Mathematics Education and Culture in Third World Countries

*Den matematikundervisning, som förmedlas i vår svenska sko-la, har kanske inte samma innehåll och angelägenhet i andra länder eller kulturer. **Paulus Gerdes**, Moçambique, reflekterar över de problem som uppstår i tredje världen när man där övertar/ärver kursplaner från i-länderna.*

Education in general and mathematics education in particular face many problems and challenges (!) in Third World countries.

Although there had occurred a dramatic explosion in the student population in many African countries in the post-Independence period, the mean illiteracy rate for Africa was still 66% in 1980. Overcrowded classrooms, shortage of qualified teachers and lack of teaching materials contributed towards low levels of attainment.

In the case of mathematics education, this tendency has been reinforced by a hasty *curriculum transplantation* from the highly industrialized capitalist nations to Third World countries [Cf. Eshiwani, 1979; Nebres, 1983; El Tom, 1984].

In 1967, Gay and Cole published a study of the learning difficulties of the Kpelle (Liberia). They concluded that there do not exist any inherent difficulties. What happened in the classroom was that the transplanted contents and methods did not make sense from the point of view of Kpelle *culture*. The Kpelle children experienced mathematics as something *alien* to their culture, as a *strange white men's creation and ability*. Since the publication of Gay and Cole's already classical study, subsequent research and analyses reinforced their conclusions. Furthermore, it turned out that

- [ ] to the majority of children of Third World countries, mathematics looks rather *useless;*
- [ ] *maths anxiety* is widespread; especially for sons and daughters of peasants and laborers, mathematics enjoys little popularity;
- [ ] mathematics is used as a *barrier* to social access; mathematics is universally recognized as the most effective educational filter [Cf. D'Ambrosio, 1983; El Tom, 1984].

Gay and Cole had showed that Kpelle illiterate adults performed better than North American adults when solving problems that belong to their *"indigenous mathematics"* like the estimation of the number of cups of rice in a container. With this notion of "indigenous mathematics" in contrast to "transplanted school mathematics,"

they emphasized the *culture conflict* involved in mathematics education in Third World countries. Latin-American researchers made a profound analysis of this conflict. The Brasilians Carraher and Schliemann showed, for example, that the practical mathematical knowledge that children acquire outside the school is "repressed" and "confused" in the school. Children, who knew before they went to school, how to solve creatively arithmetical problems, which they encountered in daily life, e.g. at the marketplace, could, later in the school, not solve the same problems, i.e. not solve them with the methods taught in the arithmetic class [Carraher a.o., 1982].

New Concepts

Different notions have been introduced to contrast with the socalled "academic mathematics"/"school mathematics" (i.e. the school mathematics of the transplanted, imported curriculum):

— indigenous mathematics [Gay & Cole, 1967];
— sociomathematics [Zaslavsky, 1973];
— informal mathematics [Posner, 1982];
— oral mathematics [Carraher a.o., 1982; Kane, 1987];
— non-standard mathematics [Carraher, 1982; Gerdes, 1985; Harris, 1987];
— folk mathematics [Mellin-Olsen, 1986];
— spontaneous mathematics [D'Ambrosio, 1982, 1985];
— hidden or repressed mathematics [Gerdes, 1982, 1986];

— frozen mathematics [Gerdes, 1985].

Gradually most of these are subsumed under the general notion of ethnomathematics [Cf. Newsletter of the International Study Group on Ethnomathematics; Gerdes, 1985; Borba, 1988].

"Ethnomathematicians" emphasize (and analyse) the influences of sociocultural factors on the teaching, learning and development of mathematics.

With the notion of "ethnomathematics," one draws attention to the fact that mathematics (its techniques and truths) is a *cultural product*. One stresses that *every* people — every culture and every subculture — develops its own particular mathematics.

Mathematics is a *universal, panhuman activity*. As a cultural product, mathematics has a history. Under certain economical, social and cultural conditions, it emerged and developed in certain directions. Under other conditions, it emerged and developed in other directions.

Towards a cultural-mathematical reaffirmation

Apparently, the school mathematics of the transplanted, imported curriculum is alien to the cultural traditions of Africa, Asia and South America. Apparently this mathematics comes from the outside of the Third World. *In reality*, about 80% of the contents of this school mathematics is of African and Asian origin.

First it became *expropriated* in the process of colonization that destroyed greatly the cultures of the oppressed peoples. Then colonial ideologies ig-

nored or despised the survivals of African and American-Indian mathematics. The mathematical capacities of the peoples of the Third World became negated or reduced to rote memorization. This tendency has been reinforced by the curriculum transplantation ('New Math') from the highly industrialized capitalist nations to Third World countries in the 1960's.

In the *cultural rebirth* (Samora Machel) of Africa and other formerly colonized regions, in the combat of racial prejudice, a *cultural-mathematical-reaffirmation* plays a part: it is necessary to encourage an understanding that our peoples have been capable of developing mathematics in the past, and therefore—regaining *cultural confidence*—will be able to assimilate and develop the mathematics we need.

Ethnomathematical studies in Third World countries look for mathematical traditions that survived colonization and for mathematical activities in people's daily life and analyse ways to incorporate them into the curriculum.

Ethnomathematical studies look also for other *culture elements,* that may serve as a *starting point* for doing and elaborating mathematics in the classroom [Cf. Gerdes, 1988 a, b, c, d].

The ultimate aim of these studies is to improve the quality of mathematics education, to turn mathematics education more interesting, to improve the pupils' motivation, in order to accelerate the access of our peoples to *"World Mathematics"* (union of all ethnomathematics), the common heritage of mankind, as a useful instrument to improve the quality of life.

References:

Borba, M (1988) Etnomatemática: una discussâo teórica sobre esta noçâo. (To be published in: *BOLEMA,* Rio Claro.)

Carraher, T. Na vida, dez, na escola, zero: os contextos culturais da aprendizagem da matemática. *Cadernos de Pesquisa,* Sâo Paulo, Vol. 42, p. 79—86, 1982.

D'Ambrosio, U. Successes and failures of mathematics curricula in the past two decades. *Proceedings of the 4th International Congress of Mathematical Education,* Boston, p. 362—364, 1983.

D'Ambrosio, U. Ethnomathematics and its place in the history and pedagogy of mathematics. *For the Learning of Mathematics,* Montreal, Vol. 5, no. 1, p. 44—48, 1985.

D'Ambrosio, U. Socio-cultural bases for mathematics education, *UNICAMP,* Campinas, 1985.

El Tom, M. *The role of Third World University Mathematics Institutions in promoting mathematics,* ICME 5, Adelaide, 1984.

Eshiwani, G. The goals of mathematics teaching in Africa: a need for re-examination. *Prospects,* Paris, Vol. IX, No. 3, p. 346—352, 1979.

Gay, J and Cole, M. *The New Mathematics and an Old Culture, a study of learning among the Kpelle of Liberia,* New York, 1967.

Gerdes P. Mathematics for the benefit of the people. *CARIMATHS,* Paramaribo, 1982.

Gerdes, P. Conditions and strategies for emancipatory mathematics education in underdeveloped countries. *For the Learning of Mathematics,* Montreal, Vol. 5, No. 1, p. 15—21, 1985.

Gerdes, P. *Zum erwachenden geometrischen Denken,* Maputo, 1985.

Gerdes, P. How to recognize hidden geometrical thinking: a contribution to the development of anthropological mathematics. *For the Learning of Mathematics,* Montreal, Vol. 6, No. 2, p. 10—12, 17, 1986.

Gerdes, P. A widespread decorative motif and the Pythagorean theorem. *For the Learning of Mathematics,* Montreal, Vol. 8, No. 1, p. 35—39, 1988.

Gerdes, P (1988). On possible uses of traditional Angolan sand drawings in the mathematics classroom. (To be published in: *Educational Studies in Mathematics.*)

Gerdes, P (1988). On culture, geometrical thinking and mathematics education. (To be published in: *Educational Studies in Mathematics.*)

Gerdes, P (1988). Ethnogeometry, contributions for cultural anthropology to the history and didactics of geometry (to be published in German and Portuguese).

Harris, M. An example of traditional women's work as a mathematical resource. *For the Learning of mathematics,* Montreal, Vol. 7, No. 3, p. 26—28, 1987.

Kane, E. *Les systèmes de numération parlée des groupes ouest-atlantiques et Mandé.* Contribution à la recherche sur les fondements et l'histoire de la pensée logique et mathématique en Afrique de l'Ouest, Université de Lille III, 1987.

Mellin-Olsen, S. *Mathematics and Culture,* a seminar report, Rådal, 1986.

Nebres, B. *Problems of mathematical education in and for changing societies:* problems in Southeast Asian countries, Tokyo, 1983.

Posner, J. The development of mathematical knowledge in two west African societies. *Child Development,* Chicago, Vol. 53, p. 200—208, 1982.

Zaslavsky, C. *Africa counts, number and pattern in African culture,* Boston, 1983.