

Refractions of Mathematics Education

Festschrift for Eva Jablonka

[Christer Bergsten](#), *Linköpings Universitet, Sweden*

[Bharath Sriraman](#), *University of Montana*

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Editor(s): Bharath Sriraman, *University of Montana*. Lyn English, *Queensland University of Technology*.

An ancient Sanskrit adage states that Knowledge is something that grows when shared, but shrinks when hoarded. Academics engaged in the generation of new Knowledge are blessed with both the time and the freedom to engage in pursuits that allow for intellectual pleasure. As a phenomenon of the Zeitgeist many have succumbed to the increased corporatization of academic work, engaging in activities for monetary and self advancement purposes. Are there any real intellectuals left in academia, à la Adorno, Bourdieu, Chomsky, Foucault, among others? This Festschrift is dedicated to academics that don't bother with self promotion or aggrandizement of themselves or their ideas in simplistic terms.

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Als Hilfe, selbstständig den Blickwinkel zu ändern, und als Mittel zum Erkennen und Bewerten von Alternativen, zur Suche nach Gründen und beim Austausch von Argumenten ist Reflexion [...] eine Haltung bei der Beurteilung mathematischer Methoden zur bewußten Gestaltung von Handlungssituationen, die dazu beiträgt, zu erkennen, daß man als Rezipient oder Betroffener autorisiert und als Anwender verpflichtet ist, eine kritische Haltung einzunehmen. (Jablonka, 1996, p. 187)

Refractions of Mathematics Education

An Introduction

Christer Bergsten and Bharath Sriraman

Although researchers have studied the conditions and outcomes of the teaching and learning of mathematics over a long time (Kilpatrick, 2014), the date of the first ICME Congress in Lyon may be seen as the formal birthday of mathematics education as a research field *in its own right* (e.g. Furinghetti, Matos, & Menghini, 2013, p. 289). That date would place this book within a frame of reference of at least 45 years, an age one would hesitate to call mature for a ‘scientific discipline’. In the ICMI Study on *Mathematics education as a research domain* published in 1998, the editors, indeed, conclude that the “search for our common identity as researchers in mathematics education is not over” (Sierpinska & Kilpatrick, 1998, p. 547). From that perspective, the title *Didactics of mathematics as a scientific discipline* of the book dedicated to Hans-Georg Steiner some years earlier may be seen as the *state of the*

progress rather than a description of the *state of the art* of this ‘discipline’ at that time.

In the preface the editors write that they did not only want

to demonstrate the level reached and the maturity gained but also to indicate questions that are still open and tasks that need to be solved in the future. Both Professor Steiner and the IDM may be honoured by showing that the object of their promotion is alive and well in both its international connections and its disciplinary diversions. (Biehler, Scholz, Straßer, & Winkelmann, 1994, p. 6)

This description assumes an evolutionary notion of a maturing body of knowledge. Twenty years after the publication of those statements, is the ‘body’ still “alive and well in both its international connections and its disciplinary diversions”? Alive yes, as witnessed by the increasing bulk of texts potentially contributing to the formation of this body, as for example articles in international scientific journals whose names signify that they belong to this particular field. A simple count covering all issues from the year 2013 of the 18 periodicals specialised in mathematics education that were ranked (based on a given set of criteria; see Törner & Arzarello, 2012) by European scholars in a survey collaboratively organised by the European Mathematical Society (EMS) and the European Society for Research in Mathematics Education (ERME), showed that there were a total of c. 500 articles published in 79 issues, adding up to some 10 000 pages. While this is still a relatively small number compared to other fields¹, considering that it is only a fraction of all published work within research of mathematics education during this one year, there are a number of pertinent questions seldom asked that pop up, such as: Who wrote these articles and why?² Who printed these articles and why?³ Who read these articles and why? Who cite these articles and why? What contribution to the development and differentiation of this body of knowledge have these articles accomplished and for what purpose?

¹ See Sriraman (2012) where also an analysis of the economic values involved is offered.

² In a study of publishing practices of the UK mathematics education research community, using social network analysis Craig (2012) found interesting patterns of author collaboration in journals, suggesting positioning strategies within the field.

³ 51% of the articles counted above were published in journals owned by one publisher and about 21% in journals owned by one other publisher.

Concurrent with these types of questions, Paul Ernest suggested a postmodern view of research in mathematics education that “does not separate research and knowledge from the group of people that do this research and produce this knowledge and from the goals they attempt to reach through these” (Ernest, 1998, p. 80). There are also many other questions one should ask about what, in light of the questions above, in Foucaultian terms could be called the discursive formation of mathematics education – what regularity with regard to “order, correlations, positions and functionings, transformations” (Foucault, 2002, p. 41) can be described between its chosen themes and objects of study, the concepts it has developed, and the types of statements it has made? Only answers to questions like these would indicate the extent to which this ‘body’ is (still) well.

The term ‘diversions’ in the quote from Biehler et al. (1994) seems to refer to the differentiation of the theoretical framework of didactics of mathematics, the diversification of methods used and of the objects of interest in the international discussion (ibid., p. 6).

When manifested, rather, through adherence to different intellectual roots and theoretical orientations (cf. Sriraman & English, 2010), ‘diversions’ may better be termed *refractions of mathematics education*. The collection and analysis of empirical data in an educational study, for example, are by necessity *refracted* through the specific analytical *lens* or approach chosen, as well as the aim of the study itself. Refractions can also refer to ways of looking at old phenomena through new lenses. Such refractions have the potential to generate what Jeremy Kilpatrick, when discussing the *reasonable ineffectiveness* of research in mathematics education, called landmark studies:

A landmark research study is one that confronts us with data analyzed and organized so as to shake our preconceptions and force us to consider new conceptions. (Kilpatrick, 1981, p. 27)

This would produce new (theoretical) lenses as bases for renewed refractions in an iterative process, resonating with the following description by Alan Bishop of the purpose of research in mathematics education:

Theory is the essential product of the research activity, and theorizing is, therefore, its essential goal. (Bishop, 1992, p. 711)

Theorising is a common core across Eva Jablonka's wide-ranging scholarship, both in empirical studies and philosophical writings. However, theorising alone does not guarantee the employment of a critical stance towards the research, something for which one is not only authorised as a researcher but should see as an obligation (cf. the quote above, in German, from Jablonka's dissertation about mathematical models).

This Festschrift is a tribute to Eva Jablonka and her work, which has provided refractions of mathematics education through the mathematical, the philosophical, the political, and the social, dimensions generally treated as inseparable, most of them pursued by the authors of the chapters in this book. The discussion of issues in mathematics education as developed in the chapters by Peter Appelbaum on the elusive experience of encountering mathematics, Paul Dowling on the purification of theories, Michael Otte on the relationship between philosophy and mathematics, and Ole Skovsmose on ethnomathematics as discourse, may be seen as refracted through the *philosophical*, in a wide sense, while different aspects of the *political* frame the chapters by Uwe Gellert on messages from textbook images, Brian Greer on the politics of mathematics education, and Paola Valero and Alexandre Pais on the presence of the political in mathematics education research. The *mathematical* provides the lens for Christer Bergsten, Michael Fried, and Carl Winsløw in their respective chapters on meaning and representations, mathematical models, and praxeologies for the calculus, thus constituting examples of mathematical approaches in mathematics education (Bergsten, 2014). Some aspects of research in mathematics education are refracted through the *personal* in Stephen Lerman's chapter, a conversation with Eva Jablonka, as well as in the poem 'Dialogical' by Bergsten. 'The White Paper', however, will remain just a fragment of a refraction until readers start scribbling over the blank pages, the only rule being to include the existing picture, glossary, questionnaire and references.

The four refractions (philosophical, political, mathematical and personal) can be further viewed through a Foucaultian lens to discuss identity in mathematics

education. One's experience as a researcher in mathematics education is subjective in a Foucaultian sense – both in engaging with the field as well as the choices one makes in theorizing within one's work. As Foucault (1982) clarified the word “subject” carries a double meaning – one meaning that is characterized by dependence or control by someone else, and another meaning characterized by one's identity or self-knowledge. Power relations are evident in both meanings, i.e., “power which subjugates or makes subject to” (p. 212). In mathematics education, an entry level researcher is often under the control of a senior professor in terms of the research agenda that they adhere to, particularly in large scale studies that require funding from multinational sources. Power relations further crop up when a researcher encounters gatekeepers (editors, referees, etc.) who impose subjectivity in the publication process. For instance adherence to an unfamiliar methodology or the employment of a theoretical lens that is not in vogue (e.g., constructivism in the 1990's) results in the outcome of rejection of one's research by the discipline.

A different pitfall that one encounters at a later stage as a researcher is that of internal theorizing:

“there is a danger of ‘internal’ theorising without taking notice of the profound and ongoing development over long periods in psychology, philosophy, cultural psychology and anthropology, social linguistics and semiotics, and sociology.” (Jablonka & Bergsten, 2010, p. 116)

Jablonka's career as a mathematics education researcher has experienced the vicissitudes of Foucaultian power-relations with the outcome of a researcher that has broken away from the “subjugates or makes subject to” cycle of oppression.

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