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DEVELOPMENT AND STANDARDIZATION OF SELF- CONFIDENCE SCALE IN MATHEMATICS

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Abstract:-This paper explains the procedure of developing and standardizing a self-confidence scale in mathematics to measure the level of self-confidence in mathematics among school students falling in the age-group of 10-12 years. The scale has been constructed by using Likert's method of summation to obtain a five point judgement on each item. After critical study of the related literature of self-confidence, four dimensions viz. self-satisfaction, self-composed, optimism and self-belief were selected for construction of the scale. The final draft of scale consisted of 32 items. The reliability of the scale was calculated by split-half method and test-retest method. The scale had face validity, content validity as well as higher intrinsic validity.

Keywords: Standardization ,Mathematics , self-confidence ,dimensions viz.

1.INTRODUCTION:

The socio-psychological concept of self-confidence relates to self-assuredness in one's personal judgment, ability and power. Sihera (2007) defined self- confidence as an attitude which allows us to have a positive and realistic perception of ourselves and our abilities. It is general and realistic belief in one's own abilities. It is characterized by personal attributes such as assertiveness, optimism, enthusiasm, affection, pride, independence, trust and the ability to handle criticism and emotional maturity. Self-Confidence is the first step to progress, development, achievement and success. Low self-confidence can impair the functioning of both the body and mind, resulting in failure. Low confidence halts the steps and one cannot take initiative. Low self-confidence paralyzes both the body and mind at the time of making decision. In today's world where success is worshiped there is no place for the undecided person and success seldom comes to someone who is undecided.

Self-Confidence in Mathematics means confidence in solving mathematical problems. The purpose of the scale is to measure the level of self-confidence in Mathematics among school students falling in the age group 10-12 years. The scale covers the following four dimensions:

Self-Satisfaction

Self-satisfaction refers to the extent to which a person is satisfied with his mathematics work.

Self-Composed

Self-Composed refers to the extent to which a child is calm and poised and has control over his behaviour and emotions.

Optimism

Optimism refers to the extent to which a child is hopeful and has positive attitude towards Mathematics.

Self-Belief

Self-Belief refers to the extent to which a child has belief in his abilities.

Construction and Standardization of the Scale

The procedure for the construction of the scale was carried through the following steps:

Item Formulation
Item Selection
Administration of the Scale
Scoring
Item Analysis
Reliability
Validity

a) Item Formulation

Before formulating the statements the investigator thoroughly studied the related literature. The statements were formulated from different sources viz. relevant literature, discussions with the research scholars working in the related fields, opinion of school teachers and deliberations held with the experts in the field of psychology, education and mathematics. In this way, 63 statements were framed to assess the self-confidence in Mathematics among the school students. These statements belonged to four dimensions of self-confidence viz. self-satisfaction, self-composed, optimism and self-belief. All the statements were framed in selective type providing 5 alternatives to each viz. Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree(SD).

b) Item Selection

The list of the statements so prepared, was reviewed. Firstly, the statements were judged from language point of view by a language expert. The statements which were having ambiguity were either modified or dropped out. After this, the list of statements was given to the experts in the field of psychology, education and mathematics. The statements were modified in the light of their suggestions. After this, the scale was administered to a small group of school students (15 students) falling in the age group of 10-12 years to know whether they properly followed these statements or not. The statements which were not properly interpreted or followed were dropped out.
In this way, 57 statements were retained in the first draft of the scale.

c) Administration of the Scale

After obtaining due permission from the concerned authorities of the school, the scale was administered on 50 students falling in the age group of 10-12 years. Usual requirements for proper test administration like quite, comfortable and well-lit room with ample space for each respondent to work were ensured. The instructions and the purpose of the scale were explained to the respondents by the investigator. They were asked to tick any of the five answers appearing in the five point scale. There was no time limit for completing the scale. Generally a student completed the scale within 20 minutes.

d) Scoring

The scoring of the scale was very easy and of quantitative type. The responses of the subject were rated on a five point scale ranging from Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. The scoring was done by awarding 4 scores to Strongly Agree, 3 scores to Agree, 2 to Undecided, 1 to Disagree and 0 to Strongly Disagree for positive statements and vice versa for negative statements respectively. The scoring procedure has been clearly illustrated in the following table:

Table 1
Scoring Procedure for Self-Confidence Scale in Mathematics

Sr.No.	Alternatives	Positive Statements	Negative Statements
1.	Strongly Agree	4	0
2.	Agree	3	1
3.	Undecided	2	2
4.	Disagree	1	3
5.	Strongly Disagree	0	4

e) Item Analysis

After scoring, item analysis was done. Item analysis is primarily concerned with item difficulty and item discrimination. Item difficulty is taken in terms of proportion of individuals completing the item successfully but as here, there was no pass or fail on any item so indices of item difficulty was not determined.

Item discrimination index refers to the degree to which it differentiates between those obtaining high and low scores. All the scores of each item were arranged in ascending order of total scores. The top 27 percent and the bottom 27 percent scores were taken out. The significance of difference between the mean scores in each item of the top and bottom piles were tested. The items which showed the significant difference were considered to be worth retaining.

Table 2
Difference between Top and Bottom Mean Scores on Self-Confidence Scale in Mathematics

tem no.	Mean(M1) for higher group	Mean(M2) for lower group	SD(σ1) for higher group	SD(σ2) for lower group	SED	't'
1	3.8	3.6	0.36	0.84	0.23	0.86
2	3.4	1.7	0.85	1.68	0.50	3.40**
3	1.1	1.4	1.02	1.28	0.42	0.71
4	3.5	2.0	1.09	1.51	0.48	3.12**
5	3.5	1.7	0.85	1.68	0.50	3.40**
6	3.6	3.2	0.51	1.05	0.28	1.42
7	3.1	2.5	1.16	1.40	0.47	1.27
8	3.0	2.4	0.73	1.55	0.44	1.36
9	1.6	1.6	1.60	1.60	0.60	0.00
10	1.9	1.5	1.68	1.39	0.57	0.70
11	3.5	2.9	1.08	1.20	0.42	1.42
12	2.9	2.9	1.07	1.14	1.07	0.00
13	1.9	1.5	1.68	1.39	0.57	0.70
14	3.1	3.2	0.66	1.26	0.36	0.27
15	3.1	2.2	1.62	1.49	0.42	2.14*
16	3.0	1.9	0.55	0.99	0.30	3.66**
17	3.4	1.7	0.85	1.68	0.39	4.35**
18	3.5	2.0	0.94	1.54	0.46	3.26**
19	3.2	2.1	0.80	1.09	0.35	3.14**
20	3.7	2.8	0.42	1.35	0.37	2.43*
21	3.7	3.3	0.43	0.93	0.26	1.53
22	3.7	2.8	0.46	1.40	0.38	2.36*
23	3.4	3.0	1.15	1.32	0.45	0.88
24	2.7	2.5	0.99	1.28	0.42	0.47
25	3.6	1.7	0.49	1.43	0.39	4.87**
26	3.5	1.6	1.16	1.45	0.48	3.95**
27	3.3	2.7	0.63	0.98	0.28	2.14*
28	3.5	1.6	0.93	1.59	0.48	3.95**

tem no.	Mean (M1) for higher group	Mean(M2) for lower group	SD(σ1) for higher group	SD(σ2) for lower group	SED	't'
29	3.2	1.6	1.26	1.33	0.48	3.33**
30	3.0	1.6	1.35	1.27	0.48	2.91**
31	3.7	3.7	0.42	0.46	1.36	0.00
32	2.4	2.2	1.55	1.58	0.58	0.34
33	2.8	1.4	1.55	1.45	0.56	2.50*
34	3.5	1.2	1.02	0.82	0.33	6.96**
35	2.6	0.7	1.49	1.26	0.51	3.72**
36	3.7	1.2	0.57	0.91	0.26	9.61**
37	3.7	3.4	0.42	1.28	0.35	0.85
38	4.0	1.7	0	1.36	0.36	6.38**
39	3.7	0.9	0.57	0.91	0.28	10.0**
40	2.8	2.0	1.61	1.81	0.63	1.26
41	3.5	3.1	0.85	1.16	0.37	1.08
42	3.6	1.7	0.49	1.43	0.39	4.87**
43	3.6	3.3	1.08	0.92	0.37	0.81
44	3.4	1.6	1.22	1.39	0.48	3.75**
45	1.5	0.5	1.28	0.93	0.41	2.43*
46	3.7	1.5	0.61	1.55	0.43	5.1**
47	3.7	3.3	0.43	0.93	0.26	1.53
48	2.71	1.5	1.06	1.08	0.46	2.63*
49	3.85	1.78	0.77	1.37	0.41	5.04**
50	4.0	2.0	0.84	1.58	0.46	4.34**
51	3.5	1.64	0.84	1.16	0.37	5.02**
52	3.5	1.5	1.02	1.52	0.48	4.16**
53	3.14	1.21	1.02	1.44	0.45	4.28**
54	2.57	3.07	1.32	1.33	0.53	1.00
55	2.71	1.78	1.28	1.44	0.50	1.66
56	1.1	1.4	1.02	1.28	0.42	0.71
57	3.6	3.2	0.55	1.05	0.30	1.33

* indicates significant at .05 level of significance.
** indicates significant at .01 level of significance.

The items which were not significant at .05 level of significance were rejected on the ground that they had not discriminatory power. In this way item number 1, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 21, 23, 24,31, 32, 37, 40, 41, 43, 47, 54, 55, 56 and 57 were rejected from the preliminary draft.
Out of 57 items, 25 items were dropped out and 32 items in all were retained in the final draft.

Table 3
Distribution of Items on Various Dimensions of Self-Confidence
Scale in Mathematics

Sr. No.	Dimensions	Item Numbers	Total
1	Self-Satisfaction	1, 6, 11,13, 15,24,31	7
2	Self-Composed	2, 12, 16, 18, 19, 20, 22, 23,25,27,29	11
3	Optimism	3, 7, 9, 14, 17,21, 30	7
4	Self-Belief	4, 5, 8, 10, 26, 28, 32	7
		Total	32

Table 4
Distribution of Positive and Negative Statements in Self-Confidence
Scale in Mathematics

Sr. No.	Dimensions	No. of Items	Positive Statements	Negative Statements
1	Self-Satisfaction	7	1,6,11,13,31	15,24
2	Self-Composed	11	2,20,22,23,29	12,16,18,19,25,27
3	Optimism	7	7,9,21,30	3,14,17
4	Self-Belief	7	4,5,8,10,32	26,28
	Total	32	19	13

f) Reliability

To test the reliability of the scale both Split-Half method and Test-Retest method were used.

Split-Half Reliability Coefficient

In this method, odd and even items were splited and their correlation was computed by applying product-moment coefficient of correlation. The reliability coefficient of the whole test was computed with the help of Spearman-Brown Prophency formula:

$r_{tt} = 2r_{hh}/1+r_{hh}$
where, r_{tt} = reliability of the whole scale
r_{hh} = coefficient of correlation between the two halves of the scale.

The reliability of the whole (test) scale came out 0.85. Thus, the test was highly reliable.

Test-Retest Reliability Co-efficient

After four weeks of time interval the scale was administered to same 50 students. The test-retest reliability co-efficient indicating the stability of measurement over a period of time came out 0.82. Thus, it shows that the test was highly reliable.

g) Validity

A technique or test is valid if it measures what it claims to measure. The validity of the scale was calculated through face validity, content validity and intrinsic validity.

Face Validity

The face validity of the scale was fairly high. There was a close agreement among the judges and experts to ensure its face validity.

Content validity

Content validity was examined to determine whether the scale covered all the items adequately from which all the aspects of self-confidence was to be assessed. The judges were in consonance with the view that the contents were covered in the test in all the items.

Intrinsic Validity

Intrinsic Validity was calculated by using the following formula:

$$\text{Intrinsic Validity} = \sqrt{\text{Reliability}}$$

$$V_{tt} = \sqrt{r_{tt}}$$

$$= 0.92$$

Coefficient of Vtt was quite high. Thus the test was highly valid.

CONCLUSION

The self-confidence scale developed and standardized by the researcher can be used to measure the level of self-confidence in mathematics among the school students falling in the age-group of 10-12 years. This can also be used to find out and analyse various factors associated with self-confidence in mathematics so that necessary steps can be taken to create an environment to develop self-confidence among students in mathematics.

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