

Reconceptualising comparative education : the case of international studies in mathematics education.

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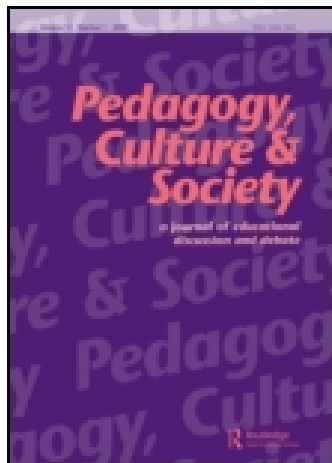
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Reconceptualising comparative education: the case of international studies in mathematics education

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REVIEW ESSAY

Reconceptualising Comparative Education: the case of international studies in mathematics education

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International Comparisons in Mathematics Education

GABRIELE KAISER, EDUARDO LUNA & IAN HUNTLEY (Eds), 1999

London: Falmer Press.

269 pp., £17.99, ISBN 0 7507 0902 2

For anyone interested in comparative studies in mathematics education, the book *International Comparisons in Mathematics Education* is worthwhile reading. It provides a helpful overview of the most recent large-scale and selected small-scale studies, and initiates discussion about pedagogical and methodological issues connected with comparative studies. The book is a welcome addition to the sparse literature on comparative studies in mathematics education. The results of the Third International Mathematics and Science Study (TIMSS) ranked countries according to pupil performance in standard tests. Perhaps predictably, questions have been asked about the methodologies used by TIMSS researchers, and about the pedagogical value of such large-scale international studies.

International Comparisons in Mathematics Education is organised in two parts. After an introductory chapter by Kaiser, the subsequent first part gives an overview of the 'most important large-scale international comparative studies in mathematics education of the last 20 years' (i.e. FIMS, SIMS, TIMSS) described by authors who had been involved in those studies (chapters 2–7) and some selected small-scale comparative studies (chapters 8–10). Part two of the book (chapters 11–16) is devoted to the discussion of methodological issues and the pedagogical value of cross-national comparative studies in mathematics education.

In the following passages, I want to outline highlights and shortcomings of the book and individual chapters. This is focused under five headings: 'descriptive and/or analytic'; 'quantitative-qualitative debate'; 'conceptual equivalence'; 'cultural embeddedness'; 'understanding by comparing'.

Descriptive and/or Analytic

The literature on comparative mathematics education can be seen as falling into three categories: studies that *describe* and document phenomena, for example, achievement, or teaching practices; studies that *predict*, for example underachievement (as in policy studies); and studies that make 'causal' links or *develop understandings* between the documented phenomena, for example, links between teaching and achievement. Accepting this categorisation, most chapters in this book can be seen to fit into the *description* category. Indeed, most authors content themselves with a *description* and discussion of investigated phenomena, without attempting to 'dig deeper' and further develop understandings of the results. Only on a few occasions do the authors probe sufficiently below the surface and 'theorise' about phenomena. In addition, the majority of chapters are concerned with the recent large-scale international studies (FIMS, SIMS, TIMSS) and their associated projects. The chapters on 'selected' small-scale studies seem 'overrun' by the impact of the large studies. Moreover, it is not explained on what basis in particular the small-scale studies were selected. Are they in any way typical or representative of the field of comparative studies in mathematics education at the present time?

Chapters 9, 12 and 16 provide examples where authors go beyond descriptions and probe deeper. Kaiser (chapter 9), who reports on a qualitative study of mathematics teaching in the United Kingdom and Germany, provides short 'profiles' of practices in the two countries, and she makes a promising start to conceptualise her findings in terms of her understanding of the wider cultural context. Unfortunately, she does not develop her conjectures further. Is it that she does not dare generalise any further because of the nature of her study? In chapter 1 she asserts that 'generalised descriptions of the teaching and learning processes in many countries are reserved to large-scale studies such as SIMS or TIMSS which lose, in contrast to small-scale studies, the possibility of microanalytic analysis' (p. 12). There seems to be the general position that it is not possible to generalise from qualitative studies. It is important to remedy this view. The criticism that qualitative findings are not generalisable because very small samples are studied, rests on the perception of what generalisability means. The notion of generalisation may have to be reconceptualised. Instead of implying generalisation over population (for quantitative studies), it can also mean to generalise over

'context' (for qualitative studies). For a deeper analysis, reference is made to Bogdan & Biklen (1992) or Hammersley (1990, 1992).

Another interesting example is provided by Romberg (chapter 12), who gives an account of how comparative studies, particularly TIMSS, have contributed to changes in policy in the United States. He develops his understanding of the underpinning philosophy of the current system in the United States in the following way:

The underlying problem with the current system is that it is based on an industrial metaphor. Schooling is viewed as being analogous to an assembly line – students are the raw material input to the system, teachers are workers passing on a fixed body of mathematical knowledge by telling students what they must remember and do, and the output of the system is judged by scores from tests that assess knowledge of facts and procedures. This metaphor is based on the need to prepare the majority of students efficiently and smoothly to fit into a mass-production economy. According to the model devised to meet this need, knowledge is construed as objective, learning as absorption and teaching as transmission and control. Policymakers are now aware that each of these assumptions has changed. Today our society needs individuals who will continue to learn and adapt to changing circumstances and who will produce new knowledge. Today, knowledge is seen as constructive, learning as occurring through active participation and teaching as guiding. (Romberg, chapter 12, p. 192)

One of the highlights of the book is the chapter by Keitel & Kilpatrick. In chapter 16, they express their critical view of international comparative studies, in particular of TIMSS, and there are at least two items that merit emphasis. First, they argue that the mathematics curricula are not an unproblematic area to investigate and that the 'idealised international curriculum', as a basis for performance tasks, does not exist:

'No allowance is made for different aims, issues, history and context across the mathematics curricula of the systems being studied. No-one really addresses how well the students in a system are learning the mathematics curriculum that their system has offered them. (Keitel & Kilpatrick, p. 243)

Secondly, they raise questions concerning the people directing any international large-scale study and those determining the methodology, the origins of the financial support; and the ways the results are framed and disseminated. The three complementary TIMSS studies serve as an example of these practices and the authors show an extremely critical stance towards them. They believe that the hopes of TIMSS to provide detailed explanations for students' performance in the light of 'rich' information about classroom practice and curricular intentions were only partly fulfilled. In their view, the dominance of the USA in terms of

funding, design and analysis of TIMSS has to a large extent determined the nature of the study, its outcomes and value. In the aftermath:

... TIMSS threatens to poison for some time the waters of educational policy, as politicians and researchers scramble to take advantage of what TIMSS allegedly says about the teaching and learning of mathematics in their country. (Keitel & Kilpatrick, p. 254)

Moreover, they criticise the perception that international comparative studies, such as TIMSS, are flawless and their results as 'infallible', because of the high investment of money (by the countries) and of efforts by so many 'serious' educationists and scientists. This view is expressed by Keitel & Kilpatrick as the final words of the authors of the last chapter of the book:

International comparative studies are trumpeted in educational journals and in the press as triumphs of rationality ... The studies rest on the shakiest of foundations- they assume that the mantle of science can cover all weaknesses in design, incongruous data and errors of interpretation. They not only compare the incomparable, they rationalise the irrational. (Keitel & Kilpatrick, p. 254)

Whilst this critical attitude does not reflect the 'flavour' of the book, they succeed in challenging most of the assumptions and values of the main studies described. If the reader was 'lured' into a kind of false 'security of rationality' during the previous chapters, this chapter, intentionally or unintentionally, could influence the reader to perceive previously presented results in a different light.

Quantitative-qualitative Debate

Since FIMS in 1964, it seems that the same questions have repeatedly been asked in large-scale studies, and that qualitative strategies are still relatively underdeveloped (M. Brown, 1998, personal communication). Interestingly, as a result of the criticism of the First International Mathematics Study (FIMS), SIMS was conceptualised as an 'in-depth study' of the curriculum. The framework of the study was devised on three levels: the Intended Curriculum (i.e. what the educational system mandated to be taught); the Implemented Curriculum (i.e. what teachers actually taught students in classrooms/schools); the Attained Curriculum (i.e. what students have learnt). For the first time, issues such as those related to 'student and teacher beliefs' were discussed. TIMSS added to SIMS, in the sense that TIMSS attempted to explore the relationships between the intended, implemented and attained curriculum. A close look at the chapters provokes the feeling that for various reasons qualitative approaches are being considered as necessary and valuable.

For example, in the study reported by Cogan & Schmidt (chapter 5), the authors report on a TIMSS-related study, based on observations in

mathematics (and science) classrooms in France, Japan, Norway, Spain, Switzerland and the United States. They argue that there are typical patterns of instructional and learning activities (Characteristic Pedagogical Flow, CPF) in each country, which seem to stem from the interaction of curriculum and pedagogy. It was assumed that students' learning experiences are moulded by teachers who select, prepare and teach the mathematical content in a variety of instructional activities. In this respect, they felt it necessary to elicit information on teachers' background knowledge, their beliefs about subject matter and pedagogical beliefs. In their discussion the authors emphasise their conceptual framework:

One [important notion] was the idea that students' curricular experiences reflect the complexity of the educational system as a whole and are not merely functions of the individual and the individual's immediate learning environment. There are many factors that have an impact on education, even at the classroom and student level, which are systemic- stemming from the broader context of the educational system and the specific cultural setting ... Another notion was the central role classrooms and teachers have in schooling and students' experiences. Embedded in the model is the backbone of curricula giving shape and definitions to educational experiences. As teachers choose particular instructional topics, ignore and minimise others, and make many other decisions about how topics are presented and what students will be expected to do with these topics, teachers become the final arbitrators of curricular intentions. In this sense they serve as brokers or midwives of students' content-related learning experiences ... (Cogan & Schmidt, pp. 73–74)

This view led the researchers to explore teachers' instructional practices in classrooms in detail. Interestingly, as the description of teachers' practices through observations became the major focus, a major reorientation in paradigm and methodology was inspired. The orientation of conceptualisation shifted from quantitative to qualitative differences between countries:

... the very notion of common practices became suspect. Practices are embedded in complex task environments and thus vary qualitatively depending on many factors – including views of teaching and learning, articulation with other practices within and across lessons, how subject matter is defined and others. (Cogan & Schmidt, p. 75)

Stevenson (chapter 7) points to the need to conduct ethnographic studies. He quotes the Board on International Comparative Studies in Education:

There is a great need for small, in-depth studies of local situations that would permit cross-cultural comparisons capable of identifying the

myriad of causal variables that are not recognised in large-scale surveys. In fact, much survey data would remain difficult to interpret and explain without the deep understanding of society that other kinds of studies provide. Given that research in cross-national contexts benefit from increased documentation of related contextual information, it would be useful to combine large-scale surveys and qualitative methods. (Gilford, 1993, p. 22)

Given the recognition of the significance of in-depth qualitative investigations, the reader wonders why 'valid' studies still need to be conceptualised quantitatively first, with the qualitative studies added to 'throw light on murky areas'. Instead, frameworks for comparative studies could be conceptualised qualitatively from the start, and then those issues that emerge from rigorous qualitative investigation guide the subsequent quantitative parts.

Moreover, it is not clear at this stage that the case studies of TIMSS, for example, are actually ethnographic. Observations, long conversations and interviews are not necessarily ethnographic, unless they are conducted with the ethnographic 'principles' in mind. Generally, the literature on qualitative research methodologies, and that of ethnographic research in particular (Hammersley, 1990), proposes several common features in the use of qualitative research strategies (for example, Burgess, 1985, pp. 7–10):

The importance of meaning and the attempt to *understand* the culture under study is based on the assumption that human behaviour does not simply consist of fixed responses and stimuli, but involves interpretations and meanings.

The research process is rather *discovery*-based and aims to let theories emerge from the data, in an attempt to avoid pre-defined frameworks.

The commitment to *holistic* research implies that human behaviour is influenced by the context in which it occurs and that what people say and do depends on the social context in which they live and work. It attempts to provide a contextual understanding.

This usually involves long stays in the field, which, in turn, can help counter threats to validity concerned with conceptual equivalence (see earlier). For the study described by Stevenson (chapter 7), it can be assumed that the experience of the researchers involved in the study provided for this, because Stevenson reports that researchers doing comparative research 'must not only have strong research skills, but must also possess a high degree of facility in the language and a broad understanding of the culture they are studying' (p. 108). What might perturb the mind of a 'pure' qualitative researcher is the fact that 'major topics' were pre-defined and each researcher was assigned one of the four topics of investigation. This contradicts, to a certain extent, the 'holistic' and 'discovery' principles of qualitative research.

Conceptual Equivalence

This point concerns the question whether concepts in one culture have the 'same' meaning in the compared cultures under study. Chapter 6, by Kawanaka et al, describes the videotape study that accompanied TIMSS. It is concerned with analyses and comparisons of mathematics classrooms in Germany, Japan and the United States. One of the points that need to be emphasised and applauded in chapter 6 is the attempt of the authors to grapple with the issues of *equivalence of concepts* within and between countries and the associated problems of coding. They argue that:

... even within the same culture, we lack shared meanings for the words we use to describe teaching ... The problem of no shared language is compounded in a cross-cultural questionnaire study – the responses are nearly impossible to interpret. (Kawanaka et al, p. 87)

Subsequently, they give a whole subchapter to 'translating impressions into codes', which involved categorising and coding complex cultural practices such as classroom practices. Keitel & Kilpatrick (chapter 16) condemn the coding procedures of the TIMSS video study and criticise that the consensus among various expert groups, who have necessarily biased views, was the final criterion for coding and interpretation.

The problem of concept equivalence is not a new one in comparative education, but important enough to be re-iterated. Warwick & Osherson (1973) outline basic problems that tend to arise in comparative analysis, amongst them and, most importantly, that of conceptual equivalence. Conceptual equivalence refers to the question of whether the concepts under study have equivalent or any meaning in the cultures being considered. Some concepts have meaning in many, but not all cultures and settings. A major challenge of comparative research is to provide conceptual understandings that have equivalent, although not necessarily identical meanings in the settings under study. Probing of subjects/participants for their meaning and long periods in the field, in order to get to know the context in which subjects/participants are working, are two of the possible 'solutions' suggested by the literature.

Cultural Embeddedness

Cogan & Schmidt (chapter 5) suggest that:

... not only is teaching an activity embedded in culture but, so is what is taught ... Mathematics, unlike culturally embedded subjects such as history and language, is often thought to be acultural ..but these common expectations are false. Not only did instruction differ qualitatively among the ... countries but, in each, culture influenced mathematics teaching in a way that is comparable to the teaching of language and history ... The presence of qualitative differences in

mathematics instruction across the six countries points in a different direction, suggesting that more complex factors than are typically assumed may lie behind instructional differences. Countries have developed their own ways of engaging students in the substance of mathematics. (Cogan & Schmidt, p. 77)

Kawanaka et al (chapter 6) also point to the 'cultural' side of classroom practices:

Cultural activities often have a routineness about them that ensures a degree of consistency and predictability. Lessons are the daily routine of teaching and learning and are often organised in a certain way that is commonly accepted in each culture. As we watched the field-test tapes, we began to see patterns that underlie lessons in the three countries. The differences in the patterns undoubtedly follow from different instructional goals, and are probably based on different assumptions about the nature of mathematics, the way in which students learn, and the appropriate role for the teacher. (Kawanaka et al, p. 91)

Kawanaka et al finish chapter 6 by emphasising that:

Teaching and learning, as cultural activities, fit within a variety of social, economic and political forces in our society. Every single aspect of mathematics education, from a particular teacher behaviour to national policy, must be considered and evaluated within a socio-cultural context. (Kawanaka et al, p. 103)

Referring to the TIMSS case study project (chapter 7) and Kaiser's study on mathematics teaching in England and Germany (chapter 9), several questions remain. Whilst it is exciting to view the CPFs in mathematics lessons of each country, the explanations that the authors present for their results are relatively inadequate. How do they understand the different pedagogies in the light of different educational 'cultures? If we believe that the teaching of mathematics is 'culturally embedded', what are the cultural and philosophical underpinnings that influence the teaching of mathematics in the different countries? Where do the cultural and educational traditions stem from? These and more questions have to be posed and answered if we want to develop an understanding of mathematics teaching in different countries.

Understanding by Comparing

Authors, such as Kawanaka et al (chapter 6), go a step further by emphasising the better understanding of one's own culture by comparing:

Over time, each culture has developed norms and expectations for teaching and learning that are passed along from one generation to next. Since these norms and expectations are so widely shared

and familiar, they become nearly invisible to members within a culture. When we observe classroom practices in other countries, these accepted and unquestioned cultural models are revealed. (Kawanaka et al, p. 86)

Other authors, for example, Stigler & Perry, in chapter 1 of the book, stress the reflective aspect of comparative studies:

Cross cultural comparison also leads researchers and educators to a more explicit understanding of their own implicit theories about how children learn mathematics. Without comparison, we tend not to question our own traditional teaching practices and we may not even be aware of the choices we have made in constructing the educational process. (p. 199)

This is important and worthwhile pointing out, though not a new idea. Hantrais & Mangen (1996) assert that, rather than being a second-order activity, comparison is, arguably, central to the very act of knowing and perceiving and, therefore, likely to be essential to social scientific analysis. They contend that through the comparison of the known with the novel, the difficulty of achieving intellectual distance from the phenomena in question is likely to be overcome. This allows the researcher to examine the taken-for-granted assumptions, which in turn can lead to a deeper understanding of the issues that are of central concern in different countries. Cross-national comparisons may also point to possible directions that could be followed and about which the researcher may not previously have been aware, or they may help to sharpen the focus of analysis of the subject under study by suggesting new perspectives. Cross-national comparativists are forced to attempt to adopt a different cultural perspective, to learn to understand the thought processes of another culture and to see it from the native's viewpoint, while also considering their own country from the perspective of a skilled observer from outside.

Finally, I would like to emphasise that all research, including international comparative studies in mathematics education, is influenced by the authors' views about the phenomena under study and about the way to study such phenomena. Unless we examine our views of investigating the world, our research may grant legitimacy to the social and cultural arrangements that originally gave rise to the problems under study.

Overall, this book is worthwhile reading and a welcome addition to the ongoing dialogue on comparative studies in mathematics education.

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