

Through the bars. Learning and Teaching Mathematics in Jail

Aldo Frezzotti, Federico G. Lastaria, Stefano Mortola

Dipartimento di Matematica, Politecnico di Milano, Italia

Abstract Teaching and learning mathematics in jail is a dramatic special instance of dealing with social barriers and cultural differences. Teachers and students involved in such experience are confronted with problems - lack of readable mathematics textbooks, need to simplify, motivate and synthesize the subject, need to cope with psychological and environmental difficulties - that go much beyond the specific situation and are a worthy challenge for the whole community of mathematics researchers and educators.

Introduction

This paper is based on the authors' experience as volunteer mathematics teachers in high-school classes for adults at the "Alta Sorveglianza" (High Surveillance) Department of the prison of Opera, near Milano (Italy). But, above all, it is the fruit of constructive remarks, contributions and criticisms by their students in jail. The paper does not have any ambition to provide a comprehensive picture of the complex problems connected with education in prison - not even mathematical education in particular - nor does it claim to have any decisive solutions to suggest. We limit ourselves:

- to gather some remarks and to focus the reader's attention on some issues that we feel might be of general interest for mathematical education; especially - but not exclusively - for mathematical education of adults in difficult societal or environmental conditions;

and above all:

- to stress the need for collaborative international interactions - possibly inside the Mathematics Education Into the 21st Century Project or other similar initiatives - between mathematics educators and researchers interested in mathematics education of adults.

Even though this might sound like a truism, it is nevertheless a crucial problem to address.

What happens in prison faithfully reproduces what happens outside of it, with deformations deriving from the state of compression and mutilation. Education - mathematical education in particular - is by no means an exception. Therefore it can be arguably maintained that the problems arising in mathematics education in jail are essentially the same as those arising in ordinary schools, although they might dramatically differ from the latter for intensity, due to the gravity of the environmental context. Nonetheless, there are some possibly peculiar values of school in prison, that we perceive as a special human, psychological and cultural enrichment, both for students and for their teachers. Of course, the exchange of experience and knowledge *through the bars* is a two-way process: mathematics educational problems in the outside world are often seen better from inside a prison, and they may even benefit from the experiences therein.

We finally stress that prisons are, at least to a considerable extent, tentative answers to social problems that could and should be coped with and solved in quite different ways. The crucial need to ensure an appropriate education - where mathematics must play its role - especially in difficult societal conditions, is to be considered as part of this wider strategy.

1. Why mathematics education in jail

Mathematics education in jail is part of a wider programme. In the field of mathematics education, new proposals and trends have been recently promoted, especially in the past two decades, which emphasize the value of a "social" orientation of teaching, motivated by broader societal changes. Among others, recall such initiatives as the Mathematics in Society Project (MISP, active since 1980) or the Mathematics Education Into the 21st Century Project, founded in 1986 and supported by the Third World Forum (see [2] and [3]). *"Almost every country has groups*

that are not being adequately served by its national school system; religious and ethnic minorities, migrant or foreign workers, the poor, the handicapped, and the biggest group, women and girls that are underserved educationally in the majority of the nations”([2], p.1238). People in prison could undoubtedly be added to the previous list. With respect to society-centred activities, however, sensibility and engagement of mathematics educators still have to be quantitatively and qualitatively enhanced. Mathematicians would greatly benefit from avoiding elitist attitudes: mathematics teaching in difficult social contexts, as well as the education of mathematics teachers working in that field and collaborative co-operation with them, should be considered as a primary interest and duty, possibly with positive consequences even on research activities. Furthermore, co-operative international relationships on themes like mathematics teaching to adults (education in jail, as a very special instance) or popularization of mathematics (see [1]) are within reach and should be substantially promoted as a worthy challenge of society (see [4]).

Finally, we should not forget that in many of the most developed countries, the number of people in prison has been definitely increasing in the past few years, reaching highly considerable percentages. For instance: about 1 over 1000 in Italy (27 per cent of whom are immigrants); and about 1 over 100 in the United States, where more college age African Americans are in prison than in college dormitories (Data of the Children’s Defense Fund. See [3]).

2. The challenge of learning and teaching mathematics in jail

It might be wrongly believed that prison is a restriction of space, balanced by an abundance of time. As a matter of fact, prisoners witness how this alleged abundance of time, far from being a factor of balance, rather becomes their main source of affliction. Degradation of self-esteem, loss of interest in mental activities, loss of contact with the external reality and depression are very strong among prisoners. Intellectual activities in prison are therefore of fundamental importance for mental and psychological survival, and human contact with teachers is necessary.

The challenge of scientific culture

In the relationship between teachers and students in jail, the objective disparity of conditions and experiences are possibly too deep to allow any sensible discourse about the reasons that caused such a disparity. Probably one of the best ways of being helpful, and what students seem to appreciate most, is proposing scientific and formal topics, rather than personal or problematic ones. In this regard, mathematics education - like any other kind of knowledge based on an objective scientific content - may contribute in a very special and decisive way to the psychological, human and cultural enrichment of young or adult people in jail.

Sometimes people in prison follow school courses – including classes of mathematics – to get a certificate that might be of some value in the future search for a job. But it may also happen that they study just to keep their mental activities in exercise and for pure cultural enrichment. For this reason adults in jail are very special students, often very exacting and inspiring ones. They may possibly learn slowly, like all adults when compared to younger people; but, on the other hand, they tend to absorb more deeply and to make immediate use of what they learn as part of their knowledge and language. This peculiarity represents a particular challenge for teachers who are confronted with the problem of finding and explaining the fundamental concepts in the easiest possible ways, providing nontrivial and convincing examples and applications.

Taking psychological and environmental factors into utmost account.

In the process of mathematics learning, a sharp distinction between so called technical difficulties on the one hand, and psychological or environmental ones on the other, is always artificial.

This is particularly true as far as adults in jail are concerned. We mention a couple of psychological issues pointed out by our students in prison. Though more evident in the context of a jail, these issues are arguably of general concern for adults at school.

a) Difficulty in memorizing and concentrating.

Teachers must acknowledge that jail causes stress, and stress destroys memory and the capacity to concentrate. Sometimes, constant psychological pressure may even be responsible for aphasia, i.e. difficulty in communicating and verbalizing. On the one hand these psychological problems are an obstacle to the study of mathematics; on the other, it is well known that any kind of intellectual effort - such as studying mathematics, for instance - may turn out to be helpful in stimulating the prisoners' capability of memorizing and concentrating.

b) Intellectual activities increase esteem by other people and, above all, self-esteem.

Apart from professional qualification, one of the main motivations for an adult to study is the need for a better esteem and self-esteem. One should not forget that sometimes people attending classes in prison have the opportunity to study for the first time in their lives or for the first time after possibly many years.

The importance of school, or any other kind of intellectual activity, in order to fight against the dangers of stress and depression in jail should not be underestimated. Mathematics educators should take full awareness of such potentiality and play their role.

3. What needs to be done?

Maybe the most crucial problem to address is that *readable and valuable mathematics textbooks should be written, having self-taught adult students in mind.*

The scarcity - not to say total absence - of readable and valuable mathematics textbooks is one of the greatest difficulties encountered by adult students, especially in jail. This is a decisive point, whose implications go much beyond the restricted scope of education in prison. The quality of textbooks does not only concern didactics: it deeply reflects, and in turn influences, the actual general conception - or misconception - of mathematics and the way in which mathematicians consider - or do not consider - its educational, cultural and social values. In this regard, the situation does not seem to be encouraging. In general, mathematics textbooks are far from fulfilling the special needs of adults who need to study by themselves or with little contact with teachers and do not properly orient the reader. We record some criticisms of our adult students in jail.

a) Coping with mathematics textbooks is discouraging: they are "flat" and difficult to read.

They contain but a flat list of definitions, theorems and proofs: no motivations, no hierarchy between concepts, no emphasis on what the fundamental concepts are and why.

b) Textbooks are too "big".

Voluminous texts are often difficult to read or consult. Textbooks should be written in a way that synthesizes the fundamental concepts or techniques, avoiding a plethora of inessential details. It seems that the more the fundamentals concepts are obscured, the biggest are the volumes.

c) Too few examples, applications, and thoroughly worked out exercises. Self-assessment is difficult.

Sometimes adult students seem to be more exacting than young adolescents as far as the choice of examples and problems is concerned, as well as more interested in finding concrete

connections and applications of the mathematics they learn. This tends to make many of the available textbooks obsolete.¹

The goal of collaborating in order to write mathematics texts for basic teaching and popularization, providing notions needed in everyday life and also the sense of a wider cultural and historical perspective, should be among the most qualifying challenges on the agenda of any mathematics educational project. The general ignorance of mathematics “*is in part traceable to a lack of clarity in the mathematical community, by both researchers and teachers, as to the nature of mathematics itself, and so to a lack of clarity about conveying this to the general public.*” ([1]). Therefore a careful reflection on this problem by the mathematicians’ community would turn out to be of primary importance not only for education at any level, but even for research itself.

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Authors’ addresses :

Dipartimento di Matematica, Politecnico di Milano, Piazza Leonardo Da Vinci 32, 20133 Milano, Italia

E-mail :

Aldo Frezzotti : aldfre@mate.polimi.it

Federico G. Lastaria : fedlas@mate.polimi.it

Stefano Mortola : stemor@mate.polimi.it

¹ One of our students, for instance, suggested to investigate the mathematics underlying the GPS (Global Positioning System), i.e. the method used to determine the position on the earth through signals sent and received by satellites in orbit around the Earth. This turns out to be a quite interesting geometric and physical problem.