



Texto 1

Mathematics, Knowledge and Political Power.

CHRISTINE KEITEL

The *pervasiveness of economic thinking and interests* have successively created so high a pressure of economic orientation that educational aims and the subject matter are marginalised unless they prove justification in terms of economic interest (Woodrow 2003).

New notions like “*Mathematical Proficiency, or Competency or Literacy*”, “*Educational Standards*” and “*Benchmark*” are expressions of such economic interests. They are a major concern of politicians but also a pressure for educational researchers and practitioners. They are the key issues in the recent political debates and disputes about mathematics education, which broadened after the release of international comparative studies like TIMSS and PISA and their ranking of test results. Proclaiming that the PISA tests are based on “definitions of mathematical literacy” that are underpinned by fundamental and widely accepted educational research results, and that it is absolutely unproblematic to test such kind of competencies or proficiencies on a global scale to rank countries’ performances, produced strange and urgent political measures to be taken in some of the countries that did not perform well, called for by the alarmed public and the medias.

The *Programme for International Student Assessment (PISA)* claims for its test of Mathematical Literacy that those competencies of young adolescents are measured, which enable them to participate in democratic decision-making processes: “Mathematical Literacy is the capacity to identify, to understand and to engage in mathematics and make well-founded judgements about the role that mathematics plays, as needed for an individual’s current and future life, occupational life, social life with peers and relatives, and life as a constructive, concerned and reflective citizen” (OECD 2000, 50).

Results of tests like PISA are used as reference and base for decisions in educational policy, in particular in the case when they show that only a small part of the tested students or adults have reached a higher level of competencies in an international comparison. However, each attempt to define Mathematical Literacy is confronted with the problem that this cannot be done exclusively in terms of mathematical knowledge: To understand of mathematised contexts or mathematical applications and to competently use mathematics in contexts goes beyond mathematical knowledge. A first research study to explore such cross-curricular competencies by investigating the ways how mathematics is used in a social-political practice had unexpected and surprising results (Damerow et al. 1974). Mathematical Literacy must be understood as functional in relation to pedagogical postulates. But by reducing the concept of Mathematical Literacy to the descriptions of the process of its measurement cannot be justified, while conclusions of these comparisons mostly are formulated in terms of daily language or connected with highly demanding and complex meanings and connotations of the concepts.

Conflicting conceptions of Mathematical Literacy are numerous, although the conflict is not always recognised: Jablonka (2003) analyses what research on Mathematical Literacy can do and what not by investigating different perspectives on Mathematical Literacy. She shows that these perspectives always considerably vary with the values and rationales of the stakeholders who promote them. The central argument underlying each of her investigations is that it is not possible to promote a conception of Mathematical Literacy without at the same time – implicitly or explicitly – promoting a particular social practice of mathematics: be it the practice of mathematicians, of scientists, of economists, of professional practices outside science and mathematics, etc. She argues that Mathematical Literacy focussing on citizenship in particular refers to the possibility or need of critically evaluating most important issues of the surrounding society or culture of the students – a society

and culture that are very much shaped by practices involving mathematics. In her conclusion, she emphasises that the ability to understand and to evaluate different practices of mathematics and the values behind has to be a component of Mathematical Literacy.

Extraído de: Christine Keitel: Mathematics, Knowledge and Political Power. Em: Edward Silver & Christine Keitel-Kreidt (eds.), Pursuing Excellence in Mathematics Education. Essays in Honor of Jeremy Kilpatrick. Springer, 2015.

Texto 2

From Chapter II of The Structure of Scientific Revolutions : The Route to Normal Science

THOMAS KUHN

When the individual scientist can take a paradigm for granted, he need no longer, in his major works, attempt to build his field anew, starting from first principles and justifying the use of each concept introduced. That can be left to the writer of textbooks. Given a textbook, however, the creative scientist can begin his research where it leaves off and thus concentrate exclusively upon the subtlest and most esoteric aspects of the natural phenomena that concern his group. And as he does this, his research communiqués will begin to change in ways whose evolution has been too little studied but whose modern end products are obvious to all and oppressive to many. No longer will his researches usually be embodied in books addressed, like Franklin's Experiments ... on Electricity or Darwin's Origin of Species, to anyone who might be interested in the subject matter of the field. Instead they will usually appear as brief articles addressed only to professional colleagues, the men whose knowledge of a shared paradigm can be assumed and who prove to be the only ones able to read the papers addressed to them.

Today in the sciences, books are usually either texts or retrospective reflections upon one aspect or another of the scientific life. The scientist who writes one is more likely to find his professional reputation impaired than enhanced. Only in the earlier, pre-paradigm, stages of the development of the various science did the book ordinarily possess the same relation to professional achievement that it still retains in other creative fields. And only in those fields that still retain the book, with or without the article, as a vehicle for research communication are the lines of professionalization still so loosely drawn that the layman may hope to follow progress by reading the practitioners' original reports. (Kuhn, pp. 19-20)

From Chapter XI: The Invisibility of Revolutions

For reasons that are both obvious and highly functional, science textbooks (and too many of the older histories of science) refer only to that part of the work of past scientists that can easily be viewed as contributions to the statement and solution of the texts' paradigm problems. Partly by selection and partly by distortion, the scientists of earlier ages are implicitly represented as having worked upon the same set of fixed problems and in accordance with the same set of fixed canons that the most recent revolution in scientific theory and method has made seem scientific. No wonder that textbooks and the historical tradition they imply have to be rewritten after each scientific revolution. And no wonder that, as they are rewritten, science once again comes to seem largely cumulative.

Extraído de: Thomas Kuhn, The Structure of Scientific Revolutions (1962), 3rd edition: 1996.

Responda às questões 1 e 2 a seguir, com base no texto 1 dado.

Questão 1. Esta análise explica o caráter das pressões sobre a política educacional e o papel dos testes de competências dos alunos nessas políticas. A partir do texto, o que se entende por "*Mathematical Literacy*"? Em que tipos de tarefas diferentes esta noção pode ter sido utilizada?

Questão 2. Traduzir o penúltimo parágrafo, que se inicia por "Results of tests ...".

Responda às questões 3 e 4 a seguir, com base no texto 2 dado.

Questão 3. Segundo Kuhn, as ciências permanecem, durante um período de "normal science" em um paradigma dominante da pesquisa. Em tais períodos de ciência normal, que papéis diferentes Kuhn atribui aos livros-texto e aos artigos de pesquisa?

Questão 4. Explique os argumentos de Kuhn ao criticar o papel de livros-texto?