Chapter 7

Summary, Findings and Recommendation

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7.1.0 Introduction:

Special abilities or aptitudes have been given special importance in the present era. Various tests are constructed and standardized to measure special abilities for educational and vocational guidance. Aptitude measurement test is constructed and standardized to guide students in foreign countries, especially in developed countries.

Considering spatial ability as a unit of intelligence, questions to test spatial ability are raised in various intelligence tests. But in certain professions like architect, to be successful, spatial ability plays an important role instead of intelligence.

Various aptitude measurement tests have been constructed and standardized in Gujarat state. In this tests, K. G. Desai’s Speed and accuracy test, P. A. Trivedi’s Mechanical Comprehensive Test, Anil Ambasana’s Test for Art Appreciatory etc. are included. In this study, spatial ability test has been constructed independently and standardized on a sample of Gujarat state. This study has been performed with a view to removing deficiency of spatial ability test in psychological measurement test sector in Gujarat state.

7.2.0 Summary of the study:

The main objective of this study was to construct and standardization of the spatial ability test for the students of standard XI and XII. In addition, objectives of checking effect of sex, standard, area and stream on spatial ability test are included. This study was limited to students of standard – XI and XII of
Gujarati medium schools only. Spatial ability is one kind of special mental ability. Psycho-measurement experts use different kinds of question forms to measure Spatial ability. Researcher discussed with guide, professor of architect colleges and psycho-measurement experts about the types of items, which can be included in this study and then divided the test in three parts, which are as follows.

(a) Diagram seen after cutting 2-D figure.
(b) Diagram seen from certain direction of 3D figure.
(c) Diagram that is not seen after cutting 3D figure.

In the initial phase 30-30 items were constructed for each part, initial form of this test was sent to the experts of this sector for checking of merits of items and collected their suggestions and thereafter a test containing 90 items was pre-preliminarily tested on 95 pupils of standard – XI and XII and tries made to find difficulties felt by students. Moreover, item wise responses were taken. Then after that test was prepared for second try-out. Second try out was made on 370 pupils in 8 different schools out of them 4 schools were situated in city area and the rest were in semi-city area. 370 answer sheets were taken into consideration for item analysis. 10-10 items were selected on the basis of item analysis by taking into consideration facility value and discrimination value. Time taken by a student to complete each subtest was noted to determine the total time period of the test.

Thus, a period of 35 minutes was decided for a test of 3 subtests. Section-wise instruction, examples, general instruction of the test and method of giving answers for final test were decided
on the basis of second try out. Separate answer sheets were printed for final run.

For final run 10 schools from city area and 13 schools from semi-city area were selected by stratified random sample from central Gujarat districts. One-one class of standard-XI and XII were selected from each school. On those students, final runoff spatial ability test was made. Total 1827 pupils were included in sample which includes 954 pupils of standard -XI and 873 pupils of standard – XII. 757 pupils of city areas and 1070 pupils of semi-city area were included in that sample. Sex-wise, 1005 boys and 822 girls were included in the sample of final run of this test.

The test was administered on the whole sample. Answer key was used for checking of answer sheets of the test. One mark was given for correct answer, while negative marking system was not there for giving wrong answer. Marks were given subtest-wise and total marks were noted 'down at the right side corner of the answer sheet. Scoring was made in this way by checking all answer sheets. Achieved marks were entered in personal computer. This information was classified in classes according to area-wise, standard-wise, stream-wise, sex-wise and its sub types.

As there are four independent variables in this study which includes area, standard, sex and stream, the researcher prepared five frequency distributions. One for each variable and one for total pupils. But for various types of statistical calculation purpose, the researcher has used raw scores. Mean, S.D. of these raw scores were calculated and compared with the help of Microsoft Excel-2002. Significance of average difference between different groups of variables was checked by t-ratio. As there were
significant difference in average among the pupils of general stream & science stream pupils of city area and pupils of general stream & science stream of semi city area. Separate PR and T-scores were calculated for each group.

Test-retest method, Split-half method, Spearman-Brown, Rulone and Flegon’s formula were used to determine the reliability of the test. in addition to this, KR20 formula was also used to find out reliability by rational equivalence method. For determining the validity of the test criterion related validity of marks of this test was established with total percentage of annual examination. Factorial validity was also determined by factor analysis.

7.3.0 Findings:

Major findings of this study are as follows.

7.3.1 Interpretation related to test:

Major findings related to this study are as follows.

1. Total 30 items have been selected in the test. facility value of these items are between 42 to 66. whereas average of facility values of all items is 55.

2. Discriminative value of 30 items of the test are between 0.34 to 0.68. whereas average of discriminative values of all items is 0.45.

3. Reliability values are in between 0.67 to 0.92.

4. Value of validity of the test are between 0.72 to 0.93. While value of first factor weight of factorial analysis of the test is 0.93. This factor shows spatial ability.
5. There is a good and positive co-relation between the scores of spatial ability and percentage of annual examination. Thus, we can say that, who scores high in spatial ability test can also score high in schools.

7.3.2 Effect of variables:

Major findings related to the effect of the variables are as follows.

1. Significant different of sex can not be seen on the scores of Spatial ability. It means there is not significant difference which can be seen in the scores of girls and boys of higher secondary schools on spatial ability.

2. There is significant difference of area on spatial ability. The students of city area are better than semi city area in spatial ability.

3. There is significant difference of stream on spatial ability. The students of science stream are more efficient than those of general stream in spatial ability.

4. There is no significant difference in spatial ability of 11th and 12th standard students of higher secondary schools.

5. Spatial ability is a special ability, therefore there are less students who get the higher scores and the students getting average and below average scores are more in spatial ability.

6. This test is Group factor and Special factor test and therefore this test has the ability to measure all the three elements of spatial ability of pupils independently.
7.4.0 Uses of the test:

The spatial ability test is ready now to determine the spatial ability of higher secondary school pupils of Gujarat. This test is useful in various purposes.

1. Evaluation: For the evaluation of a pupil for spatial ability, this test is useful. We can evaluate pupil in his spatial ability with this. This evaluation gives the clear picture of a pupil in spatial ability.

2. Guidance and Counseling: The pupils of higher secondary schools can be guided and counseled with the help of this test. Students who are coming out by completing higher secondary school studies have many sectors for selection because of diversified horizon of science and technology. It is essential that marks of different aptitude tests should be taken into consideration for selection of proper sector or to guide him. Spatial ability plays an important role in the success of a student after getting an admission in stream like engineering or architect. If these abilities may found high in a student, he can be successful in this sector. Thus result of this test may be useful in selection of sector after higher secondary school.

3. Survey: If the teacher knows the level of the pupil in spatial ability, he can plan his guidance and counseling program accordingly. For this purpose, he can make use of this test. It will facilitate him to give individual attention
and he will be more realistic in his expectation from different individuals.

4. **Research work**: Research is a part of education. This research work needs various types of tests. This test may be fulfill the need of research.

5. **For awarding**: this test can also be used for award. One can fixed up the level of spatial ability for the same.

### 7.5.0 Recommendations for further research:

The end of any research work suggests directions of new research. Researcher suggests directions of further research at the end of this research which are as follows.

1. Norms of this spatial ability test can be established by selecting a sample of whole Gujarat.
2. Construction and standardization of spatial ability test can be made for secondary school or colleges students.
3. A comparative study can be made of scores by making a trial of this test on students studying in architects and engineering sector.
4. A comparative study can be made of scores of spatial ability test of students of higher secondary schools having high educational achievements and low educational achievements.
5. A comparative study can be made of scores of spatial ability test of pupils having high IQ and low IQ.
6. A comparative study can be made of scores of spatial ability test of students having high achievement and low achievements by selecting a subject like mathematics.

7. Other ability test can be constructed and standardize for the higher secondary school pupils.

8. A group test of spatial ability can be constructed in the other national language and can be standardized.

7.6.0 Conclusion:

Modern research does not accept IQ, but gives importance to different abilities. After completing higher secondary studies in Gujarat state, students are required to get admission in technical courses. To get admission in such courses only results of board examinations are taken into consideration. Such procedure misleads some time. Spatial ability plays an important role to get success in engineering or architect courses. This standardized test will be helpful to estimate spatial ability of the students of Gujarat state. Such estimation may help the students, guardians and policy makers to estimate success-ratio of the students who were admitted in technical courses like engineering and architecture.