

## **Ethnomathematics**

### **Part 1**

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Selin, in the introduction to the book *Mathematics Across Cultures*, states that “every culture has mathematics,” which she defines as “the study of measurements, forms, patterns, variability and change.” Other scholars, however, remind us to be cognisant of the fact that “the category ‘*Mathematics*’ is not common to all cultures.” The origin of activities and questions that we might consider mathematical under this definition of mathematics is related to the practical necessities of everyday life in different societies at different times, as well as religious and ritualistic connections. Brazilian mathematics educator Ubiratan D’Ambrosio refers to this as the “needs of survival and transcendence.” In this three-part article I will try to answer the following questions: “What is ethnomathematics?” “How does one ‘do’ ethnomathematics?” “What are the main debates and controversies in this area of inquiry?” and “What are the potential implications for teaching, learning and society?”

The difficulty in providing an answer to the question, “What is Ethnomathematics (EM)?” is not a limitation, but a reflection of the differences of opinion among the many advocates of EM. More importantly, it represents a healthy diversity of interests, foci, methodologies, and agendas of the various researchers and practitioners around the globe. To summarise the main points, EM is a research programme that attempts to understand the ways in which different cultural groups use concepts and practices that we might describe as mathematical, whether or not the culture itself has a concept of mathematics. In this regard it is closely aligned with anthropological work, in that it attempts to describe the practices/beliefs of another’s world through the codes and languages of one’s own. Typically, these cultural groups have been historical, small scale, or indigenous, though, recently, attention has been focused on specialised mathematical knowledge and practices of professional groups such as heart surgeons and carpenters. EM is another lens, one that changes the way in which mathematics itself can be viewed, and one that has the potential to open up productive vistas for both education and mathematics.

Four activities are considered relevant to EM projects. The first task is to describe the practices or conceptions that are under consideration, using the languages of the groups being studied. Next, the mathematical aspects of the phenomenon are exposed by mathematising, that is, by translating the cultural material into mathematical terminology and relating it to existing mathematical concepts. In this way it may also become possible to extend the ideas in a mathematical way. Finally, having described and developed mathematical ideas from other cultures, researchers attempt to find out why the practices are the way they are. They do this archaeological work by tracing backwards in time to understand and uncover both the mathematics and the conditions or questions that led to the current set of practices or conceptions. Several good examples of this process exist and can be found in the works of Ascher, Eglash, and Gerdes, among others.

An important consideration in doing EM is the extent to which mathematical ideas were important in the creation of the piece/practice in the first place, and to consider whether the researcher is mathematising or remathematising the work. For example, in a report of the kolam (a sacred symbol drawn in dust in the doorway of households) tradition of the Tamil Nadu region

of India, it was observed in one drawing that a ninety degree rotational symmetry was not an interesting aesthetic artefact but the result of a recursive embodied process in which the individual repeats a pattern after moving her body. Here, the observation of the symmetry is a re-mathematisation of the process of construction. However, the observation that the figure is an Eulerian graph (i.e., one can pass through each edge and vertex without repeating an edge) is a mathematising activity since nowhere in the tracer's mind is this intended. This is unlike some African sand drawings where the intent is specifically to produce patterns that have the Eulerian characteristic.

Thus, ethnomathematical activity can involve both mathematisation and re-mathematisation of the artefacts and practices of different cultures, though it is the latter—the discovery or creation of correspondences between the original intent of diverse cultures of peoples with our own mathematical language and culture—that respects the integrity and dignity of both sets of traditions.

In the next part I will deal with the debates and controversies surrounding ethnomathematics within the mathematics education community, and discuss some of the implications for teaching, learning, and society that become possible through approaching mathematics and mathematics education through this perspective.

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