

VALIDATION OF IEA MATHEMATICS ACHIEVEMENT TEST IN PAKISTAN : A PILOT STUDY

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The present study was undertaken to validate a portion of International Association for Evaluation of Educational Achievement (IEA) Mathematics Achievement Test in Pakistan. The items of the test were matched with the curriculum applied in schools. A set of relevant items were translated into Urdu and administered to an ad-hoc sample of 75 female students of grades 6 to 10. The results showed that the mean scores of the students increased with their respective grades and the test generally differentiated between the students of various grades. The indices of correlation between marks in school examinations and IEA test were generally positive though low; only five out of twenty correlations reached significance levels. These results can be taken as an indication of the validity of this test for Pakistani female students.

The present study was undertaken in order to determine the validity of (IEA) Mathematics Achievement Test in Pakistan. The test was originally developed for grade 8 students by Washington National Institute of Education. It has been used for research purposes in many countries across the world for cross-national comparisons and evaluation. It was a multiple choice objective type test. The contents of the test covered Number system, Measures, Geometry and Algebra. For ascertaining its validity in Pakistan, a slightly modified version was used. The scores of the subjects were correlated with marks obtained by them in different school examinations. The mean scores of students belonging to various grades were also compared to see developmental trends.

The following two hypotheses were set up for this study.

1. There will be a significant correlation between performance on IEA Mathematics Test and the school examination in mathematics.
2. Students in upper grades will score significantly higher than those in the lower grades.

METHODOLOGY

Sample

Since it was a pilot study, only 75 students were randomly selected from a Government Girls High School in Islamabad. 15 students from each

grade (6 to 10) were taken. The students of grades 9 and 10 were in the science group.

Instrument

The original IEA mathematics achievement test for grade 8 consists of 7 booklets which cover different topics of mathematics. The present study is based on Booklet No. 3L. The booklet was selected because its content resembled the topics covered in Pakistani secondary schools mathematics curriculum. A set of 40 items was selected dropping only a few items which are not taught in Pakistani schools.

The test was translated into Urdu which is the national medium of instruction. The Urdu version was developed without altering essential content of the items, illustrations and diagrams. Three members from research staff of NIP examined the test translation in order to achieve a consensus. Items were rearranged according to their apparent difficulty level. In order to familiarize the students with the format of the test, written instructions with two solved examples were given on the cover page.

Procedure

The test was administered in class room setting. The researcher explained the instructions written on the cover page of the test booklet. No time limit was imposed. However, no respondent took more than an hour in completing the test.

The marks obtained by students in the two term examinations, as well as the marks in the annual examination, were obtained from the school record.

The scheme of analysis of data was conceived in the following pattern.

1. Performance of students on various content categories of the test.
2. The overall grade wise performance of students in the test.
3. Relationship between the scores of the students obtained in the test and school examinations.

RESULTS

Performance of students on various content categories

The analysis of performance of students in terms of various content categories of the test shows that the marks of the students increased with their respective grades in almost all content categories of the test. The only exception is the category of 'Measures' (see table 1).

Table 1

Mean scores of Students of Different Grades on Various Content Categories of the IEA Mathematics Test.
(SD in parenthesis)

Content categories	Grades				
	6	7	8	9	10
Number system	3.13 (3.20)	4.04 (3.67)	5.02 (4.67)	7.00 (4.75)	8.33 (5.19)
Measures	2.62 (3.25)	3.31 (4.06)	2.77 (4.33)	3.69 (3.63)	5.95 (4.79)
Geometry	1.33 (1.37)	2.33 (2.21)	3.17 (4.30)	6.00 (4.40)	10.17 (4.14)
Algebra	2.00 (1.29)	4.83 (2.11)	4.67 (2.81)	4.50 (2.63)	5.00 (1.83)

Overall grade-wise performance

The average scores of students belonging to various grades increased with their respective grades, although the rate of increment is very low (see table 2).

Table 2
Grade-wise Performance of Students
on IEA Mathematics Test

Grade	Mean	SD	t	p
6	6.8	2.162	2.608	<.01
7	10.2	4.118	.391	n s
8	10.73	2.999	3.331	<.005
9	14.4	2.822	4.338	<.005
10	20.26	4.382		

Students of upper grades generally obtained significantly higher mean scores than those in the lower grades indicating a developmental trend.

Relationship between IEA Mathematics Test scores and school examinations

The correlation between the marks in mathematics obtained by the students in the school examination and the IEA Test were also computed. In general, the correlation tend to be low and insignificant. Out of 20 correlations between IEA Test and school examination, only 5 are significant, indicating a rather weak relationship.

DISCUSSION

In the original study, the IEA Mathematics Test was given only to grade 8 students. In Pakistan, however, the same test was administered to the students from grades 6 through 10, to determine achievement levels of the students in various grades. The following aspects emerged from the study.

1. The test discriminated between lower and higher grades and some low but generally positive correlation was found between IEA Mathematics Test and school examinations, although only five out of twenty correlations reached significance level. These results can be taken as indication of validity of the test for Pakistani female students, and these aspects strengthen the hypotheses.

2. The results show that the test not only as whole discriminated between students of higher and lower grades but its various content categories are also generally discriminating. The students of higher grades scored higher on all content categories. The only exception is the category of 'Measures'. The low performance of students in this content category is probably due to the fact that in most Pakistani schools the use of elementary mathematical tools, like a scale, is not very common, and the classroom practices are such that actual measurement work is not employed.

3. Although the mean scores of students in various grades increased with their respective grades, yet the rate of improvement is very slow. It is virtually nil between grades 7 and 8. In fact, the performance of students in each grade remained very poor. It was only at grade 10 that the students could score half the items correctly. The author does not have yet IEA Test results of other countries to compare with, but a study done by Ahmed & Ansari, (1983) also indicated the same trend on mathematics test, namely, the scores of Pakistani students being the lowest as compared to those of other countries.

On the basis of the results, it is felt that IEA Mathematics Test series could prove beneficial for comparing Pakistani students achievement level with that of other countries' students. Such comparisons would indicate the extent to which the education of Mathematics in Pakistan lags behind. Since the equivalence of educational standards in Pakistan with that of other countries is desirable, such cross-national instruments may be further used to compare the standards and then evolve strategies to improve them.

REFERENCES

- Husen, T. (1967). *International study of achievement in mathematics: A comparison of twelve countries*: New York: John Wiley.
- Ahmad, I. & Ansari, Z.A. (1983). Science and mathematics education in Pakistan: A cross national perspective. Islamabad: *Higher Education Review*, Vol II, 55-65.
- IEA, (1980). *Second Study of Mathematics Bulletin No. 5* Washington: National Institute of Education.
- IEA, (1981). *Second Study of Mathematics: Manual for School-Grade Eight*. U.S.: National Coordinating Center.