



# Construction and Validation of Multiple Choice based Academic Achievement Test for XI Standard Students

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## Introduction:

Academic performance, which is measured by the examination results, is one of the major goals of a school. Hoyle (1986) argued that schools are established with the aim of imparting knowledge and skills to those who go through them and behind all this is the idea of enhancing good Academic Achievement. This test was constructed on the basis of the objectives of teaching; knowledge, understanding and application, in Economics at the secondary stage. Keeping in view these objectives, the syllabus of economics portion was analyzed and thoroughly read from the economics text books of IX class prescribed by the Punjab School Education Board, used in the government school at secondary stage. Then the items were prepared from the content which students have learnt in their IX class. As Crow and Crow (1954) defined Achievement as the extent to which learner is profiting from instructions in a given area of learning.

Achievement test is tool for teachers for evaluation of students in school situation. With the help of achievement test we can measure the amount of success of an individual in specific field. In school environment it is used as an instrument to measure success of an individual in particular subject or group of subjects. It gives the knowledge about what an individual acquires by testing his abilities. Achievement test is the tool which helps in measures the capacities and capabilities of an individual. It is also helpful in upgrading the standard of education in an energetic way so that the individual can see with their own eyes that what they achieve by their past learning. The Construction of an achievement test used in school-based assessments and also in external examinations. Different steps like designing, blueprinting, construction of questions, formatting the test and moderation of the question paper were described for developing good question papers. When we talk of standardization of an achievement test, it is the process of desiring comparative norms that distinguishes the formal standardized test from the informal objective test of achievement.

## Need of Academic Achievement test:

A variety of measures exist for assessing student achievement, multiple-choice testing has been the most commonly used method for the last 40 years (Feinberg, 1990: 14). Test questions are generally short, machine scorable items which require students to select answers from among several predetermined answer choices (Mitchell, 1992: 172). Multiple-choice testing has come under fire in recent years. Critics charge that multiple-choice tests ignore important areas of school curriculum, and focus instead on basic skills, rote memorization, and short-term recall (The University of California at Los Angeles, 1990: 4-5). It is thus evident that a series of changes has created an educational system driven in large part by standardized testing. Standardized test results are a major criterion in the school decision making process. They are used to select students for school programs and determine student placement. In addition, standardized test results are used to measure the performance of teachers, administrators, schools, and school systems. Ultimately, standardized test results have become the yardstick by which success or failure is measured (Neill & Medina, 1989: 688).

## Conceptual Framework of Achievement Test:

It is a matter of concern that many secondary school subject teachers that many students' difficulty in performing satisfactorily in school subjects. To identify and train in the different subject areas of these students, the tests were not readily available. Since the available tests for the assessment of Academic Achievement in all subjects of IX standard was not found to be satisfactory in terms of its objectivity, reliability and validity, necessity this Academic Achievement test was developed and standardized by the investigator using scientific procedure.

The test construction was considered for following grounds:

- a) A text books of IX standard Kannada, English, Hindi, Mathematics, Science and Social Science published by the DSERT, Government of Karnataka.
- b) Review of related research
- c) Other similar achievement tools
- d) Personal experience of the investigator subject Experts/Teachers

Academic Achievement Test was construction by the investigator using following steps

### Step-1: Planning for the Test:

The investigator consulted many secondary school subject teachers who have been teaching Kannada, English, Hindi, Mathematics, Science and Social Science for more than twenty-five years experienced. As a discussion of this the investigator decided to construct test items for measuring Secondary school student's achievement tool. Investigator further decided to construct the test items related to Kannada, English, Hindi, Mathematics, Science and Social Science, restricting the content knowledge of IX grade students. The investigator also decided to construct all the test items in multiple choice forms of objective type questions.

Construction of Achievement test was also based on the identification of objectives. Content of the unit of Kannada, English, Hindi, Mathematics, Science and Social Science was based on the achievement of one or more objectives. It was based on the classification made by Bloom (1956). He classified all the available educational objectives into cognitive, affective and psycho-motor domains. These objectives were in the form of knowledge, Understanding, application, appreciation, interest, attitude, curiosity, skill, etc. The specifications of some of the objectives are listed in the tabular form as depicted in the following: Specification of Educational Objectives (The students would be able to respond in the following way)

- **Knowledge:** Exhibit memory of previously-learned materials by recalling facts, terms, basic concepts and answers.
- **Understanding:** Demonstrate understanding of facts and ideas by organising, comparing, translating, interpreting, giving descriptions, and stating main ideas.
- **Application:** Involves knowledge and comprehension. It involves the ability to make use of the abstract or generalised ideas, principles in particular and concrete situation i.e., to apply their knowledge and understanding of the subject to day-to-day life activities to the new or unfamiliar situation.
- **Analysis:** Refers to an understanding at higher level which involves a complex cognitive process including knowledge comprehension as well as application i.e., breaking up of information into parts to reach conclusion.
- **Synthesis:** Calls for creative aspects of cognitive abilities where it is necessary to combine the different elements or components, i.e., figure of wholeness, production and unique communication.
- **Evaluation:** Involves proper decision making about the quantitative and qualitative value of a particular idea, object, principle or theory, i.e., judgment in terms of evidence and external criteria.

A three-dimensional blue-print showing coverage of content, instructional objectives and types of items was prepared by referring to IX standard text book of Kannada, English, Hindi, Mathematics, Science and Social Science content state syllabus and items were finalized in consultation with the subject experts.

## Step-2: Item writing

By discussing with the secondary school subject teachers, research experts, research scholars and investigator altogether constructed 390 items belonging to Kannada, English, Hindi, Mathematics, Science and Social Science content of IX grade state syllabus. These test items were pooled under 6(six) parts namely, Part-A: Kannada, Part-B: English, Part-C: Hindi, Part-D: Mathematics, Part-E: Science and Part-F: Social Science, there were 65(sixty-five) items in each part of the test.

## Step-3: Pooling of Items

Thus, the orderly pooled test was printed in the form of a self-responding tool. This tool was given to a few selected concerned senior secondary school subject teachers. They were requested to go through each item and look into the appropriateness of the content, grammatical correctness, distracters etc., in relation to the age, mental development of the students for whom the test is meant. All teachers were kind enough in completing the task and returned back the test tool to the investigator. By considering the suggestions made by those subject teachers ten items out of sixty-five from Kannada, six items out of sixty-five from English, ten items out of sixty-five from Hindi, ten items out of sixty-five from Mathematics, ten items out of sixty-five from science and ten items out of sixty-five from Social Science. Totally fifty items out of 390 were dropped as they either seem to be weak or ambiguous. Thus remaining 335 items were retained and considered for Pilot study.

## Step-4: Tryout of the Test:

The draft test prepared was tried out on a sample of one hundred and fifty secondary school students of IX standard in shimoga town. All the test booklets were collected back after successful administration. Each test booklets were scored referring to the scoring key prepared by the investigator. The total score from Part-A: Kannada, Part-B: English, Part-C: Hindi, Part-D: Mathematics, Part-E: Science and Part-F: Social Science together consider for further analysis.

## Step-5: Item Analysis and Selection of Items

Item wise analysis was carried out in the following way. All the test booklets on the basis of scores were arranged in descending order to analyse the items for knowing the difficulty level and discrimination index for each item. Investigator took top 27% of the sample-the high scores and the bottom 27% of the sample-low scores and 46% of the sample- arrange scored were grouped.

**Difficulty level or difficulty Index of an Item:**

The difficulty index of an item is represented by the percentage of students who responded to it correctly. It was calculated by using the formula.

$$D.I = U + L / 2N$$

Where,

U= Number of correct responses in the upper group (high scored group)

L= Number of correct responses in the lower group (low scored group)

N= Number of Students either in the lower group or higher group

**Discriminative power or discriminative Index of an Item**

The Discriminative index of an item indicates the measure of the extent to which an item discriminates or differentiates between subjects who do well on the overall test and those who do not do well on the overall test. The discriminating power of each item was calculated by the formula

$$D.P = U - L / N$$

Where,

U= Number of correct responses in the upper group

L= Number of correct responses in the lower group

N= Number of Students either in the lower group or higher group

a) The index of difficulty and the index of discrimination for the entire 335 test items were computed.

**Selection of Items**

By convention items with difficulty index higher than 30% or lower than 80% were retained. Similarly, items with index of discrimination above 0.30 were retained. In the present study only items having index of difficulty in the range of 50% to 80% and index of discrimination range from 0.30 to 0.50 were selected.

**Step-6: Finalization of the test:**

Too easy and too difficult items with discriminative index ranging from 0.30 to 0.50 and difficulty index ranging from 50% to 80% were selected and added to the final scale. Accordingly, 300 items (Each part 50 items) were selected out of 335 items and this constituted the final form of the test. The final tool consisted of 300 items in all Distribution of items in the final form is given in the following table:

**Table 3.12: Distribution of items in the final form**

Sl No.	Part	Subjects	No. of items retained
1	A	KANNADA	50
2	B	ENGLISH	50
3	C	HINDI	50
4	D	MATHEMATICS	50
5	E	SCIENCE	50
6	F	SOCIAL SCIENCE	50
	TOTAL TEST ITEMS		300

**Step-7: Evaluation of Academic Achievement test:**

The final test was administrated on a sample of 100 secondary school IX standard students and the scores were used for the purpose of developing norms, estimating reliability and validity.

**Reliability of the Academic Achievement test:****Test-retest method:**

The reliability of a test is its ability to yield consistent result from one set of measures to another. The reliability co-efficient of the test was established by Test-rest method. The reliability co-efficient of the test was administered to a sample of One hundred students and after two weeks interval it was re administrated to the same sample. The Co efficient of correlation between the two sets of scores on the each part of the achievement test using Pearson's product moment correlation method and it was shown in the table no 3.15.

**Split half method:**

Reliability refers to the accuracy or internal consistency or internal stability of measurements by a test. In this study the co-efficient of internal consistency has been found by the split half method. The reliability co-efficient of the test was administered to a sample of one hundred and sixty students. The test administered only once.

The group of the individuals and scores divided into two halves-one relating to odd numbered items and the other to even numbered items. The Co efficient of correlation between the scores on the halves was correlated each part of the achievement test using by means of Spearmen Brown Prophecy formula (Garrett,1966,p.339) and it was shown in the table no 3.15.



The group of the individuals and scores divided into two halves-one relating to First 50% of the items (1<sup>st</sup>halve)and the other to last 50% of the items (2<sup>nd</sup> halve). The Co efficient of correlation between the scores on the halves was correlated each part of the achievement test using by means of Spearmen Brown Prophecy formula and it was shown in the table no 3.15.

**Table 3.13: Different methods of Reliability Coefficients (for Six subjects of Academic Achievement Test)**

Sl no.	Reliability Measures	Part-A Kannada	Part-B English	Part-C Hindi	Part-D Maths	Part-E Science	Part-F Social Science	Total Academic Achievement
1	Test-retest	0.814	0.737	0.806	0.771	0.811	0.760	0.780
2	Split half (Odd and even)	0.818	0.809	0.800	0.789	0.813	0.766	0.80
3	Split half (1st Half and 2nd half)	0.792	0.780	0.775	0.765	0.801	0.752	0.766

#### **Establishing Validity of the Test:**

##### **Content Validity:**

It is the extent to which test items match or align with the target topic, performance, or content domain. Generally, content validity is established via expert analysis relevant to the target construct. Content validity was established for the Achievement Test by attaching test booklets by giving 30experts, which included subject Teachers teaching Kannada, English, Hindi, Mathematics, Science and social science in Secondary School schools and teacher educators to decide the content validity of the test. The experts agreed that the items in the achievement test are relevant and worthwhile for collecting the Data and considering the suggestions of the experts, some of the items and responses were modified and rewritten. The experts were satisfied with the relevance of the test items and the scoring procedures. They were also satisfied with the adequate coverage of content of each part of the achievement test at IX Standard. This implies that the achievement test is comprehensive and relevant.

##### **Concurrent validity (usefulness of the test):**

Concurrent validity of the achievement test was computed by the score of 100 students in class IX on achievement test were correlated against the Annual Examination marks of these students. And the concurrent validity of the test was found to be 0.762 which is found to be significant at 0.05 level. Likewise, teachers opinion in terms of 4 points ratings [Best (4), Good (3),

Fair (2), Poor (1)] of each 100 students was obtained. The number of teachers was 24. Each of 100 students rating, after being converted into scores, was correlated with their score and it was found to be 0.730.

### Item Validity

The item-to-item correlation for that the cronbach's alpha technique was employed. The item validity was computed to 50 items in each part of the achievement test selected based on difficulty index and discriminatory power. Corrected Item-Total Correlation was found to be range from 0.366 to 0.910 (If this correlation is weak (de Vaus suggests anything less than .30 is a weak correlation for item-analysis purposes [de Vaus (2004), *Suveys in Social Research*, Routledge, p. 184]), then that item should be removed and not used to form a composite score for the variable in question.

Table no 3.16 represent the inter scales correlations of Academic Achievement tool. The score ranged from .771 to .874.

**Table 3.14: Inter Scales Correlations of Academic Achievement Tool**

	KANNADA	ENGLISH	HINDI	MATHEMATICS	SCIENCE	SOCIAL SCIENCE	TOTAL
KANNADA	1	.826**	.868**	.822**	.827**	.771**	.923**
ENGLISH		1	.870**	.825**	.874**	.823**	.932**
HINDI			1	.840**	.806**	.788**	.929**
MATHEMATICS				1	.837**	.782**	.913**
SCIENCE					1	.838**	.924**
SOCIAL SCIENCE						1	.902**
**Significant at 0.01 level							

From the table 3.14, the results show that all sub tests scores are correlated with each other and significant correlation with the total test score. Subtest 'English' is highly correlated with the total scale (.932) followed by Hindi (.929), Science (.924), Kannada (.923), Mathematics (.913) and Social Science (.902).

### Scoring:

The maximum possible score on this test is 300. This test consists of Six parts namely, Part-A: Kannada, Part-B: English, Part-C: Hindi, Part-D: Mathematics, Part-E: Science and Part-F: Social Science. Each part has maximum of 50 scores. All the score sheets will be scored referring to the scoring keys (Enclosed in the Appendix). Each correct answer is assigned One score and wrong answer a Zero score.



**Norms:**

Percentile norms for the interpretation of achievement test were established for IX standard students, both boys and girls from a sample of 200 students, 100 Boys and 100 Girls. As the norms are based on a sample drawn from the city of Shimoga, Karnataka the users are advised to develop their own norms based on their own sample.

**Percentile Ranks**

Norms was established through percentile analysis on achievement test.

**Table 3.15: Percentile Ranks of Respondents Score on Academic Achievement Test (N=200)**

Percentiles	Scores
10	107
20	135
25	153
30	159
40	175
50	187
60	200
70	213
75	217
80	223
90	240

**Table 3.16: Percentile norms for the interpretation of scores:**

Percentiles	Description
p <sub>90</sub> and above	High Achievement
p <sub>75</sub> to p <sub>89</sub>	Above Average Achievement
p <sub>50</sub> to p <sub>74</sub>	Average Achievement
P <sub>25</sub> to p <sub>49</sub>	Below Average Achievement
P <sub>24</sub> and below	Low Achievement

**CONCLUSION:**

The scale was designed to assess IX grade students' academic achievement in Kannada, English, Hindi, Mathematics, Science, and Social Science subjects. Systematic efforts were made to validate the tool using appropriate statistical techniques, so that it could be used to assess overall academic achievement. The tool's findings will be useful in determining a student's level of academic achievement and taking appropriate measures to improve their performance.

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