Mathematics as im/pure knowledge system: envisioning a contextualised mathematics education via inclusive logics.

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Overview and the aim of the paper

The proposed paper emanating from Bal Chandra's ongoing doctoral research that aims at developing a transformative philosophy of mathematics education in Nepal, responds directly to the DG 18 discussion theme, namely, the role of ethnomathematics in mathematics education. Specifically, we shall respond to an aspect of the problem of culturally decontextualised mathematics education in Nepal by unpacking and deconstructing three conventional logics (propositional, deductive and analytical) that underlie and orient existing mathematics education in Nepal. In the process, we shall explore additional logics that can help promote the multidimensional nature of mathematics which entails ethnomathematics (impure mathematics) being as important as formal mathematics (pure mathematics) in mathematics education. In the process we also shed light on an inclusive curriculum vision that can incorporate such a multidimensional nature of mathematics.

We shall start this paper with Bal's lived experience as a student, teacher and teacher educator in Nepal as an epistemic means for unraveling the undue emphasis placed upon the three conventional logics as an in/visible framework for orienting the school mathematics curriculum of Nepal, a country that hosts more than 92 language groups and varying cultural practices arising mainly from Vedic-Buddhist-Animist traditions. Embedded exclusively in the nature of *mathematics as a body of pure knowledge*, the conventional logics give rise to the Western Modern Worldview, a strong form of which celebrates many unhelpful dualisms, such as West versus East, pure versus impure, hard knowledge versus soft knowledge, concrete versus abstract and ethnomathematics versus official mathematics. Legitimated via the Tylerian linear model of curriculum design, the conventional logics espouse an agenda of one-way border crossing to the Western Modern Worldview (Fleener, 2005; Taylor & Wallace, 2007), thereby un/wittingly preventing diverse Nepali knowledge systems and practices from being incorporated in the school mathematics curriculum. These conventional logics appear to promote disembodied-dualistic thinking, an undue emphasis upon which cultivates exclusively an essentialist view of mathematical intelligence as an ability to manipulate mathematical symbols so as to fit in a prescribed algorithm, thereby dismembering culturally situated thinking models. Consequently, embedded in curriculum practices of Nepal, this singular view of mathematical thinking is likely to have contributed to the rampant underachievement of Nepali students in mathematics, as reported by recent national studies (Koirala & Acharya, 2005; Mathema & Bista, 2006). Such a phenomenon of underachievement is also a major stumbling block for culminating the goal of 'education for all'. Legitimating one particular worldview via a narrowly conceptualised 'thinking model' embedded in mathematics education does not help to realise an inclusive vision of globalisation that places emphasis on promoting hybrid and non/essential cultural identities as a basis for opening holistic and empowering visions of education. Thus adhering to D'Ambrosio's (2006) notion of dignified living by celebrating culturally woven mathematics in mathematics education leads us to discuss additional logics, such as dialectical thinking, poetics and metaphorical thinking, as a basis for conceptualising the multidimensional nature of mathematics and an inclusive curriculum perspective, both of which legitimate ethnomathematics in mathematics education.

Additional logics

Although there are different forms of dialectics, the main purpose of dialectical thinking is to minimise contradictions imbued in 'either or' dualistic logics. In

generating different forms of dialectical thinking that are useful for developing an holistic mathematics education that incorporates both official mathematics and ethnomathematics, we will draw on Vedic and Buddhist sources (Loy, 1997; Raju, 2001; Sri Aurobindo, 1998). Similarly, metaphorical thinking promotes open and embodied inquiry for exploring multiple facets of knowledge and knowing by making use of images and imageries (Willison & Taylor, 2006). Poetic logic helps reach toward the unreachable (or ineffable) via a normal academic-language structure (Fleener, 2002). Bringing this logic into mathematics education requires us to unpack the prevailing academic language games that promote conventional logics which prefer clean (not messy), linear (not nonlinear) and unequivocal texts via the interlocking system of academic training, research and productivity.

Developing the multidimensional nature of mathematics

We envisage that these additional logics will help develop the multidimensional nature of *mathematics as an im/pure knowledge system* which gives rise to a culturally contextualized mathematics education in Nepal. Different forms of dialectical thinking will serve as a new logical referent for reconciling antagonistic views about mathematics. Indeed the notion of pure cannot stand alone from the opposing notion of impure, and *vice-versa*. Thus informed by dialectical thinking we do not advocate for a total replacement of the existing one-dimensional nature of *mathematics as a body of pure knowledge* by an alternative equally privileged nature of *mathematics as impure knowledge system* that will celebrate only the local-cultural dimension of mathematics. In a similar vein, the idea of metaphorical thinking helps us to conceptualize plural natures of mathematics through different images and imageries. Rather than making use of narrow literalism we make use of metaphors, images and imageries to explore underlying concepts associated with ethnomathematics and formal mathematics, especially their roles in an inclusive curriculum perspective. Here we have used the metaphors of *pure* and *impure* to represent the notions of formal mathematics and ethnomathematics, knowing that purity and impurity are interrelated and that one cannot be conceptualized without the other. In this process, poetic logics will help us to explore nonlinearity, complexity and ineffability associated with blurred spaces between pure and impure mathematics.

Developing an inclusive curriculum vision

Guided by the (conventional and) additional logics, the nature of *mathematics as an im/pure knowledge system* gives rise to a need for a more inclusive image of curriculum than the conventional image of *curriculum as subject matter* which is exclusively oriented by the conventional logics. Employing both images (Schubert, 1986) representing structure (*curriculum as subject matter, planned activities*, *learning outcomes, discrete tasks and concepts*) and agency (*curriculum as currere, experience, cultural reconstruction, cultural reproduction*) aspects of curriculum, we derive the meta-image of *curriculum as montage* that accounts for the multidimensional images of mathematics which, taken together, help promote a contextualised mathematics education in Nepal (Luitel & Taylor, 2008, Jan). In this process, we see the image of impure mathematics being aligned, but not exclusively, with the agency aspect of curriculum while the image of pure mathematics can be expressed via the structure aspect of curriculum. However, the dialectical pairs, such as structure/agency and ethnomathematics/official mathematics will generate more complex and liminal images as they enter different stages of curriculum enactment, thereby opening potentially non/essential and creative perspectives about mathematics, ethnomathematics and education.

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