A Multi-Paradigmatic Approach to Researching Lived Experiences in Mathematics Education: Contemplating Possible Connections

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How can we conceive a research design space that accounts for lived mathematical experiences of mathematics education practitioners during their roles as learners, teachers and teacher educators and that enables the researchers to develop a vision of inclusive mathematics education in Nepal? The same question has been very central to my research program which subscribes to the metaphor of research as professional development for mathematics education practitioners (i.e. teachers and teacher educators) to prepare them as agents for transforming the landscape of school mathematics education from a culturally decontextualised subject to an inclusionary, life-affirming and participatory learning enterprise for culturally rich Nepal, a country that hosts more than 120 languages[1] and multiple traditions arising from Vedic, Buddhist, Animist and many other pre-historical Wisdom traditions.

My research program at Kathmandu University employs a two-stage epistemic activity, first of which enables researchers to account for their lived experiences of mathematics as students, teachers and teacher educators. Applying a mixed methodology of hermeneutic phenomenology, autoethnography and philosophic inquiry, the researcher captures key moments of their educational lifeworld through multiple genres, such as stories, dialogues and screenplays, to name but a few. The second important dimension of my research program is to facilitate researchers to construct visions of a life-affirming and meaningful mathematics education as an empowering alternative to the exclusionary image of mathematics as a culture-free subject (Luitel, 2013). Subscribing to the metaphor of research as imagining, researchers are further enabled to exercise what Maxine Green (1995) calls an inherited ability for humans to cultivate futures through the power of perspectival thinking and expressions.

While my program aligns with the mathematics as a lived experience (DIME) research group, I envisage that there are important connections between researching lived experience of mathematics and different research groups of this symposium namely quantitative reasoning (QR), technology in mathematics teaching (TTAME), and learning progressions (LP). As far as connections between quantitative reasoning and mathematics as lived experience are concerned, researchers account for their lived experiences of applying mathematical and statistical knowledge and skills whilst dealing with QR related issues (e.g., applying appropriate units of measurement in contexts, making sense of proportions, establishing relationship among two data sets, and comprehending graphs (Hatfield & Mayes, 2013/in press; Steffe, 2013/in press; Thompson, 2013/in press)). By doing so, the researcher can unpack, for example, the enabling and disabling conditions under which learners make better use of quantitative skills needed for their present and future lives. Having the context of technology in mathematics teaching (Olive, 2013/in press), researchers can focus on their lived experience of mathematics in virtual context, thereby examining whether these virtual contexts are useful for promoting empowering learning trajectory for learners. Putting in the context of this symposium, I can say that researchers in my research program map out trajectories of their "learning progressions" (Lehrer, 2013/in press) in mathematics on the basis of their lived experiences as students, teachers and teacher educa-

1 See www.ethnologue.com

tors as the first necessary condition for envisioning empowering learning progressions that are inclusive of students´ lifeworlds.

I have used the notion of lived experience to portray a dynamic image of a person being-in-the-world, a radical departure from the conventional 'positivistic' notion of experience as a reductive measurement of sensory perceptions (van Manen, 1995). The idea of being-in-the-world is used to represent an inseparable relation between the "experiencing person" (e.g. the researcher, research participants) and "object of experience" (e.g., additive relation, limits, infinity, mathematical concepts and objects) in the context of experience. Specifically, I have chosen three major orienting perspectives to develop a conceptual premise of lived experience: a) that the basis of lived experience is action that brings together the person, context and ideas; b) that individuals may experience the same phenomenon differently; and c) that lived experiences of individuals can be influenced by various visible and invisible structures surrounding the context of the individual.

Given the nature and purpose of my research program, I have been employing a multi-paradigmatic design space (see, Taylor, Taylor, & Luitel, 2012) to facilitate the process of capturing lived experiences of researchers who encounter culturally decontextualised mathematics education during their life-roles as students, teachers and teacher educators and enable them to develop visions of inclusive, empowering and life-affirming mathematics education. The basic units of my design space are research paradigms developed over a period of time out of phenomenology, anthropology, critical social theory and Wisdom Traditions of different cultures, to name but a few. In what follows, I discuss how three major research paradigms (i.e., interpretivism, criticalism and postmodernism) contribute to the development of such a multi-paradigmatic design space together with a host of logics and genres that facilitate the research process. I explore a number of quality standards (cf. validities) to judge the quality of research process and outcomes.

The Paradigm of Interpretivism

Touted as the paradigm for generating context-based meaning, interpretivism has its roots in phenomenological notion of lifeworld as a subjective space for making sense of experiences from the vantage point of the living person (Hopp, 2008; Husserl, 1970). This paradigm takes a departure from the positivistic assumption of independence of thoughts, language and beliefs of the researcher (P. Willis, 2011). In this connection, the use of interpretivism in researching lived experiences of mathematics can be discussed on the basis of four key features: primacy of context, progressive subjectivity, emergence, interpretive sensibilities, and constructivist epistemology.

In my research program, the notion of context can be understood as a network of space, time and persons (J. Willis, 2007). Having this feature at their disposal, researchers do not only portray the description of their lived experiences, but also unpack the rich detail of context in which they encounter a particular form of lived experiences of mathematics. Similarly, the feature of progressive subjectivity enables researchers to clarify their initial subjective positions as they embark on researching lived experiences (Guba & Lincoln, 2005). In other words, progressive subjectivity is about monitoring researchers´ prior and emerging assumptions, which might influence the way they portray their lived experiences of mathematics. A next important hallmark of this paradigm is to take emergence as the defining attribute of the research process (Noy, 2011). An emergent inquiry begins with an initial focus, but grows further into depth and richness by adding possibly new inquiry issues to supplement the initial focus. Having been informed by this feature, researchers develop their "report" in terms of events and eventualities

grounded in the research process of portraying their lived experiences of mathematics. For example, the researcher may account for his or her lived experiences of developing QR knowledge and skills (e.g., proportions, additive relations, critical thinking, to name but a few) in different periods of his or her life.

Likewise, the paradigm of interpretivism facilitates researchers to make sense of lived experiences of mathematics through multiple vantage points and positions. The historical myth of data speaking-by-itself is not so much true, due to the sedimentation of meanings in several seen and unseen layers of "data". Thus one of the major tasks of researchers in my research program is to develop interpretive sensibilities to account for possible layered meanings of their mathematical experiences in their roles as students and teachers. In this process, researchers develop an account of their learning progressions during their liferoles as students and teachers, thereby interpreting them via a host of perspectives such as socio-cultural theory (e.g., how did learning take place within the context of teacher-centred pedagogy?), constructivist theories (e.g., how differently was mathematical knowledge constructed in specific learning domains?) and philosophy of mathematics (e.g., which view of the nature of mathematics might have governed the mathematical activities that took place inside and outside of classroom?), to name but a few. Finally, the paradigm of interpretivism makes use of a mix of social and radical constructivist epistemology of knowledge claims, for claiming to know is an adaptive, iterative and active process of meaning making as per the notion of radical constructivism (Glasersfeld & Ackermann, 2011). Social constructivism as an epistemology enables researchers to understand various socio-cultural contexts upon which researcher´s lived mathematical experiences are grounded (Ernest, 2006).

The Paradigm of Criticalism

The paradigm of criticalism complements the design space by giving due emphasis on a political turn of research in mathematics education. Such a turn is further strengthened by asking this question: *Whose interests are being well-served by a particular form of lived experiences?* – This question facilitates researchers in examining a host of disempowering conditions that might impact ways in which Nepali students experience mathematics. More so, the paradigm helps researchers to critically examine distortions and false consciousness about mathematics arising from unexamined values and beliefs embedded in their learning journey. I have envisaged that these three attributes of the paradigm of criticalism are helpful for the researcher to contest the hegemony of culturally decontextualised mathematics education in Nepal: critical selfhood, transformative sensibilities, and mathematics as a cultural activity.

The feature of critical selfhood challenges the long-held assumption of neutrality that often remains uncritical of power structures embedded in the self of the researcher, and that continues to reproduce the view of culture-free mathematical experiences in the disguise of neutrality (Kincheloe, 2010). The idea of critical selfhood is often used to challenge the positivistic view of self as external to, and independent of the research process, thereby offering a set of radical views: 1) that self is understood through an ontology of change, 2) that it has a propensity to change others, and 3) that self-consciousness plays an important role in conceiving pedagogic possibilities. In this way, this feature enables the researcher to act as an agent for change from a culturally dislocated mathematics education to mathematics education of cultural inclusivity. An example of a change agent may entail the researcher working towards a pedagogical framework for promoting an adaptive trajectory for students to develop culturally grounded learning progressions for them to apply mathematical and statistical knowledge and skills in context (Alonzo & Gotwals, 2012).

Another tenet of this paradigm is to harness transformative sensibilities in the researcher

by turning the ego to himself or herself via the process of critical self-reflection (Luitel, 2007; Niznik & Sanders, 1996). More so, the process also enables the researcher to critique disempowering socio-political ideologies which might have been shaping his or her lived experiences of mathematics. Consequently, researchers are enabled to unpack restraining forces contributing to distortions of their experiences of mathematics as a life-affirming learning enterprise, such as non-participatory pedagogy and emphasis on algorithmic problem solving devoid of meaningful mathematical learning (Luitel, 2009). Consequently, a host of transformative roles of the researcher (as advocate, resistor, jester, magician, alchemist, to name a few) are readily available for the researcher to embody the process of examining values, beliefs and perspectives associated with a particular form of lived experiences of mathematics, thereby offering ways to foster empowering mathematical experiences among learners (Taylor, in press). Such experiences may include, but not limited to, applying quantitative reasoning skills and knowledge to analyse the nature of wealth distribution in their locality, developing comparative representations of literacy rate of different districts of Nepal and their impact on household budgets, and carrying out comparative analysis of daily calorie intake on the basis of food consumptions.

The metaphor of mathematics as a cultural activity is yet another referent for researchers to contest (and complement) the hitherto view of the nature of mathematics as a body of pure knowledge, an orienting referent for the promotion of culturally decontextualised mathematics education (Davis, Hersh, & Marchisotto, 2012; Lerman, 1990). The activity turn enables researchers to subscribe to a historical perspective that a large part of mathematical experiences is not Absolute Ideas, but rather they are revisable and corrigible as novel problems and situations arise.

The Paradigm of Postmodernism

The paradigm of postmodernism as a unit in the multi-paradigmatic space offers the much needed aesthetic turn of performing research in mathematics education (Cooper & White, 2012). Thus, the key aim of the paradigm is to facilitate the process of portraying rich, colourful, playful, disruptive and nuanced accounts of lived experiences. Reconceptualising such a multidimensional nature of lived experience is possible by subscribing to the view of human nature as being-for-itself. Whereas chairs, tables and other material objects are being-in-itself, humans are seekers for visions of growth, expansion and transformation (Greene, 1997). In the context of researching lived experiences of mathematics, I have envisaged three key attributes of the postmodern paradigm to facilitate researcher to portray different dimensions of their lived experiences: epistemic pluralism, arts-based sensibilities, and alternative modes of thinking and expressing.

The paradigm promotes epistemic pluralism via which each corpus of 'knowledge' has the possibility to retain the same epistemic status with every other type of knowledge. One of the benefits of promoting pluralism is to challenge the mantra of one-size-fits-all in conducting and reporting the research (Barone & Eisner, 2012; Eisner, 2008). Similarly, arts-based methods provide the researcher with otherwise ignored possibilities of accounting for different dimensions of those experiences. A number of researchers in my program (e.g., Belbase, 2006; Khatri, 2012; Lama, 2012; Neupane, 2012; Poudel, 2010; Shrestha, 2011) have used ethnodrama, poetry and evocative stories to represent their lived experiences of mathematics as students and teachers. In this way, researchers present their "naturally occurring" learning progressions through a host of representational possibilities for their transferability in other pedagogical contexts.

In my research program, researchers employ the epistemic metaphor of knowing as aesthetic meaning making to explore the otherwise ignored ineffable, ambiguous and implicit di-

mensions of mathematical experiences embedded in the lifeworlds. Departing from hypothetico-deductive thinking and the propositional form of expressing, the paradigm of postmodernism opens the possibility of employing a host of new ways to portray the world of mathematical experiences, such as metaphor, images, dialectics and poetry. For example, an extensive use of metaphors is likely to deliterize[2] (i.e., artistically represent) knowledge (Eisner, 2008) by drawing contrasts between seemingly different concepts to expand the border of concepts, ideas and notions under discussion. The use of images are taken as heretical means for aestheticizing (sic) the process of accounting for lived experiences by juxtaposing visuals against the text (Taylor, Luitel, Désautels, & Tobin, 2007). The idea of aestheticizing refers to an approach to using aesthetic means for representing lived experience of mathematics so as to portray their maximum possible features and dimensions.

Recent developments in the area of researching lived experiences (e.g., Eastmond, 2007; Frentz & Hocker, 2010; Maidment, 2008) have suggested that alternative modes of thinking and expressions are helpful for illuminating different forms of lived mathematical experiences occurring in different life roles of the researcher. In the next section of this paper, I have explained the usefulness of new ways of thinking (i.e., logics) and expressing (i.e., genres) in accounting for lived experiences of mathematics and developing visions for fostering empowering mathematical experiences.

Analysis Plus via Inclusive Logics and Genres

A multi-paradigmatic design space enables the researcher 1) to understand the multifaceted nature of mathematical experiences arising from actual, non-actual, embodied, real and non-real contexts of the researcher, and 2) to construct visions for fostering empowering mathematical experiences towards the development of mathematics education as a life-affirming learning enterprise. These processes entail a synergistic approach via a cooperative interaction among sometime adversarial and seemingly different attributes arising from lived experiences of the researcher. In this way, the researcher makes use of the notion of unity in diversity by accounting for lived experiences occurring in different context of lived body, such as confessing, critical, uncertain, certain and relative, to name but a few.

Such an iterative process of researching lived experiences of mathematics cannot be well represented by the conventional notion of analysis wrapped in the propositional language game of positivism. As the researcher develops visions to foster empowering lived mathematical experiences among learners, she or he moves from "what is" to "what can be" and "what should be" (Greene, 1997; P. Willis, 2011). Then, guided by the epistemic metaphors of knowing as constructing, critiquing, aesthetic meaning making, the researcher is suitably enabled to go beyond the conventional modes of analysing as confirming *a priori* mathematical experiences.

In the two-stage process of describing lived experiences and making futuristic visions about their use in pedagogical contexts, the conventional logic and genre (i.e., combination of propositional, deductive and analytical) may be necessary, but are insufficient to capture the complex process of analysis (e.g., what is?) and envisioning (e.g., what should be?). Thus, I have envisaged that the metaphor of analysis plus is useful to represent such an epistemic process via a host of post-formal genres and logics which are different from what Piaget articulated as formalist logics and representation arising from hypothetico-deductive thinking and propositional expressions. For me, post-formal logics and genres are a means for promoting holistic, complex and 'vision' thinking and expression in terms of cultivating pedagogical possibilities to

2 In Eastern Wisdom Traditions, only literal meanings of words are thought to be a source of sorrow and unhappiness (Aurobindo, 1972).

foster empowering mathematical experiences (Pfaffenberger, Marko, & Combs, 2011). In what follows, let me explain some of these logics and genres.

Dialectical logic for complementarity

Dialectical logic is the logic of synergy in which different (often antagonistic) qualities, objects and concepts are held together to offer a holistic meaning of phenomenon under study (Giegerich, Miller, & Mogenson, 2005; Wong, 2006). This logic is useful for making sense of lived experiences which often appear to be contradictory and antagonistic. For example, recent studies by a number of graduate students have demonstrated that their lived experiences of mathematics within the school setting were often represented by the metaphors of machine, chains, and commands whereas their experiences in informal setting were explained by fun, connection, satisfaction and play (Belbase, 2006; Shrestha, 2011). In this context, dialectical logic plays a key role in 1) developing a heightened consciousness about possible controversies and paradoxes in different forms of mathematical experiences (e.g. subjective and objective, embodied and disembodied, and artefactual and abstract), and 2) facilitating the process of constructing inclusive visions to foster empowering experiences of mathematics in pedagogical contexts (Basseches, 2005; Edwards, 2011).

Metaphorical logic for multi-schema analysis and envisioning

A definition of metaphor entails its notion as making sense of one concept in terms of an unrelated other concept (Lakoff & Johnson, 1980). Metaphorical logic is operated via parables, analogies, images and imageries so as to capture multiple meanings, perceptions and conceptions of lived mathematical experiences. Indeed, metaphorical logic is not restrained by the literal meaning enshrined in those experiences; instead it enables the researcher to pursue the understanding of them beyond bounded literalism. Unlike the exclusive use of literalism which promotes a correspondence theory of truth, the use of metaphorical logic accounts for conscious, subconscious and unconscious forms of lived experiences. Unsurprisingly, metaphorical logic is about projecting one landscape of schema profiles onto another landscape of schema profiles. This logic also offers a platform for thinking and acting through perspectival 'as-thoughs' in order to minimize extreme essentialism embedded in conceiving the nature of mathematical experiences. Here, essentialism is associated with narrow literalism that regards words and sentences used to represent lived mathematical experiences as un-alterable objects (Joanna, 2011).

Poetic logic and genres for unpacking ineffability

Poetic logic and genres can be understood as a natural way of interacting self with other through the ever-shifting nature of meanings embedded in different levels of enacting a language of lived experiences. Unlike the logic of extreme assertion, deduction and analysis that often tends to promote a linear, literal and non-relational approach to knowledge generation, poetic logic can help explore the bumpy landscape of human thinking and actions associated with the investigation of lived experiences (Danesi, 2004). In Eastern mystical traditions poetic genres appear to be a means for communicating different layers of expressible and ineffable forms of experiences (Sri Aurobindo, 1972). As it goes with a popular dictum in the East and West, a poetic language can organize a marriage between water and fire, divine and demon, safety and danger, *Brahma* and *Maya*, Buddha and ignorant, and soul and body (Christie, 1979; Vico, 1984). I argue for the use of poetic logic and genres as a means for expressing various forms of ineffability resting in our world of experiencing (as a basis for thinking and performing) mathematics. The etymological root of poetic logics and genres, *poiesis*, seems to depict the notion of creation,

making and production, whereas various Sanskrit words[3] pertaining to poetic logic convey its meanings in association with the creation through our inner, intimate and felt world of lived experiences, thereby demonstrating an aesthetically textured landscape of the experiential world of a lived body. By refraining from using the exclusive view of mathematical language as a non-objective (but does not mean anti-objective) entity in an endeavour to facilitate a non-objective (soulful, contextual, playful, multiplistic, context-dependent, unique) nature of mathematical experiences, we can use the inner poetic (e.g., creative, imaginative, dreamful) voice for fostering empowering mathematical experiences (Glesne, 1997; Obeyesekere, 2012).

Narrative logic and genres for diachronic representations

Narrative logic and genres are helpful for bringing intelligibility to researching lived experiences in terms of what has transpired and bygone in the lifeworld of a researcher. Contrary to an excessive emphasis on searching for reality outside of one's own lived experiences, narrative logic and genres act from within and from the proximity of the lifeworld of the researcher. Unlike the crypto-positivistic orientation of creating a synchronic representation of lived mathematical experiences, the diachronic quality of narrative genres is helpful for uniting time, space, person, events associated with such experiences (Walshaw, 2009). In the North American history of qualitative research, narrative genres seem to have arisen after the post-structural movement that made visible the intertwined relationships between writing and experiencing (Denzin & Lincoln, 2000). Known as the "crisis of representation", this movement in educational research questions the privilege assumed by any form of text as being the unquestionable genre for representing lived experiences, thereby creating the ground for personal, embodied, soulful, contextual and reflective genres to depict them. In this way, narrative logic and genres are helpful for promoting holistic thinking that transcends the hegemony of reductionism by integrating place, people, action and time in researching lived experiences (Frentz & Hocker, 2010).

Non-linguistic genres

Can all forms of lived mathematical experiences be expressed through "linguistic" genres? Recent innovations in research methods suggest that a host of non-linguistic genres (photographs, paintings, cartoons, collage and creative models, to name a few (Barone & Eisner, 2012; Weber, 2008)) are useful for a holistic representation of lived experiences. Such genres are useful to demonstrate the multi-focal, pluri-vocal, embodied nature of mathematical experiences associated with our lifeworlds. It is said that the linguistic genres are mediated in the process of inscribing experiences in a so-called seamless structure whereas non-linguistic genres are likely to offer an approximately very close portrayal of lived experiences of anything including mathematics. In my research program, the most popular use of non-linguistic genres is to juxtapose images and creative designs against linguistic genres to illuminate otherwise ignored meaning of lived experiences of mathematics. By doing so, the researcher can evoke readers with pedagogical thoughtfulness in the reader and viewer (van Manen, 1991).

Quality Standards

Moving away from the positivist approach to producing an exclusively objective explanation of lived experiences requires us to conceive quality standards that reflect multifocal nature of the research process. Conventional quality standards of reliability, validity and objectivity are used to "pulverize life into minute abstracted fragments and particles that are of little use to

3 Literature (i.e., *Sahitya*: poetry, narrative, story, etc.) means association, connection , combination , union of self with other; Poet (i.e., *Kavi*) means seer, sage, prophet, wise, creator

practitioners" (Van Manen, 1990, p. 7). Thus, I have proposed the following standards to judge the quality of researching lived mathematical experiences with a view to promote a metaphor of research as professional development of mathematics education practitioners.

Incisiveness as focus on significant issues

This standard is useful to see the extent to which the research is focused on significant educational experiences (Barone & Eisner, 2006). In the case of my research program, the quality standard of incisiveness can be addressed by 1) capturing otherwise neglected but significant lived experiences of mathematical learning, 2) demonstrating how those lived experiences foster our understanding of the unfolding nature of mathematical learning in a school 3) justifying how lived mathematical experiences of some kinds are useful for systemic restructuring of mathematics education as a meaning-centred learning enterprise. Moreover, the quality standard has been used in my research program to unpack and portray lived experiences of the researcher in the context of culturally dislocated school mathematics curricula so as to 1) develop inclusive pedagogical possibilities for classroom contexts, and 2)offer futuristic vision to promote empowering mathematical learning experiences across the system of school mathematics.

Illuminating as cultivating subtleties

The quality standard of illuminating is used to see the extent to which meanings associated with lived mathematical experiences are enriched, deepened, made vivid, and made more complex (Barone & Eisner, 2006). The use of narrative, reflective, poetic and non-linguistic genres is helpful for researchers to illuminate subtleties associated with those experiences. In particular, these genres enable the researcher to be more richly expressive about the range of mathematical experiences being investigated and to make visible those subtleties embedded in lived experiences of the researcher.

Verisimilitude as lifelikeness

I envisage that by the use of verisimilitude, the researcher does not claim that his or her lived texts and vignettes embody objective Truth (for it is difficult to access the notion of objectivity without its co-dependent notion of subjectivity, and vice versa), nor can it be expected of him or her to carry the burden of claiming their absolute realness outside of the researcher's experiences (Amundrud, 2011; Richardson, 2000). Nevertheless, I uphold the view that research stories and vignettes depicting lived mathematical experiences need to be judged on the basis of their truthfulness and lifelikeness. In the process of judging the fulfilment of this standard, readers of this type of research can ask these questions: "Do the context, event and persons in the vignettes sound believable?" and "Do the experiences depicted in researcher's stories ring true from my lived experience?"

Transferability as viability

A key purpose of researching lived mathematical experiences is to develop a basis for fostering those experiences which can promote empowering learning environments. This purpose of the research is addressed by the quality standard of transferability, which is about the viability of transferring research activity or its product to another setting or context by identifying similarities and dissimilarities between the research site and would-be research sites (Guba & Lincoln, 1989, 2005). In my research program, the researcher attempts to address the quality standard by providing rich details of pedagogical contexts, events and moments in which a particular form of lived experiences of mathematics occurred. As a result, future researchers can use some aspects of the research design to investigate similar (and different) research agendas pertaining to lived mathematical experiences.

Pedagogical thoughtfulness as evoking readers

Arising from phenomenological-hermeneutical traditions the quality standard of pedagogical thoughtfulness enables the researcher to construct accounts of lived mathematical experiences with a view to evoking present and future readers of the research report to question, reflect and examine their own pedagogical practices (van Manen, 1990). Furthermore, the standard of pedagogical thoughtfulness is also about increasing the prospect of teachers and teacher educators becoming aware of the deep-seated assumptions guiding their beliefs about the nature of mathematics and its pedagogy. To see if the research texts fulfil the criterion of pedagogical thoughtfulness, readers of such research may ask the questions; "Is the research text engaging?", "Does the researcher invite me to reflect upon my perspective on differing lived mathematical experiences?" and "Does the research text offer perspectival envisioning about the possibility of fostering those experiences for an inclusive mathematics education?"

Critical reflexivity as transformative process

As discussed throughout the paper, my research program entails the component of researching lived experiences in the context of the lifeworld of a researcher. Thus, the quality standard entails the notion of exposing the researcher as well as being self-conscious of her or her own (unfolding) subjectivity, thereby being aware of the limitations of chosen epistemology, methodology and theoretical perspectives (Denzin, 2003; Flecha, Pulido, & Christou, 2011). Arising from the critical research paradigm, the standard of critical reflexivity can therefore be judged by the extent to which: 1) the researcher made the process of generating and interpreting lived experiences visible to readers; 2) he or she has reflected critically upon his or her assumptions as a researcher; 3) he or she has consciously and critically reflected upon their evolving subjectivities (false consciousness) throughout the process of inquiry; and 4) her or his textual constructions did not arise from isolated navel gazing, thereby envisioning present and future praxis for the promotion of empowering lived mathematical experiences. Here, navel gazing refers to self-referential and self-absorbed act that do not connect with the work of others.

Final Comments

The multi-paradigmatic design space can also be useful to account for lived experiences of applying a host of skills and knowledge associated with quantitative reasoning (QR), thereby developing visions for constructing empowering lived experiences for learners to engage in meaningful application of QR skills and knowledge. More so, one or more paradigms of the design space can be used for specific purpose of QR research. For example, if we are to deepen our understanding of students´ applications of one or more QR skills (e.g., constructing units (Steffe, 2013/in press)), we can use the paradigm of interpretivism to provide a detailed account of their lived experiences in terms of context, learning tasks, persons involved and outcomes of such an application. Although there is an emphasis on intended learning progression in the mainstream literature, the multi-paradigmatic design space can otherwise be useful to map out unintended (and naturalistic) trajectory of learning progressions of research participants and researchers. In this process, the design space provides researchers with the opportunity to construct more empowering and adaptive trajectory of learning progressions for their pedagogical contexts. In a similar line, the use of technology in mathematics teaching offers yet another context to explore how lived experiences of mathematics are similar to and different from the lived experiences arising from the conventional teaching context in terms of promoting authentic, life-affirming and meaning-centred mathematics education in Nepal.

Finally, the importance of this research design lies in facilitating professional development of mathematics education practitioners in a unique way. Contrary to the positivistic belief that researchers cannot be the research participants at the same time, the multi-paradigmatic research design space enables researchers 1) to be critically aware of their beliefs and values as a mathematics teacher and teacher educator, 2) to understand various paradoxes inherent in her or his pedagogical practices, and 3) to develop visions for promoting life-affirming and meaningful mathematical experiences among the learners.

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