



Construction and Validation of Mathematical Attitude Scale (MAS) of student of standard IX

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Abstract:

The study was conducted to construct and standardize mathematical attitude scale. The sample for the study consisted of 275 students of students of std. IX of Ahmedabad district. As the first step in developing mathematical attitude scale, 84 statements were gathered from literature, books, bulletins, articles, journals and by holding discussions with the subject matter experts These statements were framed in such a way that they could express the positive or negative attitude of students towards mathematics. In order to get five point judgement, five alternative response categories ranging from “strongly agree” (SA) to “strongly disagree” (SD) were assigned to each statement. After Item collection, for Item selection, 52 items were administered for a random sample of 129 students. Those students were not included in the main sample. 25 per cent of the highest total score and 25 per cent of the subject with the lowest total score were taken and finally 35 statements are selected at the end if item analysis. To know the reliability of attitude scale construction was determined by using ‘split halves method’ on 100 students. Since the contents of attitude scale were derived from the list of statements based on the opinion of the experts, it was assumed that the score obtained by administering the attitude scale of this study would measure what was intended to be measured. In this way validity of scale was justified It was concluded that the scale was valid and reliable for measuring students’ attitude toward Mathematics and hence recommended for teachers to utilize the scale to measure the attitude of their students’ to facilitate positive attitude towards Mathematics. It was concluded that the scale was valid and reliable for measuring students attitude toward Mathematics and hence recommended for teachers to utilize the scale to measure the attitude of their students’ to facilitate positive attitude towards Mathematics.

1. Introduction

Mathematics is very beneficial to our mind if we go into its study. It develops our logical reasoning, analytical thinking, problem solving etc. Mathematics is present in our daily lives. If we are able to understand Mathematics and arrive at logical solutions, we will be able to prepare our minds when we have real problems. We can look for the best logic, see the possible solutions and relate the data we have to reach the conclusion. Each student has not the same feelings or emotions for math subject. For many students, math is very interesting, creative and easy subject whereas for some student’s math is boring, abstract, lacking in creativity, complex and very difficult to understand. In psychological terms, these beliefs, emotions, liking or disliking are defined as attitudes. In other words, attitudes are expressions of how much we like or dislike various things. They express our beliefs for something or someone. They may be based on our knowledge, our feelings and our behaviour. They may influence future behaviour. The objective of evaluating students’ mathematical attitudes is to use information to decide and modify teaching strategies and curriculum materials of Maths. Attitudes toward learning, subject area, and teaching strategy are very important because they affect students’ motivation to learn. A positive mathematical attitude reflects a positive emotional disposition to learn Maths and in a similar way, a negative attitude relates to a negative emotional disposition. These emotional dispositions have an impact on students’ math scores and educational achievements. For this reason positive mathematical attitudes are desirable since they may influence one’s willingness to learn Maths and also the benefits one can derive from teaching and learning process. In this sense, measuring mathematical attitude is very important task before designing math curriculum, applying teaching methods and techniques to teach

math etc. Knowledge of students' mathematical attitude provide guidelines to a teacher for betterment of student. In the present research, a researcher focused on construction and validation of mathematical attitude scale of students of std. IX.

2. Objectives of the Study

The following are the objectives of the study:

1. To construct Mathematical Attitude Scale (MAS)
2. To Establish the Reliability of MAS
3. To Establish the Validity of MAS

3. Method

In the present study, attitude was operationalized as positive or negative feeling of students of standard IX towards Mathematics. In order to construct the Mathematical Attitude Scale (MAS), relevant books, journals, articles, etc. were referred. Because attitudes are so much a part of human behavior, researchers had spent a great deal of time figuring out ways to measure attitudes. As the Likert Scale is most universal and easy to understand, researcher preferred to construct MAS by Likert Scale. For construction and validation of MAS, the following steps were taken.

4. Preparation of Items

For that six components were selected. These six components were usefulness, confidence, emotions, motivation, necessity and stress. Altogether 81 statements were collected and framed. For application of the scale, the researcher decided to collect information against each 81 statements in five-point continuum viz. 'Strongly agree', 'Agree', 'Neutral', 'Disagree' and 'Strongly disagree'.

5. Reviewing and Editing of the Test Items

The draft containing the 81 statements was given to 10 experts in the field for analyzing the content, language, nature of the items as well as for editing the statements. The experts were requested to give their opinions regarding validity and relevancy of statements. Based on their suggestions and useful recommendations, the statements were modified accordingly and some of them were rejected. Out of 81 statements that were constructed, 52 statements were finalized and 29 were rejected.

6. Preliminary Try Out

Based on the feedback from the experts, some of the 52 statements were modified before they were arranged according to the six components. There are 28 positive statements and 24 negative statements altogether. The positive and negative statements were merged together before administration. The tool was then administered to 149 students of standard IX to determine the level of understanding of the appropriateness of the dimensions and the items of the Scale. The response continuum for each statement was a linear scale indicating the extent respondents agree or disagree with each statement. For example, 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), and 5 = Strongly Agree (SA) for positive statements and reverse order for negative statements. Out of the 52 statements, 16 statements were discarded and the scale now comprised of 36 statements.

7. Item Analysis

In the present research, the MAS was constructed by using Likert Scale principles. The numerical values for the response options were reversed at the time of analysis. For example, for positive statements, 1 = SA, 2 = A, 3 = N, 4 = D, and 5 = SD and reverse order for negative statements. For the basis of rejecting statements, the frequency distribution of the scores based upon the responses to all the statements was taken. Two groups were formulated- one with high scores on the scale (top 25% of the group) and other with low scores (i.e. bottom 25% of the group). Then researcher applied t-test between two groups for each item at 0.05 level of significance. The items with significant t values ($t > 1.96$) were accepted while

those with insignificant t-values ($t \leq 1.96$) were rejected. Selected items with their 't' values are shown in table 1 and table 2.

Table 1: Calculated 't' value and decision regarding selection and rejection of the statements of the attitude test

No. of statement	't' value	Result	No. of statement	't' value	Result	No. of statement	't' value	Result
1	2.24	Selected	19	1.6	Rejected	37	4.68	Selected
2	2.86	Selected	20	1.5	Rejected	38	2.79	Selected
3	18.75	Selected	21	9.9	Selected	39	3.79	Selected
4	8.82	Selected	22	6	Selected	40	1.85	Rejected
5	3.68	Selected	23	4.38	Selected	41	2.4	Selected
6	2.5	Selected	24	12.13	Selected	42	1.65	Rejected
7	6.25	Selected	25	30	Selected	43	1.92	Rejected
8	7	Selected	26	6.21	Selected	44	2.5	Selected
9	0.29	Rejected	27	6.61	Selected	45	2.91	Selected
10	3.1	Selected	28	3.27	Selected	46	1.15	Rejected
11	8.32	Selected	29	3.33	Selected	47	0.15	Rejected
12	3.63	Selected	30	4.76	Selected	48	1.21	Rejected
13	2.57	Selected	31	1.07	Rejected	49	1.19	Rejected
14	3.39	Selected	32	3.96	Selected	50	1.5	Rejected
15	1.72	Rejected	33	1.36	Rejected	51	1.5	Rejected
16	10	Selected	34	6.47	Selected	52	1.19	Rejected
17	5.27	Selected	35	3.7	Selected	--	--	--
18	2.5	Selected	36	9.41	Selected	--	--	--

Table 2: Selected Items

1	મને ગણિત ભણવામાં કોઈપણ પ્રકારનો આનંદ આવતો નથી.	Negative
2	ગાણિતિક પ્રક્રિયાઓ મારા માટે એક મનોરંજક કાર્ય છે.	Positive
3	ગાણિતિક કૂટપ્રશ્નો ઉકેલવામાં હું અસમર્થ છું.	Negative
4	ગણિત મારી શૈક્ષણિક સિદ્ધિનો એક ભાગ છે.	Positive
5	ગણિત મારા માટે રસનો વિષય નથી.	Negative
6	ગણિત મને માનસિક રીતે થકવી નાંખે છે.	Negative
7	ગણિત મને ખૂબ જ પીડા આપે છે.	Negative
8	ગણિત ખૂબ જ ઉપયોગી વિષય છે.	Positive
9	ગણિત વિષય માત્ર સૂત્રો યાદ રાખવા સાથે સંબંધ ધરાવે છે.	Negative
10	ગણિત વિષય મને સંકટનો આભાસ કરાવે છે.	Negative
11	ગણિત વિષય મને ખંતપૂર્વક જીવન જીવવાની તક પુરી પાડે છે.	Positive
12	ગણિત વિષય મને કોઈ પણ રીતે ડારાવી શકતો નથી.	Positive
13	ગણિત વિષય મને ક્યારેય ગમ્યો નથી.	Negative
14	ગણિત વિષય સમજાણની દૃષ્ટિએ કઠિન છે.	Negative
15	ગણિત વિષય પ્રત્યે મને અપાર રસ છે.	Positive
16	ગણિત વિષયમાં કોઈ રચનાત્મકતા નથી.	Negative
17	ગણિત વિનાની કેળવણી અધુરી લાગે છે.	Positive

18	ગણિત શીખવાની વાત મને ગભરાવી મૂકે છે.	Negative
19	ગણિતના જ્ઞાનથી વ્યક્તિની આંતરિક રચનાત્મકતાનો વિકાસ થાય છે.	Positive
20	ગણિતના વર્ગમાં મારો આત્મવિશ્વાસ વધી જાય છે.	Positive
21	ગણિતના દાખલા ગણીને વખતે મને અસુરક્ષિતતા અનુભવાય છે.	Negative
22	ગણિતના કોયડાઓ ઉકેલવામાં મને ગભરામણ થાય છે.	Negative
23	ગણિતના નવા સિદ્ધાંતો માટેની જાણસા મારામાં છે.	Positive
24	ગણિતનું જ્ઞાન તર્કશક્તિના વિકાસ માટે જરૂરી છે.	Positive
25	ગણિતનું જ્ઞાન વ્યક્તિને નવું સંશોધન કરવામાં મદદરૂપ બને છે.	Positive
26	ભણવા માટેના મહત્ત્વપૂર્ણ વિષયોમાંનો એક વિષય ગણિત છે.	Positive
27	હું મારા વિચારોને ગણિતના વર્ગમાં સરળતાથી વ્યક્ત કરી શકું છું.	Positive
28	હું હંમેશા ગણિતના દાખલા અલગ અલગ પ્રયુક્તિઓથી ગણવાનો વિચાર કરું છું.	Positive
29	વ્યવહારિક જીવનમાં ગણિતની કોઈ જરૂરિયાત નથી.	Negative
30	વ્યવહારિક જીવનમાં ગણિતની કોઈ ઉપયોગિતા નથી.	Negative
31	વ્યક્તિને વિચારતાં કરવામાં ગણિત વિષયનો મુખ્ય ફાળો છે.	Positive
32	જ્યારે મને ગણિતમાં કશી સમજણ પડતી નથી ત્યારે ગાણિતિક પ્રશ્ન સમજવા માટે બીજી માહિતી મેળવવાનો પ્રયત્ન કરું છું.	Positive
33	જે વિષયોને હું ધિક્કારું છું તેમાંનો એક વિષય ગણિત છે.	Negative
34	જટિલ ગણિત પણ હું સરળતાથી શીખી શકું છું	Positive
35	ગણિતનું જ્ઞાન તર્કશક્તિના વિકાસ માટે જરૂરી છે.	Positive
36	ગણિતનાં મૂળભૂત ખ્યાલો મારા મગજમાં સ્પષ્ટ નથી.	Negative

8. The Final form of the test

In the final form of the scale there are 36 items, 19 positive statements and 17 negative statements. For the final application, the attitude scale consisting of 36 statements was then administered to 100 students of standard IX.

9. Estimation of Reliability

For finding out the reliability, the Split Half Method to estimate the internal consistency of the scale was used on a sample of 100 students of Ahmedabad district. The scale was divided into two equivalent group. Half test reliability coefficient was computed first. From the half test reliability coefficient, the whole test reliability coefficient was estimated. It was found significant at 0.05 level. Reliability was also checked by Rullon and Flangon formula and it was found significant. The calculation is shown in table 3 as below.

Table 3 :Value of 'r' calculated using spilt half method

a.	Pearson's product moment method	0.92000
b.	Rulon Formula	0.96037
c.	Flanagon Formula	0.89761

10. Estimation of Validity

In the present research, researcher checked concurrent and content validity of a scale.

11. Concurrent Validity:

It is concerned with the relation of test scores to an accepted contemporary criterion of performance on the variable which the test is intended to measure. The attitude scores of 100 students were compared to

their first semester marks gained in Maths to calculate it and it was found 0.8562 and which was significant.

12. Content Validity

The content validity of the scale was confirmed on the basis of the opinion of the experts that it does convey the concept it purports to measure and has a logical link with the objectives. After the items were constructed, the draft was given to experts in the field of education. Based on their suggestions and useful recommendations, the statements were modified accordingly and some of them were rejected. After try out was carried out, only items with 't' value above 1.96 which are significant at 0.05 level were selected. Therefore, the scale has content validity.

13. Conclusion

This study was done to construct and to validate an attitude scale for students of standard IX to find out their attitude towards Mathematics. This scale i.e. MAS has been found to be very reliable and valid in terms of concurrent and content validity. Researcher constructed MAS as a part of experimental study so sample was limited to 275 students only. Norms can not be established on such a small sample Therefore MAS is reliable and valid but not standardized and can be used by Maths teachers who are interested in finding out the attitude of students of std. IX towards Mathematics.

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