ATTITUDES TO MATHEMATICS OF BEGINNING UNDERGRADUATES AND PROSPECTIVE TEACHERS: SOME IMPLICATIONS FOR EDUCATION

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ABSTRACT

An acute shortage of mathematics teachers has emerged in the Western world. This article describes a study of the influence of tertiary education experiences on the attitudes of potential mathematics teachers towards their subject.

Parallel questionnaires were given to groups of students who were respectively entering university mathematics courses as new undergraduates, and entering postgraduate teacher training courses. Both groups of students answered items pertaining to their experiences within secondary mathematics courses.

The undergraduate students were also asked a series of questions about their expectations of tertiary mathematics courses. For the postgraduates a parallel set of questions was provided that required them to rate their actual tertiary experiences.

An analysis of responses indicated that the postgraduate students were more positive about their recollection of secondary mathematics than were the undergraduate students with their more recent experience of it. They were also less positive about the reality of their tertiary courses than were the undergraduates about their expectations. Responses of the postgraduates suggested that tertiary mathematics is not merely an extension of secondary mathematics, but a subject with which distinctive and, in general, more negative reactions are associated.

Mathematics emerges as a subject which progressively loses its appeal with further study and implications are drawn for both tertiary education and teacher supply.

Introduction

The quantity and quality of mathematics and science instruction available to the rising generation of students is of widespread concern, with emergency signals being transmitted within the U.K. by documents such as the Cockcroft Report (1982), and within the U.S.A. by reports such as Educating Americans for the 21st Century (1983). This latter presents the views of a subcommission of
the National Science Board on the teaching of Mathematics, Science, and Technology at the pre-college level.

In Australia the state of Queensland has set up a working party to recommend ways in which an acute and worsening shortage of mathematics and science teachers can best be met.

Woodrow (1982) has indicated that whereas in the U.K. the teaching of mathematics occupies between 12 percent and 20 percent of a pupil's schooling, the proportion of mathematics specialists in teacher training courses is only about 7 percent, so tending to exacerbate the shortage.

The "science and the citizen" section of the Scientific American for April 1983 claims that only a minority of high school students in the U.S.A. now receive an adequate scientific education and that public instruction may have been more efficient 20 years ago.

Of the 140,000 students enrolled at the University of California in 1980–81, only 22 were cited as being in courses leading to certification as mathematics teachers. The corresponding figures for California State University were 75 intending mathematics teachers from an enrolment of 300,000.

Given that significant shortfalls exist, various implications arise. The most obvious implication is that mathematics and science classes will be increasingly placed in the charge of teachers trained in other areas.

A second implication is that such specialists as do enter the teaching profession will have an added burden of responsibility. Not only must they accept the burden of academic leadership, but they must possess inspirational qualities, not only for themselves and their students, but for the conscripted and unwilling colleagues with whom they share teaching responsibilities.

Writing in Phi Delta Kappan of March 1982, Usiskin, Professor of Education at the University of Chicago, underlines the importance of affective variables in contributing to the teacher shortage, when he reports that the high school experiences of too many students in the recent past have not been positive enough to make them want to teach mathematics.

Thus, the mathematics curriculum, both the content and the way the content is taught, must be considered a cause of the teacher shortage (p. 436).

Attitudes cannot be divorced from ability and performance and as observed by Woodrow (1982),

it is clear that the preparation in terms of mathematical knowledge is not universally satisfactory among postgraduate students, and even the attempts to compensate for those omissions are made difficult by the variability of the gaps.

Other writers have addressed the knowledge base of mathematics teachers and its interrelation with approaches to learning and teaching.

Writing within a British inservice training context, Howson (1975) wrote,