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## Mathematics, Mathematics Education and Economic Conditions

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### ABSTRACT

*This chapter looks at the rhetoric which surrounds the relationship of mathematics to the economic assumptions in modern societies. It is concerned on the one hand with the economic language which has invaded educational principles and on the other its converse, in which the language of mathematics is used to justify and authenticate political and economic arguments. Economic conditions are now globally managed – through inter-dependant markets, through overt political pressures from such bodies as the World Bank and through dominance and pressures from global corporations – and so too education is becoming an internationally uniformly conditioned commodity. The chapter also looks at the issues raised by international testing as measures of educational success and the supposed dominant variable in national economic success. After reviewing the dilemmas raised by ICT and new technologies in the context of disparate world resource divisions it also looks at the limited studies available on the impact of poverty on mathematics education in classrooms.*

### 1. INTRODUCTION

This chapter looks at the rhetoric which surrounds the relationship of mathematics to the economic assumptions in modern societies. It is concerned with the economic language which has invaded educational principles and with the manner in which the language of mathematics is used to justify and authenticate political and economic arguments. Economic conditions are now globally managed – either through inter-dependant markets, through overt political pressures from such bodies as the World Bank and through dominance and pressures from global corporation. It looks at the issues raised by international testing as measures of educational success, and also reviews the potential impact of ICT and new technologies in the context of disparate world resource divisions. It finishes by looking at the limited studies on the impact of poverty on mathematics education in classrooms. It is also related to other chapters in Section 1 of the second *International Handbook of Mathematics Education*, in particular to: Atweh

et al. on 'Mathematics Education in International and Global Contexts'; Gates and Vistro-Yu on 'Is Mathematics for All' and 'Lifelong Mathematics Education' by FitzSimons, Coben and O'Donoghue. There is also a close connection with the chapter in the first Handbook by Jacobsen (1996) on 'International Co-operation in Mathematics Education' which looked at disparity in resources between nation states and the impact in this of the World Bank and other international organisations.

## 2. CONTEXT

Mathematics has a peculiarly special position in the social and political discourse across the world – to use a now dangerous word it holds global significance. As the 'language of science' it had long assumed power and influence as the terminology of science but during the last half century it has permeated many of the social sciences, including not only economics but also such social areas of debate as wealth distribution (poverty and affluence) or crime and its causes and consequences. Mathematics is initiated into political/social debate as a contribution to the conduct of rational debate – much as forensic science has become recognised in crime detection – fuelling and being fuelled by the 'myth of cold reason' (Taylor, 1996). It has been used in this form within 'economics' during its rise to political prominence. Economists use mathematics not to formulate, not to theorise, but essentially to describe their world. They thereby invoke all the security and certainty that is embedded in popular conceptions of mathematics but with no axiomatic basis and little predictability. Yet by the use of mathematics as a language of 'the market' so mathematics has become entwined and identified with market economics.

This is, in the words of Ian Stronach (1999) essentially a 'cultural performance' containing all the irrational intuitions and imagery with which plays, films, dance and writing capture the hearts and minds of their audiences. No longer an arbiter of truth, mathematical language has become the *creator* of truth. Stronach's article offers

"... a deconstruction of global evaluation discourses concerning school effectiveness and improvement. It portrays these discourses in anthropological terms, as 'cultural performances' and examines the ways in which technical discourses obscure elements of ritual, philosophy, myth and shamanism. The author concludes that such discourses, especially in their mediated forms – as league tables – are a form of contemporary 'spectacle'. They are our form of Olympic Games." (p. 173)

We shall return to this issue later when the impact of, and response to, the TIMSS activity is discussed.

This use of TIMSS as a politicised view of international comparative league tables was a much criticised issue at ICME 9 by delegates from a number of

countries. It is important not just for the impact and political import within the countries themselves, i.e. those in the developed world, but it displays an attitude of collective mind, of national priorities and of a style of national argument which colours the international project (“Our aim is to lead all other nations in the achievement of our pupils in mathematics and science”, USA Goals 2000). It brings about, it is argued, the reduction of internationalism to global capitalistic competition in which the inequities of the current world resource distribution are not merely maintained but exacerbated (see Atweh, Clarkson, & Nebres in Section 1).

Locally it also, of course, affects teachers and their actions. The constant context of assessment and critical comparison engenders a protective relationship with the activity. The act of teaching becomes that of a highly-skilled artisan, delivering the goods designed and owned by someone else. It discourages risk-taking and de-professionalises the activity. Dunne (1999) described teachers taking up a ‘positioned neutrality’ in their classroom assessments and in a similar manner the developed world also takes up a ‘positioned neutrality’ in terms of the assessments of resource provisions and resource disparities, sympathetic but dispassionate and self-absorbed.

At the opening session of ICME 9 in Tokyo, serious concerns were also raised in regard to the technological divide which increasing dependence on the new technologies is likely to create, and which could serve to exacerbate the existing differentials both globally between nations and locally between pupils. ICT was not seen as problematical in terms of its presence or power, there was universal recognition that it was already a significant arbiter and provider of the curriculum. It is the implications of economic imperialism (however altruistic the intention) coupled with epistemological imperialism which will increase the distance between global societies (Koblitz, 1996; Dubinsky & Noss, 1996; Woodrow, 2001). At a micro-level it does indeed increase the distance between those individual pupils with access and those for whom access is unavailable. The difficulties arise from the unequal distribution of resources, which the use of ICT in the curriculum enhances and increases. Yet who would gainsay its use where it improves learning and understanding.

As with the proselytisation of the ‘new maths’ in the 1970’s, when the developed countries exported their resource (altruistically – but not without profit) to the developing world and imposed an often apparently inappropriate mathematics curriculum, so now there is a real danger that they will repeat this pattern with the ICT reforms and we will arrive at a global curriculum designed by (and thus maintaining) those already holding power and resource. Some would see this as disempowering; see for example the theoretical underpinnings of the ethnomathematics movement pioneered by D’Ambrosio (1997) and Gerdes (1996) amongst others, however, Kuku (1997) and Sawiran (1995) argue for greater globalisation with its potential for raising resources and utilising the gains made by the ‘front runners’ to help those who are intent on ‘catching up’. Vithal and Skovsmose (1997) present a detailed critique of the political and social arguments relating