, the more support is likely to be gained for a consideration of ethno-education. Within this broader notion we need to think about the assumptions made within the culture(s). We need to consider the influence of beliefs, of language, of the metaphors used in language that help determine thought patterns. And we need to be aware of the ways people come to know, of the traditional and current ways that learning/schooling occurs, and what the people of the culture(s) value.

This implies a radical review of education that we as mathematics educators need to participate in, and, because of our work in ethnomathematics, provide a lead in. While we might facilitate this review, it is important that the review is not dominated by the West. For too long non-Western cultures have been denigrated by the West, thought of as inferior, and not respected because they were different and were not understood. Our Western colonization has been of little service to these countries, teaching them Western values of consumerism and capitalism which have caused problems for not only these people but for the whole world. A review of education that considers cultural diversity and all its implications in depth, gives us an opportunity to also reassess the societal trends of the West, the society we would want for our children, and the sort of education that might help us achieve this. Of course such a rethink is much broader than education but much can be done if we take the viewpoint of Postman and Weingartner (1971) and regard „teaching as a subversive activity“.

Such a review should look at the aims of education (and of society). Traditionally our aims have been academically or practically oriented. Recently they have included more social and personal aims, and very recently

some linked with economic growth have been included. A review needs to examine all of these, be prepared to put a different emphasis on them, and include others that may arise such as those to do with culture. After the general aims have been considered we would need to think about how they might be operationalised for subjects such as mathematics in terms of learning, teaching and lecturing, assessing, and curriculum and resource development.

9. Reality

I would expect that most people think that these challenges are too difficult and that I am out of touch with the real world. I would suggest that if we as educators do not make a stand then the present problems of society will continue. There is no doubt that over the last forty years much of society has at last become aware of many environmental issues even though there is much to be done before we get the environment we want. Bio-diversity is seen as something we should value and work towards retaining, and environmental costs and taxes are being considered in some political systems. My belief is that cultural identity and the cultural environment are as important and that cultural-diversity has a similar high value to bio-diversity. Just as environmentalists have created this awareness of the challenges in the natural world, so too can we as educators do the same in the world of ideas.

10. Interim solutions

When one has a grand vision it is sometimes easy to think that what one does in the meantime is of little consequence. I would suggest that nothing could be further from the truth. The maxim „think globally, act locally“ provides us with a guide to action. We know that the process of change is slow, it often takes more than one generation. New ideas need to be legitimated by being considered over a considerable time span and by being compared with alternatives which means that many options need to be offered. We need to challenge the status quo by suggesting other ways forward and to show that these at least work to some extent. Thus, while we keep the big picture in our mind, we need to rephrase our three challenges so that we can consider local and personal ways forward.

If we take up this notion then the challenges might become:

- What elements of knowledge from the cultures of students in my classes might be regarded as mathematical either for the purpose of introducing topics or as enrichment? How can I decide whether it might be appropriate to use these elements in my teaching? Who from these cultures might assist me in making these decisions?
- What can I find out about my students with respect to their cultures and their interests? How can I take into consideration aspects of their beliefs and how can I find out more about how people from these cultures learn? Who from these cultures might assist me in finding out these things? and, how might I implement such ideas into my classroom?

- Can I teach some, part, or all of the present curriculum (mathematics and other subjects) in a way that better integrates the knowledge and helps my students make more connections?

As teachers we can all, to some extent, move in this direction. As researchers we can legitimate such action from others by researching the processes that they work through, document it for others, and share the findings so that a broader view of these issues arises. As teacher educators who have people from many cultures in our classrooms, we can encourage these students to talk to the elders from their communities and find out what they think and be aware of their responsibilities when they become teachers. As scholars we can read whatever we can on such matters. As members of teams involved in curriculum we can ensure that there is some space for and encouragement of such innovative changes.

11. Conclusion

Many of us are interested in ethnomathematics, but how far are we willing to go? Are we content to dabble and to continue to get our academic papers from the cultures of others, sometimes with their consent but sometimes without even involving people of the culture? Are we committed to change and ready to give the power we have to the people of the cultures we work with?

I believe that we are approaching a time when our actions and decisions can influence the direction of mathematics and mathematics education, but are we ready to stand up and be counted?

Kia Ora Katoa.

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