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PREPARING TOOLS FOR EXPLORING THE INTEREST IN MATHEMATICS AND LEARNER STRATEGIES ASSOCIATED TO THE ACADEMIC ACHIEVEMENT AT HIGH SCHOOL LEVEL

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ABSTRACT

The trend of using learning strategies as a teaching tool is now rapidly expanding into education. Although learning environments are becoming popular there is minimal research on an exploring the interest in mathematics andlearner strategies on the students. The purpose of this study is to develop a tool to measure the interest in mathematics and learner strategies on the students' of high school level in the Indian scenario. Initially interest in mathematics tool was constructed with 60 statements and learner strategies with 125 statements and administered to 60 students of high school level. Out of these 60 statements of interest in Mathematics 40 statements are positive and 20 statements are negative. Similarly 125 statements of learner strategies 30 statements focused on cognitive strategies, 40 statements focused on motivational strategies, 20 statements focused on meta-cognitive strategies and 35 statements focused on management strategies. In order to standardize the tool the researcher applied t-test. After the item analysis 41 statements were selected in interest in mathematics and 77 statements were selected in learner strategies with the dimensions cognitive strategies (21), motivational strategies (20), meta-cognitive strategies (15) and management strategies (21).

KEY WORDS: *Interest in Mathematics, Learner Strategies, IX Standard Students.*

INTRODUCTION

As an important component of the classroom experience in higher education, learning strategies are specific patterns or combinations of academic activities that learner use to gain knowledge (Vermetten, Lodewijks & Vermunt, 1999; Vermunt, 1996). There are a variety of methods that students can use when studying and learning, and these self-regulating behaviors contribute to student success in a variety of ways. Learning strategies can range from taking notes when reading and in class, to summarizing and organizing new information, to creating an environment that is conducive to studying (Ormrod, 2011). Additionally, learning strategies contribute to regulating and monitoring time, concentration, and enhancing comprehension (McKeachie, Pintrich, & Lin, 1985). Thus, students' use of learning strategies is closely related to their perception of an emphasis on mastery or performance goal orientation in the classroom (Ames & Archer, 1988).

Learning strategies, through their connection with enhanced cognitive, motivational, metacognitive and management skills, are additionally relevant to interdisciplinary learning, where students move past declarative and procedural knowledge in a single discipline and apply concepts and themes across multiple areas (Ivanitskaya, Clark, Montgomery, & Primeau, 2002).

The importance of mathematics has been hailed by many studies in literature. According to Drew (1996), mathematics is the most important factor that relates to an individual's success. He proceeded to describemathematics as a subject that is required for entry into many professions and it is important for existing as wellas emerging occupations in a global economy that is based on information and technology. Saffer (1999) also stated that mathematics is not just useful in the day to day skills such as managing money but also in the most popular occupations and countless of jobs that call for some mathematical skill or another. This is the reason why mathematics is hailed at a higher rate compared to other subjects, and it has been called as the queen of all sciences and servant to all disciplines (Ajayi, Lawani, & Adeyanju, 2013).

OBJECTIVE

The purpose of this study is to develop a tool to measure the interest in mathematics and learner strategies on the students' of high school level in the Indian scenario with reference to the improvement on their academic achievement. As such it seems that there is no research tool to measure interest in mathematics and learner strategies on the students' of high school level and the researcher intended to construct a tool.

METHODOLOGY

As a preliminary step, the investigator reviewed books, periodicals and other descriptive materials to procure the requirements to construct the items for the Interest in Mathematics Scale and Learner Strategies Scale. Experts in the field of education, psychology, counseling social works and school health were also consulted and their suggestions were taken into consideration.

THE FOLLOWING CRITERIA WERE FOLLOWED IN SCREENING AND EDITING OF THE ITEMS:

1. As far as possible items were retained in the form of simple sentences, avoiding words, which may not be understood by the subjects.
2. Items were clear, brief and precise.
3. Items having more than one meaning and those with double negatives were not used.

INTEREST IN MATHEMATICS

Thus sixty Items were included in the draft form of the Interest in Mathematics scale. This scale was developed following the Likert method. Out of the sixty items eighteen were of negative polarity and remaining forty two were of positive polarity. The scale thus developed was a two point scale having two categories of response either 'yes' or 'no'.

The distribution of items in the draft form of Interest in Mathematics Scale was given following table.

Table-1

Scale	Serial Number of Items		Total
	Positive Polarity	Negative Polarity	
Interest in Mathematics	1, 2, 5, 11-17, 24-29, 31, 32, 35, 38-42, 44-48, 50-60	3, 4, 6-10, 18, 19, 20, 21, 22, 23, 30, 33, 34, 36, 37, 43, 49	60

Learner Strategies

Thus one hundred and twenty five Items were included in the draft form of the Learner strategies scale. This scale was developed following the Likert method. Out of the one hundred and twenty five items

eighteen were of negative polarity and remaining one hundred and seven were of positive polarity. The scale thus developed was a four point scale having four categories of response namely, 'SA' (Strongly Agree), 'A'(Agree), 'DA'(Disagree) and 'SD' (Strongly Disagree).

The distribution of items in the draft form of Learner Strategies Scale was given following table.

Table-2

Dimensions of Learner Strategies	Serial Number of Items		Total
	Positive Polarity	Negative Polarity	
Cognitive Strategies	1, 3, 5, 6, 9-16, 18, 19, 21, 24, 25, 27, 29, 30	2, 4, 7, 8, 17, 20, 22, 23, 26, 28	30
Motivational Strategies	31, 32, 34-40, 42-46, 48, 50, 51, 52, 55-63, 65-70	33, 41, 47, 49, 53, 54, 64	40
Meta-Cognitive Strategies	71-90	-	20
Management Strategies	91-100, 102-108, 110-125	101, 109	35

Try-out and Item Analysis

After pre-try-out, the test was administered on a sample of seventy five students under study. In this step of actual try-out, item analysis was done, out of the seventy five response sheets obtained; only sixty response sheets were selected for item analysis. Keeping in view the applicability of the method, the investigator applied t-test for item discrimination. The sum of the scores of all the items constituted the total score of the scale. The response sheets were arranged in a descending order of the total score. The highest 27% and the lowest 27% of the response sheets were separated. These were criterion groups in terms of which to evaluate individual statements.

The statement for which t-value is greater than or equal to 2.58 was regarded as an item, which possesses internal consistency and hence discriminating power (significant at .01 level). 20 statements in Interest in Mathematics scale and fifty items in Learner strategies scale having t-values lower than 2.58 were rejected from the draft form. Thus forty statements in Interest in Mathematics and seventy five statements in Learner strategies scales were selected for the final scale.

Table 3: Item Analysis - Interest in Mathematics Scale

Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA
1	3.587	**1**	**13**	1.895	*	**25**	2.329	*	**37**	3.589	**29**	**49**	2.005	*
2	6.229	**2**	**14**	5.956	**13**	**26**	1.557	*	**38**	2.014	*	**50**	6.587	**36**
3	4.109	**3**	**15**	6.023	**14**	**27**	5.278	**21**	**39**	2.325	*	**51**	5.248	**37**
4	2.978	**4**	**16**	4.812	**15**	**28**	5.854	**22**	**40**	3.058	**30**	**52**	1.228	*
5	3.269	**5**	**17**	2.997	**16**	**29**	2.091	*	**41**	4.011	**31**	**53**	2.349	*
6	2.881	**6**	**18**	3.020	**17**	**30**	2.968	**23**	**42**	2.124	*	**54**	6.954	**38**
7	4.862	**7**	**19**	1.984	*	**31**	3.225	**24**	**43**	3.656	**32**	**55**	6.228	**39**
8	5.117	**8**	**20**	2.023	*	**32**	3.698	**25**	**44**	4.689	**33**	**56**	1.058	*
9	2.845	**9**	**21**	2.965	**18**	**33**	2.888	**26**	**45**	5.214	**34**	**57**	4.528	**40**
10	3.558	**10**	**22**	3.545	**19**	**34**	4.125	**27**	**46**	1.179	*	**58**	1.365	*
11	6.216	**11**	**23**	2.003	*	**35**	6.581	**28**	**47**	1.589	*	**59**	1.497	*
12	4.242	**12**	**24**	6.465	**20**	**36**	1.008	*	**48**	2.991	**35**	**60**	4.231	**41**

Note: SA - Serial arrangement of items in the final form

*** Items rejected**

Table 4: Item Analysis - Learner Strategies Scale

Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA	Item No	't' value	SA
1	4.879	**1**	**26**	5.217	**18**	**51**	4.284	**33**	**76**	5.089	**45**	**101**	3.661	**64**
2	3.025	**2**	**27**	1.589	*	**52**	1.457	*	**77**	4.065	**46**	**102**	6.302	**65**
3	3.258	**3**	**28**	5.321	**19**	**53**	1.784	*	**78**	3.558	**47**	**103**	2.983	**66**
4	3.090	**4**	**29**	4.289	**20**	**54**	2.957	**34**	**79**	5.658	**48**	**104**	2.790	**67**
5	1.087	*	**30**	4.213	**21**	**55**	1.009	*	**80**	2.869	**49**	**105**	2.062	*
6	1.528	*	**31**	3.687	**22**	**56**	1.234	*	**81**	2.997	**50**	**106**	1.852	*
7	2.987	**5**	**32**	1.584	*	**57**	4.869	**35**	**82**	5.020	**51**	**107**	1.080	*
8	3.047	**6**	**33**	5.897	**23**	**58**	3.521	**36**	**83**	1.223	*	**108**	1.202	*
9	1.074	*	**34**	1.875	*	**59**	2.352	*	**84**	4.008	**52**	**109**	1.601	*
10	2.087	*	**35**	4.652	**24**	**60**	6.134	**37**	**85**	4.228	**53**	**110**	2.007	*
11	6.087	**7**	**36**	2.877	**25**	**61**	5.331	**38**	**86**	3.278	**54**	**111**	1.784	*
12	5.095	**8**	**37**	1.589	*	**62**	2.078	*	**87**	2.417	*	**112**	4.158	**68**
13	4.012	**9**	**38**	1.258	*	**63**	2.215	*	**88**	2.058	*	**113**	3.519	**69**
14	3.578	**10**	**39**	3.658	**26**	**64**	2.887	**39**	**89**	3.879	**55**	**114**	6.213	**70**
15	6.854	**11**	**40**	1.789	*	**65**	2.322	*	**90**	5.668	**56**	**115**	1.337	*
16	6.107	**12**	**41**	2.689	**27**	**66**	2.719	**40**	**91**	4.214	**57**	**116**	4.278	**71**
17	3.258	**13**	**42**	1.257	*	**67**	1.543	*	**92**	6.021	**58**	**117**	4.297	**72**
18	2.908	**14**	**43**	2.907	**28**	**68**	1.250	*	**93**	3.089	**59**	**118**	1.810	*
19	1.558	*	**44**	1.225	*	**69**	6.985	**41**	**94**	2.947	**60**	**119**	4.213	**73**
20	1.945	*	**45**	1.089	*	**70**	1.012	*	**95**	2.886	**61**	**120**	5.812	**74**
21	1.478	*	**46**	6.587	**29**	**71**	3.104	**42**	**96**	3.654	**62**	**121**	1.601	*
22	1.025	*	**47**	5.231	**30**	**72**	3.625	**43**	**97**	1.232	*	**122**	6.228	**75**
23	3.057	**15**	**48**	5.473	**31**	**73**	1.123	*	**98**	3.589	**63**	**123**	5.017	**76**
24	4.112	**16**	**49**	6.225	**32**	**74**	1.980	*	**99**	2.228	*	**124**	3.287	**77**
25	2.978	**17**	**50**	1.974	*	**75**	4.223	**44**	**100**	1.359	*	**125**	2.047	*

Note: SA - Serial arrangement of items in the final form

*** Items rejected.**

Further to establish the significance of the test items t-value was calculated. The t-value greater than the table value at 0.01 level, were taken into consideration. Based on the above mentioned statistical treatments out of 60 statements of interest in mathematics 41 statements were found to be valid and 125 statements of learnerstrategies 77 statements were found to be valid.

The final version of the tool entitled "Exploring the interest in mathematics consists of 41 statements and learner strategies consists of 77 statements with the dimensions cognitive strategies (21), motivational strategies (20), meta-cognitive strategies (15) and management strategies (21).

Final form of the Scale

The final form of the Interest in Mathematics contained forty one statements and Learner strategies Scale contained each seventy seven statements and specific directions for the respondents. To avoid the tendency to give a stereo typed response, items of positive and negative responses were arranged logically. The distribution of items in the final form is given in the following table.

Table-5

Scale	Serial Number of Items		Total
	Positive Polarity	Negative Polarity	
Interest in Mathematics	1, 2, 5, 11-16, 20-22, 24, 25, 28, 30, 31, 33-41	3, 4, 6-10, 17, 18, 19, 23, 26, 27, 29, 32	41

Table-6

Dimensions of Learner Strategies	Serial Number of Items		Total
	Positive Polarity	Negative Polarity	
Cognitive Strategies	1, 3, 7-12, 14, 16, 17, 20 21	2, 4-6, 13, 15, 18, 19	21
Motivational Strategies	22, 24-26, 28, 29, 31, 33, 35-38, 40, 41	23, 27, 30, 32, 34, 39	20
Meta-Cognitive Strategies	42-56	-	15
Management Strategies	57-63, 65-77	64	21

CONCLUSION

This research tools focus on gathering information about the mind set of students on how far exploring the interest in mathematics and learning strategies associated with their academic achievement. Learner's strategy is in the embryonic stage in the Indian higher educational scenario. This is the time to read the mind-set of the students towards learner's strategies and accordingly the appropriate learning strategies may be evolved in the higher educational institutions. This research tool will be of immense use for the educational administrators, which will throw light upon the interest in mathematics and learner strategies on students of IX standard.

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