Executive summary

Teach *ganita*, not formal math

Some suggestions regarding the Draft New Education Policy 2016

C. K. Raju
ckr@ckraju.net

The Draft NEP 2016 suffers from a major lacuna. It does not discuss the need to decolonise education. Macaulay declared the West "immeasurably superior" in science, using a false history of science. But a gullible nation fell for that con-trick, and accepted Western education. In 1857, that education was still 100% church education, designed to create a missionary mindset. It so brainwashed our elite that they did not once cross-check that false history in two centuries. For example, "Euclid", declared the father of mathematics, did not exist, and my Rs 2 lakh challenge prize for serious evidence about "Euclid" is still standing. Contrary to the related myth, the book *Elements* (purportedly authored by "Euclid"), too, does NOT contain any pure deductive proofs, not even of its very first proposition. Even teachers trained in formal math do not read the book, and just go by the myths about it.

Under colonial pressure, Indians replaced indigenous *ganita* by Western formal math. They came to believe that math is "universal", a belief incorporated in the NEP2016 recommendation to centralize the curriculum for math and science. Actually, *ganita* differs from formal math in many ways: e.g. it accepts empirical proofs prohibited and declared inferior by formal math. For example, 1+1=2 is done empirically in *ganita*, as we still teach in kindergarten. But, later we teach that the kindergarten method is wrong, since empirical, and that 1+1=2 must be deduced from some axioms. Whitehead and Russell took 368 pages to give a formal proof of 1+1=2 in their *Principia*. All systems of Indian philosophy, without exception, accept empirical proof (प्रत्यक्ष प्रमाण), as the first means of proof, as does science, so teaching formal math (as a compulsory subject) in school also indoctrinates children into the belief that all Indian philosophy (and science) is inferior to metaphysical formal math.

Commonsense tells us that deductive proofs are not "superior" but are inferior to empirical proofs, since (a) ascertaining the validity of a deductive proof is a fallible process (as in the first proposition of the *Elements*, wrongly believed to be a valid deductive proof for centuries). (b) Even a valid deductive proof does not lead to valid knowledge (or even approximately valid knowledge), since absolutely any nonsense proposition can be deductively proved as a theorem by choosing suitable postulates. E.g.

1. Anything related to church dogma is metaphysical nonsense.
2. Formal mathematics is related to church dogma.
   ∴
3. Formal mathematics is metaphysical nonsense.

This is a valid deductive proof, but is it valid knowledge? Not until we ascertain the validity of the postulates. There is no way to ascertain the validity of the postulates of set theory, say, since the postulates of formal math are 100% metaphysics and irrefutable. In practice, we just blindly accept those postulates on Western authority. (c) Finally, reason depends on logic, and 2-valued logic, assumed by formal math, is neither culturally universal nor empirically certain, as Western philosophers, under the overarching influence of the church theology of reason, badly failed to understand.

The focus of *ganita* is on calculations of practical importance, not metaphysical proof (which the church needed for persuasion), so *ganita* accepted the inexact and non-eternal, since the *sulba sutra*-s,

whereas formal math has claimed exact and eternal truth, due to its linkages to religious beliefs about soul since Plato. The actual history of math shows that most school math (arithmetic, algebra, trigonometry, calculus, probability) first developed in India as *ganita*, for its practical value, and then went to the West, also for its practical value.

For example, Indian arithmetic algorithms went via Baghdad and Cordoba in the 10th c., and again via Africa to Florence in the 12th c. for commerce. Algebra and trigonometry went via Arabic texts through the Toledo mass translations of 1125. Calculus and probability went via the Cochin mass translations of the 16th c. for navigation etc. But the West had great conceptual difficulties in understanding that imported knowledge, a story told by the very terms in current use: *zero* from cypher (meaning mysterious code), *sine*, *surd*, *trigonometry*, etc. The Western conceptual difficulties with infinite series (of the Indian calculus) are notorious, and probability has not been formally understood to date.

To overcome its lack of understanding, the West (a) added a layer of metaphysics (of infinity, aligned to church dogmas of eternity), to the imported *ganita.* This was then (b) packaged with the usual false history ("Newton and Leibniz invented the calculus", "Euclid" etc.) and (c) exported back to India as "superior" mathematics through colonial "education".

That added metaphysics of formal math is of nil practical value. Eliminating it, and reverting to *ganita*, leaves intact the practical value for all current applications of national importance, e.g., sending a spacecraft to Mars. It makes math very easy and thus enables students to do harder problems not covered in usual courses. At an advanced level, eliminating that bad metaphysics of formal math results in a *better* science: for example, eliminating the metaphysics of time that Newton added to the calculus (to make it "perfect") results in a superior theory of gravitation. Reverting to the calculus using "non-Archimedean" arithmetic of Aryabhata and Brahmagupta eliminates the problems with infinities in quantum field theory, general relativity, fluid dynamics, and Maxwell's equations. Alternative logics are relevant to the future technology of quantum computing.

Therefore, we should teach *ganita* because it represents progress over the regress that the West has imposed on us through inferior formal math.

Several decolonised courses have been proposed, and some have already been tried out. These include "Calculus without limits", "String geometry", Statistics for social science", "History and philosophy of science 1 and 2", physics, computer science, and ethics. Thus, it cannot be said that there is no alternative. Several other decolonised courses exist in social sciences. My suggestions in this note are limited to decolonisation of mathematics and science because science and technology were the bait used by Macaulay to impose Western education, and both depend on mathematics.

The basic suggestion is not to impose these decolonised course from the top right away, but (a) to first open these courses for public discussion. The "experts" who have prepared the existing formal math curriculum must be asked to publicly justify it, with ample time allowed for debate, for educating or mis-educating the nation is a serious matter. They must also declare any conflict of interests. Formal mathematicians have persistently evaded serious public debate for the last two decades (barring personal attacks and generic arguments, which avoid engaging with particulars). The state must force them to be academically accountable, since academic corruption corrupts the mind of students and is hence worse than financial corruption. Second, the suggestion is that (b) ample room must be provided at the ground level to experiment and alter the curriculum, and the same process of public discussion should also be continuously applied to decolonised courses in the near future.