

**A STUDY TO EXTRACT COMMON FACTORS FOUND IN LEARNING CHEMISTRY  
AT SENIOR SECONDARY LEVEL.**

**B.P. Singh, Ph. D.** Associate Professor, MLRS College of Education, Charkhi Dadri (Bhiwani)  
Haryana.

**Abstract**

*The present study was concerned with the extraction of common factors found in learning Chemistry at Senior Secondary level. A co-relation matrix was obtained from eighteen reliable and valid objective type tests taken into items and were distributed over the whole course. Investigator decided to use centric method for Factor Analysis of the correlation matrix because it involves less rigorous mathematical calculation and it was easy to interpret psychologically. Guilford and Lacey's criterion was applied to test the validity of Factor VI. The product of two highest factor loadings fell short of  $1/\sqrt{N}$ . Hence the factor stood rejected. After factorization, it was observed that difference between the obtained and guessed communalities is more than 0.10, and then factor analysis was done afresh, starting with obtained communalities without doing any adjustment in the diagonal cell. After first reiteration it was found that difference between the obtained and guessed communalities is less than 0.10. It was concluded that factor 1 constitutes 60% of the cognitive abilities in Chemistry while the other four factors contribute 40% of the total cognitive abilities in Chemistry.*



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**INTRODUCTION:** Aim of education is to explore the inherent potential of the child. Neither the child nor his parents know the potential and capabilities present in the child. Number of exercises was given to the students to know the various types of cognitive abilities present in the student. To know various abilities, items are constructed in such a way that hidden or inherent potential of the student can be discovered after mathematical calculation.

No extensive research work has been done in India and abroad so far to identify common factor. For chemistry which is equally important for science students. When some intellect abilities had

been found related with Physics (Ignatz 1982, Spero 1974), Mathematics (Peterson 1965, Chauhan 1984), Biology (Chhikara 1984). Prich, Paul R (1990) found that self efficacy and intrinsic value were positively related to cognitive engagement and performance. Kember, David (2003) found that a student adopting a surface approach does not seek understanding and, therefore, relies upon memorization. GWO- Hshiang Tzen (2007) carried out a research on evaluating Intervtwin effect in e-learning programmes. A noval hybrid MCDM Model based on factor analysis. Hilde brand H.P. (2011) conducted a research on a factorial study of introversion-extraversion and it is found that previous research suggested that Jung's theory of psychological types could be best examined by factorial method.

A review of studies carried out in the field of factor analysis reveals that no systematic attempt has been made to assess the cognitive abilities in chemistry. Since there is paucity of such studies in Indian set up, it is appropriate to investigate common factors found in learning chemistry.

#### **OBJECTIVE OF THE STUDY:**

1. To construct 18 objective type achievement tests for assessing the achievement in different aspects of chemistry at secondary level.
2. To find out the correlations between the achievement in different aspects and to apply factor-analysis in order to extract common factor.

**SELECTION AND CONSTRUCTION OF TOOLS:** The researcher has constructed own tests for assessing achievement in different aspect of chemistry. The purpose was to find out the inter-correlation of scores in different aspect for factor analysis.

#### **OPERATIONAL DEFINITIONS OF THE TERMS USED**

**Factor:** It is the weighed sums of the observed variables.

**Learning:** Learning in chemistry has been defined as the student's performance (achievement) in a chemistry course.

**Chemistry:** A chemistry course prescribed for class XI and XII.

**Senior Secondary level:** Senior secondary level has been confined to only class XII science group students studying in various schools.

#### **METHOD OF STUDY AND PROCEDURE**

The study was undertaken to extract common factors found in learning different aspects of chemistry at senior secondary level. Correlation among different tests was carried out, thereafter, common factors were found out by Centroid Method for psychological interpretation.

### **SAMPLE**

Sampling was done on two occasions. Try out test was administered to about 75 students. Out of these 69 were selected at random to get data about each individual item. Sample was of 250 students.

### **INSRUMENTATION**

The researcher constructed 18 achievements in different aspects of chemistry. The purpose was to find out the inter correlations of the score in different aspects for the factor analysis.

### **ANALYSIS OF DATA**

Investigator decided to use the Centroid method for the factor analysis of the correlation matrix. It was found that the communalities obtained from the factor matrix after the first reiteration had stabilized fairly well, since the maximum difference between the guessed and the obtained communalities was less than 0.10. The factor analysis was stopped after the fifth factor in the first round because the loadings of the sixth factor fell short of Guilford and Lacey's criterion:

$$.224 \times .226 = .050 \text{ while } = 1/\sqrt{N} = 1/\sqrt{250} = .06232$$

Hence, the product of the two highest factor loadings fell short of  $1/\sqrt{N} = .06232$  and the factor VI stood rejected.

The communalities as they came out after factorization and the difference between the guessed and obtained values are shown in table 01 along with factor loadings. The loadings are in the first five columns and the communality ( $h^2$ ) obtained by adding the squares of the loadings in each test is in the succeeding column.

**Table 01: After Reiteration: (For this reiteration the communalities obtained from first factorization were used after correct up to the decimal places)**

Tests	Factors					h <sup>2</sup> obtained	h <sup>2</sup> guessed	Diff.
	I	II	III	IV	V			
1.	.667	-.247	.183	-.420	.104	.728	.628	.092
2.	.619	-.129	-.163	.463	.075	.644	.582	-.062
3.	.776	-.466	-.092	-.268	-.197	.836	.82	.016
4.	.627	-.403	.252	-.329	-.133	.747	.659	.088
5.	.662	-.182	.224	.132	.082	.571	.669	.098
6.	.755	.583	.203	-.187	.067	.917	.943	.025
7.	.425	.134	.187	-.139	.171	.28	.248	.032
8.	.550	.327	-.144	-.303	-.312	.616	.715	.099
9.	.674	.392	-.230	-.178	-.332	.794	.697	.097
10.	.627	.461	.226	-.102	.270	.604	.614	.010
11.	.471	.279	-.056	-.049	-.232	.358	.358	.000
12.	.919	-.134	-.186	.185	-.235	.984	.992	.008

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13.	.543	-.191	-.187	.048	.017	.367	.399	.032
14.	.458	-.097	.133	.099	.148	.267	.245	.022
15.	.582	-.160	-.282	-.195	-.453	.685	.661	.024
16.	.723	-.131	-.352	.294	-.258	.812	.713	.099
17.	.490	.179	.324	.328	-.278	.560	.580	.020
18.	.383	-.108	.090	.086	-.117	.185	.217	.032
Total	10.948	2.355	1.822	1.635	.932			
%	60.82	13.08	10.122	9.083	5.17			

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### **SUMMARY AND CONCLUSIONS**

The present study carried out to extract the common factors found in learning chemistry puts up the following questions.

Is there any correlation in different aspects of chemistry?

Is there any common factor among various aspects of chemistry?

On the basis of analysis of the results the following conclusions can be drawn.

1. Every aspect of chemistry shows less to more correlation with one another.
2. Factor no.1 constitutes 60% of total cognitive abilities in student to learn chemistry. This factor indicates the major portion of achievement in the chemistry. It has 13 aspects out of 18 which have loading of more than .5.
3. Factor II constitutes 13.08% of total achievement in chemistry.
4. Factor III constitutes 10.122 of total achievement in chemistry.
5. Factor IV forms 9.083% of total achievement in chemistry.
6. Factor V forms 5.17% of total achievement in chemistry.

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