ABSTRACT. In this study, I report some attitudinal data on eighth grade students of a lower secondary school from administration of the MSD, which is the only SD type mathematical attitudinal instrument developed in Japan. The data reported are the results of item analysis, reliability coefficients, factor analytic results, correlation between attitudes and achievement, and some sex-related difference statistics.

1. INTRODUCTION

1.1. Rationale for the study

In recent years attitudes toward school mathematics have been the topic of much concern. In fact, during the past decade many studies related to the topic have been reported, especially in America, and several instruments have been developed for measuring such attitudes.

Although interest in and concern about attitudes toward school mathematics have been expressed by researchers and educators in Japan, little has been published on topics related to the affective domain because of the complex and undefined nature of the concept of 'attitudes'.

Recently, however, Saeki (1978), Ito (1979), and I (Minato, 1979a, 1979b) translated some attitudinal instruments into Japanese, and I administered these instruments to Japanese students to test their reliability. With the experience of translation, administration and examination of the instruments, we (Minato et al., 1981) developed a Likert-type mathematics attitude scale, simply referred to as MILMAS, for measuring attitudes of prospective elementary school teachers.

Following this development, I developed a semantic differential, simply referred to as the MSD, for measuring attitudes toward school mathematics. The development and the results of examinations of the instrument MSD will be reported in detail (Minato, submitted).

The semantic differential, or SD is an instrument developed by Osgood and his collaborators for the measurement of the connotative meaning of concepts. They referred in their early work (Osgood et al., 1957) to the usefulness of this instrument as a new approach to attitude measurement, but the instrument has been used less as an attitudinal instrument with regard to mathematics than have Thurstone or Likert-type instruments. The first semantic differential for the measurement of attitudes toward school mathematics was apparently the
Anttonen's (1967) version. Several versions of the SD have been developed, for example, by Anttonen (1967), McCallon and Brown (1971), Klein (1974) and Smith (1975) ... for measuring attitudes toward mathematics or school mathematics, and some have been administered to subjects in Japan. I recently administered Anttonen's version of the SD to prospective elementary school teachers to test the reliability, and concluded (Minato, 1979a) that Anttonen's version of the SD could be used for evaluating attitude toward school mathematics by researchers and educators in Japan.

At one time it was assumed that a version of the SD could be almost age-independent (Di Vesta and Dick, 1966) and international; however, it has become clear that the SD is not culture-free and that there are several types of interactions between subjects and concepts, between subjects and scales (items), and so forth. It seemed likely, therefore, that a mathematical attitudinal SD instrument suitable for Japanese students deserves to be developed, and data obtained from administration of such instrument also deserves to be described.

In this study, I report some attitudinal data of subjects of a lower secondary school from administration of the MSD which is the only SD-type mathematical attitudinal instrument developed in Japan.

Fennema (1979) said in her study on sex-related differences:

Although variables of this (cf. attitudinal) type have not received the attention that cognitive variables have, their importance to the learning of mathematics is being increasingly recognized.

I think that sex-related differences in attitudes toward school mathematics is now an important topic in mathematics education. Therefore I will be concerned with sex-related differences in some of the data.

I think that the reporting of the study will contribute to the drive towards conducting international studies on attitudes, through the analyses and comparison of various instruments, including the MSD, suitable for various cultures, and the comparison of attitudinal data from administration of the MSD for students in various countries. Such international studies, I think, take mathematical attitudinal studies some steps further.

1.2. Purposes of the study

The purposes of the study are as follows:
(1) to describe results of item analysis procedures,
(2) to describe some reliability coefficients,
(3) to describe factor analytic results,
(4) to describe additional data with some sex-related difference statistics,