Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 10, 4333-4344

Difficulties In Learning Concepts Of Chemistry At Secondary Level In Lahore

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Abstract

The study was carried out to find the difficulties faced by the secondary level students in learning chemistry in public school. A questionnaire was designed to collect data from two high schools situated in Lahore. The participates of the sample group were explained how to reply to the asked questions. From the analysis of the collected data the study concludes that the students feel more difficulty in learning complex concepts of chemistry as compared to those concepts which are in the form of simple statements. Nearly 70% students also feel difficulties in learning factual information, equations, formulas and procedures of preparation of various compounds. Mathematical calculations were considered the most difficult part in learning chemistry.

Keywords: Learning Difficulties, Concepts of Chemistry, Secondary Level

Introduction

Difficulties in learning occur frequently in the students at all grade levels. Difficulties and problems are often the first descriptive words used when a child begins to have trouble in school. At some time in some task, everyone has had the experience of having difficulties. Any kind of school always triggers the question "why". Sometimes difficulty simply points to an area that simply needs additional time and effort, but because learning is cumulative and because of interconnected, difficulties may point to a large pattern that should be identified and addressed. There are a few questions related to learning difficulties; what is the child's understanding or what he is supposed to learn? ; Will these difficulties interfere with the next steps of learning or in other areas of learning?

Learning is a natural process of growth, the direction in which growth takes place is determined chiefly by interest, curiosities and needs felt by the individuals. A human infant is essentially dependent upon other people for the necessities and comforts of life. He learns quietly that people are important to him especially those who are in the same house hold with him. Learning is the process that causes permanent change in knowledge or behavior (Folk, 1998). The act, process or experience of gaining knowledge or skills (American heritage Dictionary, 2002).

Many students are failing simply because the tasks are too difficult and the required level of performances is far beyond their tolerance level, can result in complete breakdown of learning. Learning difficulties are not a diagnostic level or term recognized under the law and does not imply a need for modifications. Subject's disability is the term frequently used for the difficulty in learning in that particular subject. As a core subject in national curriculum of chemistry is essential for effective learning of science, both in its own right and within other subject area; and understanding the environment. Science itself is a study of systematized knowledge produced by careful observations, measurements, and experiments (Page & Thomas 1979).

Chemistry is one of the most important and fundamental branches of science. It has gained a secure position in the curricula of schools, technical colleges and universities as an essential part of education for life (Bury, 1990). Only proper teaching can fulfill the purpose of learning chemistry. Proper learning requires an understanding of various concepts and information in the chemistry curriculum and to overcome all difficulties in learning chemistry. These difficulties can only be overcome if problems identified, therefore it is imperative to find out the difficulties of the students, if we have to improve the teaching of chemistry.

Chemistry being a difficult subject is a major source of scientific knowledge, to conduct research and understanding of the environment. Chemistry is the science of matter and its transformations. In order to acquire the facilitation in learning chemistry, natural science foundation developed two parallel programmes for learning chemistry; Chemical bond approach (CBA 1964) and Chemical education material study (CHEMSTUDY). Although they differ in content and format, both stress on basic principal and concepts of chemistry. The central theme of chemistry programmes were; Energy and its role in chemical reactions; Conservation of mass-energy in terms of conservation of atoms and electrical charge; Kinetics and mechanics of reactions; Dynamic equilibrium; Competitive factors acting in chemical systems in general; Electron structure

and geometrical arrangement of atoms (Hurd,1970).

The central theme of CBA program was the study of chemical bonds, reflecting the view of that, chemistry is the breaking and formation of bonds and distinguishes chemistry from other related sciences. Chemistry is presented as an integrated subject as manifested in the following main areas; Organic chemistry, inorganic chemistry physical chemistry, biochemistry and applied chemistry

The learning of chemistry to an even greater extent depends on symbols. One important problem relates to the acquisition of meanings for symbols used to express chemical facts and processes. Such meanings are acquired either through reading about them or through actual contact with the processes in the laboratories. In the laboratories, actual things are observed and knowledge is gained at first hand. Laboratory plays a crucial role in the learning and understanding of various concepts in the chemistry. Just for example, learning of preparation of HCI is a difficult task, but if its preparation is experimentally performed then firsthand experience makes its learning easier.

Chemistry is one of the easily motivated subjects, since its applications can be readily seen buy the students if the materials are presented in a functional and related manner. Again its exactness makes accurate checking on the part of the teacher and pupil, for the purpose of evaluating progress and revealing difficulties easy. Two factors responsible for most errors in high school students in the learning of chemistry are; Insufficient drill (thus, failure to provide for the over learning of the fundamentals) and a lack of organization of materials into meaningful patterns.

The science materials in the chemistry are organized around verbal units as, many of which are simply isolated word formulas unrelated to their experiences. Sometimes certain formulas or definitions may be fundamentals to the development of the larger or more complex units of learning; but if they are to have meaning, be retained, and transferred to larger related problems, they must be grasped and understood in connection with patterns of ideas and concepts that are already present. If the student learns that chemistry is a study of the changes in the substances of things, and that these changes occur according to certain fundamental laws and principles, he is on the right track for the development of good study habits.

The study is important due to necessary education aspects. The study would help the teachers, curriculum planners and text book writers to identify the difficulties regarding learning chemistry, in the secondary level students and to improve their teaching textbooks and other instructional materials and methods. The study will help curriculum planners to develop the

curriculum of chemistry keeping in view necessary needs, capacities and interest of the students and teachers. The study will open up a new horizon for further research in this aspect.

Objectives of the Study

Following are the objectives of the study:

- To find out the difficulties faced by the students in learning basic concepts of chemistry.
- To classify the difficulties of students with respect to learning level.
- To give suggestions, to overcome the difficulties faced by the students at higher secondary school level in learning chemistry.

Hypothesis of the Study

Students feel difficulties in learning difficult concepts of chemistry. This may be the reason for the students to not learn chemistry properly.

Research Methodology

The main purpose of the study was to find out the difficulties in learning chemistry at secondary level.

Population

Students of 10th class studying science subjects constitute the population of this study. Two high schools of Lahore were selected to get the data.

Sample

The researcher had selected the students from two well-known high schools of Lahore city. So the sample comprised of:

- Fifty students from 10th class of Model Boys H/S Lahore
- Fifty students from 10th class of Govt. Boys High School Lahore

Research Instrument

As it was an effort to find out the learning difficulties of secondary level students in the subject of chemistry. Therefore research tool was a diagnostic test. A questionnaire was designed and two high schools were visited to collect data.

- The test content was drawn from what had taught or what was proposed to be taught.
- The test was developed from the content of the text book of chemistry of 9th class because the students of 10th class had learnt it.

Administration of the Test

The test was administered to sample of 100 students of 10th class of two different schools. Before starting the test, the students were given a brief introduction about the purpose and format of the test.

- They were explained how to mark the correct response of each item.
- Students were guided when they found any difficulty in responding each answer.

- The test was collected when each and every student finished it, as there was no restriction of time. After scoring the test, the test was marked according to the prepared key.

Collection and Analysis of Data

The marks obtained by the students have made the raw data for the study. The scores were transferred into the percentage form. Item analysis of correct and incorrect response was made to know the learning difficulty in the individual concepts.

Results

Table 1 Percentage Distribution of Correct Responses about the Concept of Acids

Topics	No. of Items	% of Correct Responses
History of acid	2	46%
Date of discovery	1	43%
Name of scientist	1	72%
Physical properties	2	79%
Taste of acid	1	87%
Taste of acidic	2	81%
Chemical properties	3	75%
Neutralization reaction	1	74%
Reaction with Metals	2	72%
Substance that contains acids	3	82%

The above table shows that students have difficulty in learning the history of acids.

Table 2 Percentage Distribution of Correct Responses about the Concept of Bases

Topics	No. of Items	% of Correct Responses
Physical properties	2	37%
Colour change of Litmus Paper	1	85%
It Corrodes the Skin	1	78%

The above table reveals that both the physical properties of bases seem difficult for the students. It is also noted that did not differentiate between the acids and bases on the bases of their physical properties.

Table 3 Percentage Distribution of Correct Responses about the Arrhenius Concept of Acids

Topics	No. of Items	% of Correct Responses
Definition	1	76%

Representation by Equation	1	15%

The above table indicates that students feel difficulty in the identification of equation which represent Arrhenius concept of acid.

Table 4 Percentage Distribution of Correct Responses about the Lowery and Bronsted concept of acid and bases

Topics	No. of Items	% of Correct Responses
Definition	1	28%
Formation of compound	1	85%

The above table the learning of definition of Lowery and Bronsted concept of acid and base seems difficult for the students.

Table 5 Percentage Distribution of Correct Responses about the Lewis concept of Acids

Topics	No. of Items	% of Correct Responses
Representation by Equation	1	88%
Type of Bond Formation	1	74%
Name of Compound	1	91%

The above table reveals that the difficult task in learning the concept of Lewis acids and bases is the type of bond formation when acids and bases reacts but overall it seems not the difficulty because the response is greater than 70%.

Table 6 Percentage Distribution of Correct Responses about the Strength of Acids and bases

Topics	No. of Items	% of Correct Responses
Definition	1	36%
Symbol	1	27%
Formula	1	71%
Ka Value	1	33%
Weak Base	1	25%
Definition of Strong Acid	1	82%
Acidity of Base	1	81%

Basicity of An Acid	1	84%

It is concluded from the above table that the most difficult item was the identification of weak base, then finding the Ka values of various acids, definition and symbols to denote the strength of a base.

Table 7 Percentage Distribution of Correct Responses about the Concept of Salt

Topics	No. of Items	% of Correct Responses
Definition	1	74%
Classification	1	73%
Preparation	1	45%
Normal Salt	1	72%
Basic Salt	1	76%

The above table depicts that the learning difficulty in the concept of salt is mainly in the preparation of basic salt.

Table 8 Percentage Distribution of Correct Responses about the Double Salt Potash Alum

Topics	No. of Items	% of Correct Responses
Preparation	1	73%
Formula	1	57%
Uses	1	72%

From the above table we see that learning difficulty is mainly in the identification of the formula Potash Alum.

Table 9 Percentage Distribution of Correct Responses about the Salt; Na_2Co_3 and $MgSO_4$ H_2O

Topics	No. of Items	% of Correct Responses
NA_2CO_3	3	49%
Preparation	2	75%
Old Method	1	84%
Commercial Method	1	91%
Chemical Formula $MgSO_4$	1	81%
Common Name	1	72%

From the above table conclusion is drawn that identification of chemical formula of Na_2CO_3 is difficult to learn for the students.

Table 10 Percentage Distribution of Correct Responses about the salt $CuSO_4$ H_2O

Topics	No. of Items	% of Correct Responses
Preparation	1	44%
Uses	1	33%
Definition of Calico-Printing	1	77%

The above table indicates that the identification of reaction condition for the preparation of $CuSo_4$ and writing its uses are difficult task for the students.

Table 11 Percentage Distribution of Correct Responses about the PH Scale

Topics	No. of Items	% of Correct Responses
Formula	1	81%
PH Scale	1	95%
PH Value of A Substance	1	52%
Optimum PH For Potato Plant	1	34%
Uses of PH Paper	1	46%

The above table reveals that in learning the concept of PH scale. The difficult tasks are to find out the PH of a substance, to identify the PH of soil for potato growth and the uses of PH paper.

Table 12 Percentage Distribution of Correct Responses about the Double Salt Potash Alum

Topics	No. of Items	% of Correct Responses
Definition	1	22%
Definition of Titration	1	92%
Definition of Standard Solution	1	86%
Use of Indicators	1	88%
Formula of Molarity	1	54%

The conclusion drawn from the above table is that the most difficult task in learning the concept of molarity is its definition and its formula.

Findings

Following findings were drawn from the analysis of data. The analysis of the test

indicated the following most problematic areas in learning of chemistry.

Factual Information

Students feel difficulty in factual information such as history in which name of the scientist and date of the discovery were given. 50% of the responses were correct. So, they feel difficulty in learning factual information.

Definition of Concepts and Technical Terms

As far as definition of various concepts and technical terms are concerned, 62% of the responses were correct which means that learning of definition also seem diff;eilit the subject chemistry.

Equations of Chemical Reactions

It is very difficult to learn equation of any sort, whether those equations are used to denote preparations, including some reactions or simply explaining the concept, in all aspects students feel it hard to learn them. The result shown that 50% responses were correct about representation of equation.

Physical and Chemical Properties

It seems easier to learn physical properties of any substance, but from the data it is seen that physical and chemical properties also seem difficult to learn. Students cannot distinguish any substance on the basis of their physical and chemical properties the correct responses in this regard are only 50%.

Calculations of Numerical Values

The calculation of numerical values such as; PH value of an acid etc, were difficult to learn. The overall correct responses in this respect were only 25%. 54

Formulas and Symbols

It is not easy to learn and understand formula and symbol of a compound or any substance. The correct responses were only 66% in this aspect. So, pupils also feel difficulty in learning this task.

Uses of Various Substances

Learning of uses of any substance i.e., uses of acids, bases and salts seems difficult because Students confuse between the uses of two substances. The correct response in this regard is 50%.

Conclusion

In the light of above findings, the following conclusion was drawn. The students were weak in learning the factual information such as the scientist who for the first time discovers acid and the data of discovery of acid. Students were weak in learning the procedure for preparations of various salts. Learning of equations such as equation to represent Arrhenius concept of acids, learning of formulas such as formula of potash Alum and symbols as to denote strength of a base seem difficult tasks or the students. The overall result shows that students have a lot of difficulty in learning chemistry.

Recommendations

The following recommendations are;

- The study would open a new avenue for further research with sample on other concepts of chemistry at secondary level.
- Such type of research study should be undertaken in other concepts at higher levels in the subject of chemistry.
- Such type of research should be undertaken in other sciences, in arts subjects also.
- Overall conditions (results of the students) were not satisfactory because many other factors such as time, teacher's efficiency, text book, physical health, standards of school etc involving were not considered in this study. So, such type of study should also be undertaken in order to investigate the causes of learning difficulties in chemistry and other subjects.
- Curriculum planners and policy makers should pay attention to make the content of chemistry curriculum in such a manner that it should facilitate the learner rather to make it a difficult task.
- Facts and concepts of chemistry should be taught by relating them with daily life examples.
- Full participation or attention of the students must be required for fruitful learning.
- Mental and physical health should be under consideration in order to find out any difficulty in learning.
- Internal assessment is an important aspect to find out the difficulty, so the difficulty may be eradicated at the initial stage.
- Overall conditions (results of the students) were not satisfactory because many other factors such as time, teacher's efficiency, text books physical health, standard of school etc involving were not considered in this study. So, further research open new paves when considering these factors.
- More time should be given for teaching and learning of chemistry.
- Teachers refresher courses may also be taken into consideration in order to give effective teaching in turn reduce learning difficulties.

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