

Evaluation of Chemistry Curriculum at Secondary Level and Objectives of National Curriculum of Chemistry 2006

Batool Fatima* Umbreen Ishfaq† Tehseen Tahir‡



Abstract

The study evaluates chemistry curriculum at the secondary level. Chemistry is the science subject which help in technological advancement. It deals with the study of composition, structure, properties, and different changes which take place in matter. There are different careers in chemistry such as in food processing, industries, health etc. The progress of any country depends on the achievement in the field of chemistry. The successes of these reforms are associated with chemistry curriculum. Therefore, this study re-examines the objectives of National Chemistry Curriculum 2006 and identifies the nature of implementation of chemistry curriculum. Questionnaire based data from 138 chemistry teachers (male and female) teaching at secondary level in District Haripur determined that modern teaching techniques are required in teaching chemistry. So, it is recommended to improve curriculum at regular intervals according to global standards.

Key Words:

Curriculum
Objectives,
Evaluate,
Global needs

Introduction

This is the era of science and technology. Advancement in science has changed the entire life of a man. For an independent nation, the scientific autonomy as the pre requisite in the modern world should be recognized. This is the cause that developing countries should build up their own scientific and technical potentials to solve their problems in their own way. There are various careers in Chemistry in different sectors, e.g. in health, food, processing, industries and many others. However, it is complex due to complicated nature of chemistry. Chemistry is one of the most conceptually tough subjects in the secondary school curriculum. The success of scientific literacy is dependent upon the acquirement in connecting the ideas from a range of experiences, problems and event both in the classroom and outside the classroom (Bruner, 2009).

According to Makau (2000), the teaching and learning strategies are planned and unplanned activities with the help of which students interact and understand

*M.Phil Scholar (Education), Department of Education, University of Haripur, KP, Pakistan.

†Assistant Professor, Department of Education, University of Haripur, KP, Pakistan.

Email: umbreenishfaq@hotmail.com

‡Assistant Professor, Department of Education, University of Haripur, KP, Pakistan.

the content, skills and concepts of Chemistry. These activities contain talking and discussion, writing and reporting, reading and researching games, dramas, computer-aided learning and practical experiences are also used by teachers, not only in the teaching of Chemistry but in other subjects as well.

Osborne (2003) states that nation's standard of success and competitiveness is based upon a highly learned, well trained and adaptable workforce. Chemistry is a passport into one of the country's most important and successful industries. It may direct a range of other careers ranging from medicines to forensic science leading to a financial success (IPCMF, 2003).

Chemistry is the branch of science which is related with identifying problems, searching for their explanations and seeking their solution for the benefit as well as the progress of the nation. It is the spirit of science that helped the mankind to get improvement in various fields. It is imperative to direct our youth towards science education. The courses should be designed in such a way that every student may have the chance suitable according to their potentials and needs of an individual as well as of the country (Govt. of Pakistan, 2012).

It may be accomplished that the progress of our country depends upon the advancement of technology and industry. It is ultimately dependent upon the advancement in the scientific knowledge that can be developed in the students by giving them up-to-date curriculum, better educational facilities and well-trained teachers.

Research Objectives

Objectives of the study were as follow:

- i. To critically analyze the objectives of Chemistry curriculum.
- ii. To explore the consistency of implementation of Chemistry Curriculum with objectives of National Curriculum of Chemistry 2006 for the secondary level

Research Questions

Research questions of the study were as follow:

- i. What are the stated objectives of Chemistry Curriculum?
- ii. What are gaps in implementation of the National Curriculum of Chemistry 2006 at Secondary level?

Review of Literature

The prime purpose of the research was to evaluate the Chemistry Curriculum at secondary level in Pakistan. It was the reason the researcher made an extensive

study of related literature on the problem under study. This looks on different researches that had been carried out earlier on the problem nationally and internationally. The researcher also studied the National Chemistry Curriculum 2006 at secondary level in Pakistani educational system. The literature was reviewed not only to set up the framework for the study but also for historical perspectives on the reform of curriculum.

Concept of Curriculum

The term curriculum had been defined in different periods differently. Some of these definitions which are related to how administrators and teachers outlook curriculum are given below:

- i. Curriculum is considered as the official written document from higher authority which must be followed by the teachers (Bloom 2006).
- ii. Curriculum for the students can be thought as the set of values or goals that can be activated by the development process within the classroom. Goal is the direct function to see the effectiveness of the development efforts of the given curriculum (Govt. of Pakistan, 2006).
- iii. Smith (2007) defined the curriculum as an order of potential experiences i.e., setup within the institution to discipline the young students in various ways of acting and thinking.

Evaluation

Evaluation can be regarded as the gathering of facts on the bases of which potency of any programme can be judged. According to Gordon (2001), evaluation is related primarily to the significance of a learning process as well as effectiveness with which it is being worked out. Evaluation is vital part of the planning of the curriculum. It involves the procedure of judgment of the educational results and correlating them with the results to be expecting.

Usually curriculum evaluation involves discussions, experiments, interviews, observations and questionnaires etc. Stufflebeam (2003) described four types of discussions which are used in the evaluation of curriculum.

Curriculum Evaluation

A variety of educational evaluation illustrations and explanations were developed by evaluation theorists who give forth the diversity of ideas and access to the evaluation in education. The meaning of variety of definitions of concepts of evaluation covers the scrutinizing evaluation as an evaluation of merits of educational objectives (Trochim, 2006). According to Madaus and Stufflebeam (2000), assessment of achievement is also called as the Tylerian prospect of

evaluation. Cronbach (2003) described that the procedure of evaluation should be concentrated on collecting and stating information which could help in making decisions in educational program.

Concept of Chemistry

Chemistry is the branch of science on which technological breakthrough is made and the spin on which the wheel of science rotates. According to Hombay (2005), chemistry is the scientific learning of the structure of matter. It deals with various parts of substance and how they react when chemically combined

Chiu (2005) described chemistry as a world full of attractive phenomena, striking experimental activities and beneficial knowledge to understand the world that is both manufactured and natural. Breuer (2002) stated that chemistry is hard as it needs more attention to be given to various activities and skills (literacy, numeracy and experimental skills) than many others.

Research Methodology

Research means to come across the truth. It relates new knowledge with the old one. According to Mcmillan and Sehumacher (2001), research sketch is the design that explains the settings and measures to gather and analyze the data.

Questionnaire was used to assemble data in order to evaluate chemistry curriculum. It was developed for secondary school chemistry teachers. Questionnaire was based on five point Likert scale.

Data Collection

The study was intended to evaluate chemistry curriculum at secondary level against the objectives given in the National Curriculum 2006. The analysis was carried out by the researcher after collecting the data through questionnaires. Each statement for objectives had five responses:

1. Strongly agree
2. Agree
3. Undecided
4. Disagree
5. Strongly disagree

Data collected was analyzed by means of mean, frequency and standard deviation. On the basis of the analysis and interpretation of data, conclusions were drawn and recommendations were made.

Analysis of Objectives, of Chemistry Curriculum

The first objective of the study was to analyze the Chemistry curriculum with reference to the content. The following tables elaborate the results of this objective.

Table 1. Understanding the Physical World

Table 1.1 Students can State Concepts

Gender	N	Mean	SD	SE Mean
Male	87	3.90	.542	.058
Female	51	3.56	.50	.070

Table 1.1 indicates that in the above case, the mean lies between 3.37-4.45 for male and 3.06–4.06 for female, which shows that agreement for both lies between undecided to agree. It means that both agree with the statement “students can state the concepts after studying the text books”.

Table 1.2 Students can Exemplify the Concepts

Gender	N	Mean	SD	SE Mean
Male	87	4.16	.427	.045
Female	51	4.31	.468	.065

Table 1.2 indicates that the mean for male lies between 3.733-4.589 and for female 3.06 – 4.06, which shows that agreement for both lies between undecided to agree. It means that both agree with the statement “students can exemplify the concepts after studying the text books”.

Table 1.3 Students can Interpret the Concept

Gender	N	Mean	SD	SE Mean
Male	87	4.27	.423	.045
Female	51	4.37	.488	.068

Table 1.3 indicates that in the above case the mean for male lies between 3.807-4.653 and for female 3.88-4.861, which shows that agreement for

both lies between undecided to agree. It means that both agreed with the statement “Students can interpret the concepts after studying the text books”.

Table 1.4 Students can use the Appropriately Fundamental Terms Related to the Concepts

Gender	N	Mean	SD	SE Mean
Male	87	3.68	.556	.059
Female	51	3.43	.500	.070

Table 1.4 indicates that in the above case the mean score lies from 3.133-4.246 for male while from 2.931-3.931 for female. It shows that agreement for both lies between undecided to agree. It means that both agreed with the statement “students can use the appropriately fundamental terms related to the concepts after studying the text books”.

Table 1.5 Students can use Appropriate Classification Related to the Concepts

Gender	N	Mean	SD	SE Mean
Male	87	3.5	.58	.062
Female	51	3.70	.460	.064

Table 1.5 indicates that in the above case the mean for male is from 3.004 to 4.168 and for female 3.246-4.166 which shows that agreement for both lies between undecided to agree. It means that both agreed with the statement “The students can use appropriate classification related to the concepts after studying the text books”.

Table 1.6 Students can cite or Interpret the Concepts

Gender	N	Mean	SD	SE Mean
Male	87	3.71	.45	.048
Female	51	3.68	.46	.065

Table 1.6 indicates that in the above case, the mean for male lies between 3.257-4.168 and for female 3.218-4.155, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can cite or interpret the concepts after studying the text books”.

Table 1.7 Students can Provide Scientific Evidence in Support of Concepts

Gender	N	Mean	SD	SE Mean
Male	87	3.42	.675	.072
Female	51	3.54	.502	.070

Table 1.7 indicates that the mean for male falls from 2.75 to 4.1 while it is from 3.05 to 4.05 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can provide scientific evidence in support of concepts after studying the text books.

Table 2: Using appropriate cognitive, affective and psychomotor abilities

Table 2.1 Students can Formulate Questions that can be Investigated by Gathering First or Second Hand Data

Gender	N	Mean	SD	SE Mean
Male	87	3.43	.547	.058
Female	51	3.47	.504	.070

Table 2.1 indicates that in the above case the mean for male is from 2.952 to 4.04 and for female, it is from 2.97 to 3.98, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can formulate question that can be investigated by gathering first or second hand data after studying the text books”.

Table 2.2 Students can Find Relevant Published Background Information

Gender	N	Mean	SD	SE Mean
Male	87	3.43	.585	.062
Female	51	3.25	.440	.061

Table 2.2 indicates that in the above case, the mean for male falls from 2.86 to 4.03 and for female, from 2.82 to 3.70. It shows that agreement lies between

undecided to agree. It means that both agreed with the statement that “The students can find relevant published background information after studying the text books”.

Table 2.3 Students can Formulate Hypothesis and Make Predictions from Them

Gender	N	Mean	SD	SE Mean
Male	87	3.48	.546	.058
Female	51	3.13	.347	.048

Table 2.3 indicates mean score (2.94-4.03) for male and (2.79-3.49) for female, showing agreement lies between undecided to agree. It means that both agreed with the statement that “The students can formulate hypotheses and make predictions from them after studying text books”.

Table 2.4 Students can Plan an Investigation and Carry Out the Planned Procedure

Gender	N	Mean	SD	SE Mean
Male	87	3.60	.490	.052
Female	51	3.56	.50	.070

Table 2.4 indicates that in the above case the mean score 3.12-4.10 for male and for female, 3.07-4.07, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can plan investigation and carry out the planned procedure” after studying the text books.

Table 2.5 Students can use Appropriate and Relevant Motor Skills in Carrying Out Investigations

Gender	N	Mean	SD	SE Mean
Male	87	3.40	.65	.07
Female	51	3.33	.47	.06

Table 2.5 indicates that in the above case, the mean score for male lies between 2.75 and 4.06 while for female, 2.86-3.81, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can use appropriate and relevant motor skills in carrying out investigations after studying the text books.”

Table 2.6 Students can Observe Phenomena

Gender	N	Mean	SD	SE Mean
Male	87	3.88	.32	.03
Female	51	3.43	.50	.07

Table 2.6 indicates the mean score for male lies in between 3.56 and 4.21 while 2.93-3.93 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can observe phenomena after studying the text books.

Table 2.7 Students can describe these as Data

Gender	N	Mean	SD	SE Mean
Male	87	3.65	.47	.05
Female	51	3.56	.50	.07

Table 2.7 indicates that in the above case, the mean for male lies from 3.18-4.13 and for female from 3.07-4.07, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can describe these as data” after studying the text books.

Table 2.8 Students can Measure and Record These as Data

Gender	N	Mean	SD	SE Mean
Male	87	3.74	.44	.047
Female	51	3.37	.48	.068

Table 2.8 indicates that in the above case, the mean score for male lies between 3.29 and 4.18 while it is from 2.88 to 3.86 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can measure and record these data” after studying the text books.

2.9 Students can Classify Data

Gender	N	Mean	SD	SE Mean
Male	87	3.70	.46	.04
Female	51	3.68	.46	.06

Table 2.9 indicates that in the above case, the mean for male lies between 3.24-4.16 and for female, 3.22-4.16, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can classify data” after studying the text books.

Table 2.10 Students can Collect Data

Gender	N	Mean	SD	SE Mean
Male	87	3.63	.48	.05
Female	51	3.90	.30	.04

Table 2.10 indicates the mean score for male lies between 3.15 and 4.12 and for female, 3.602-4.20, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can collect data.” after studying text books.

Table 2.11 Students can Display Data

Gender	N	Mean	SD	SE Mean
Male	87	3.39	.49	.05
Female	51	3.29	.46	.06

In the above case, the table 2.11 indicates that the mean score for male lies between 2.92 and 3.88. The mean score lies in between 2.83 and 3.75, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can display data.” after studying text books.

Table 2.12 Students can Construct Visual Representations of Phenomena and Relationship Among Diagrams, Graphs, Flowcharts and Physical Models

Gender	N	Mean	SD	SE Mean
Male	87	3.54	.50	.05
Female	51	3.11	.32	.04

The table 2.12 indicates mean score from 3.04 to 4.04 for male and from 2.79 to 3.44 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can construct visual representations of phenomena and relationship among diagrams, graphs, flowcharts and physical models after studying text books.

Table 2.13 Students can Analyze Data

Gender	N	Mean	SD	SE Mean
Male	87	3.56	.49	.05
Female	51	3.13	.34	.04

Table 2.13, in the above case, indicates that the mean for male lies between 3.06 and 4.06 whereas for female in between 2.79 and 3.48, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can analyze data.” after studying the text books.

Table 2.14 Students can Draw Conclusions

Gender	N	Mean	SD	SE Mean
Male	87	3.50	.50	.05
Female	51	3.49	.504	.07

Table 2.14 reflects that in the above case, the mean for male lies between 3.00 and 4.01 while for female, from 2.99 to 4.00, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can draw conclusions after studying text books.

Table 2.15 Students can Evaluate Investigative Procedures

Gender	N	Mean	SD	SE Mean
Male	87	3.65	.47	.05
Female	51	3.64	.48	.06

Table 2.15 indicates that in the above case, the mean for male lies between 3.18 and 4.13. For female, the mean score is from 3.16 to 4.13. It shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can evaluate investigative procedures.” after studying text books.

Table 2.16 Students can Draw Conclusions from such Investigations

Gender	N	Mean	SD	SE Mean
Male	87	3.59	.49	.05
Female	51	3.33	.47	.06

Table 2.16 indicates that in the above case, the mean for male, lies in between 3.00 and 4.01. For female, the mean score is in between 2.86 and 3.81, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can draw conclusions from such investigations.” after studying text books”.

Table 3. Understanding the Nature and Limitations of Scientific Activity.

Table 3.1 Students can Describe

Gender	N	Mean	SD	SE Mean
Male	87	3.65	.48	.05
Female	51	3.50	.50	.07

Table 3.1 indicates that in the above case, the mean for male lies in between 3.15 and 4.12 while for female, from 3.01 to 4.02, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can describe.” after studying text books.

Table 3.2 Students can Exemplify

Gender	N	Mean	SD	SE Mean
Male	87	3.50	.50	.05
Female	51	3.34	.47	.06

The table 3.2 indicates that in the above case, the mean for male lies in between 3.00 and 4.01 and for female, it is from 2.86 to 3.81, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can exemplify.” after studying text books.

Table 3.3 Students can Appropriately Use the Fundamental Terms and Classifications Related to them

Gender	N	Mean	SD	SE Mean
Male	87	3.50	.50	.05
Female	51	3.33	.47	.06

Table 3.3 indicates the mean score for male (3.00-4.01) and for female (2.86-3.81), showing that agreement lies between undecided to agree. It means that both agreed with the statement that “Students can appropriately use the

fundamental terms and classifications related to them.” after studying the text books.

Table 3.4 Students can Recognize that the Problem Solving Nature of Science has Limitations

Gender	N	Mean	SD	SE Mean
Male	87	3.72	.60	.06
Female	51	3.45	.50	.07

Table 3.4 indicates that in the above case, the mean for male lies in between 3.12 and 4.33 while for female, it is from 2.95 to 3.95, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can recognize that the problem solving nature of science has limitation.” after studying the text books.

Table 3.5 Students can acknowledge that people engaged in science, particularly human enterprise, have the characteristics of people in general

Gender	N	Mean	SD	SE Mean
Male	87	3.80	.54	.05
Female	51	3.13	.347	.04

Table 3.5 indicates that in the above case, the mean for male lies between 3.26 and 4.35 whereas from 2.79 to 3.49 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can accept that people involved in science, especially human enterprise, have the characteristics of people generally.” after studying the text books.

Table 4. Appreciating Influences of Science and Technology

Table 4.1 Students can Recognize that the Technology Resulting from Scientific Activity Influences the Quality of Life and Economic Development Through or by Improvements in Medical, Health Care, Nutrition, and Agricultural Techniques

Gender	N	Mean	SD	SE Mean
Male	87	3.68	.68	.07
Female	51	3.60	.49	.06

Table 4.1 indicates that in the above case, the mean for male lies in between 3.00 and 4.38. It is from 3.11 to 4.10 female, showing that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can identify that the technology which results from the scientific activity affects the quality of life and economic development through or by improvements in medical, health care, nutrition and agriculture techniques.” after studying text books.

Table 4.2 Students can explain that these influences may be the result of unforeseen consequences rapid exploitation and rapid cultural Changes

Gender	N	Mean	SD	SE Mean
Male	87	3.72	.54	.05
Female	51	3.50	.50	.07

Table 4.2 indicates that in the above case, the mean for male lies in between 3.18 and 4.27 while for female, it is from 3.01 to 4.02, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can explain that these influences may be the result of unforeseen consequences of rapid exploitation and rapid cultural changes.” after studying text books.

Table 4.3 Students can Realize that Advancement in Technology Requires Judicious Applications.

Gender	N	Mean	SD	SE Mean
Male	87	3.80	.39	.04
Female	51	3.42	.50	.07

Table 4.3 indicates that in the above case, the mean for male lies in between 3.41 and 4.20 while for female from 2.93 to 3.93, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can realize the advancement in technology requires judicious applications.” after studying the text books.

Table 5: Respecting Evidence, Rationality and Intellectual Honesty

Table 5.1 Students can Display Respect for Evidence, Rationality, and Intellectual Honesty

Gender	N	Mean	SD	SE Mean
Male	87	3.55	.542	.05
Female	51	3.56	.15	.07

Table 5.1 indicates that in the above case, the mean for male lies in between 3.03 and 4.12 while for female, from 3.07 to 4.07, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can display respect for: evidence, rationality and intellectual honesty.” after studying text books.

Table 5.2 Given the Number of Emotive Issues in the Area of Chemistry

Gender	N	Mean	SD	SE Mean
Male	87	3.80	.42	.04
Female	51	3.56	.50	.07

Table 5.3 indicates that in the above case, the mean for male lies in between 3.35 and 4.26 whereas for female, the score is from 3.07 to 4.07, which shows that agreement, lies between undecided to agree. It means that both agreed with the statement that “The students can give the number of emotive issue in the area of chemistry.” after studying text books.

Table 6: Showing Capacities to Communicate

Table 6.1 Students can Comprehend the Intention of a Scientific Communication, the Relationship among its Parts and its Relationship to what they already know

Gender	N	Mean	SD	SE Mean
Male	87	3.80	.62	.06
Female	51	3.35	.48	.06

Table 6.1 indicates that in the above case the mean for male lies in between 3.18 and 4.40 while for female from 2.87 to 3.84, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can understand the purpose of a scientific communication, the

relationship between its parts and its relationship to what they already know.” after studying text books.

Table 6.2 Students can Translate Information from Communications in Particular Modes Spoken, Written, Tables, Graphs, Flowcharts, Diagrams to other modes

Gender	N	Mean	SD	SE Mean
Male	87	3.63	.47	.05
Female	51	3.66	.47	.06

Table 6.2 indicates that in the above case, the mean score for male lies in between 3.19 and 4.14 while for female, the score is from 3.19 to 4.14, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can translate information from communications in particular modes such as spoken, written, tables, graphs, flowcharts and diagrams to other modes.” after studying text books.

Table 6.3 Students can Structure Information Using Appropriate Modes to Communicate it

Gender	N	Mean	SD	SE Mean
Male	87	3.75	.43	.04
Female	51	3.52	.50	.07

Table 6.3 indicates that in the above case, the mean for male lies in between 3.33 and 4.19 while for female from 3.03 to 4.03, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can structure information using appropriate modes to communicate it after studying text books.

Table 6.4 Students can Structure Information Using Appropriate Modes to Communicate it

Gender	N	Mean	SD	SE Mean
Male	87	3.79	.48	.05
Female	51	3.31	.46	.06

Table 6.4 indicates that in the above case, the mean for male lies in between 3.31 and 4.28 while for female, mean is from 2.85to 3.78, which shows that agreement lies between undecided to agree. It means that both agreed with the

statement that “The students can structure information using appropriate modes to communicate it after studying text books.

Table 7: Working with Other Students Actively Participates in Group work.

Table 7.1 Students can Share the Responsibility for Achieving the Group task

Gender	N	Mean	SD	SE Mean
Male	87	3.71	.50	.05
Female	51	3.50	.50	.07

The table 7.1 indicates the mean score for male lies between 3.19 and 4.21 while from 3.20 to 4.01 for female, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can share the responsibility for achieving the group task.” after studying text books.

Table 7.2 Students can show concern for the fullest possible involvement of each group member

Gender	N	Mean	SD	SE Mean
Male	87	3.78	.51	.05
Female	51	3.37	.46	.065

Table 7.2 indicates that in the above case, the mean for male lies in between 3.27 and 4.30 while for female, the score is from 2.85 to 3.78, which shows that agreement lies between undecided to agree. It means that both agreed with the statement that “The students can show interest for the complete involvement of each group member.” after studying text book.

Conclusions

On the basis of findings, following salient points are established:

1. Mostly teachers agreed that after studying the chemistry text books students can state, exemplify and interpret the concept. Moreover students can use appropriately fundamental terms related to concepts.
2. Most of the teachers agreed that after studying the chemistry text books students can formulate questions and hypothesis and make predictions from them by using cognitive, effective and psycho motor abilities. They also said that after observing the phenomena students describe it as data,

- display, classify and analyze the data then can draw the conclusions from such investigations.
3. Mostly teachers agreed that after studying the chemistry text books students can recognize that the problem solving nature of science has limitation.
 4. Most of the teachers agreed that after studying the chemistry text books students can recognize that technology resulting from scientific activity influences the quality of life and economic development.
 5. Mostly teachers agreed that after studying the chemistry text books students can display respect for evidence, rationality and intellectual honesty.
 6. Mostly teachers agreed that after studying the chemistry text books students can comprehend the intention of the scientific communication, the relationship among its parts and they can pick and use the related parts of communication.
 7. Most of the teachers agreed that after studying the chemistry text books students can share the responsibility to achieve the group task while working with other students in group work.
 8. Mostly teachers used scientific inquiry method, inquiry based teaching methods, students centered, direct teaching, discussion, lecture, demonstration and activity based method to teach the chemistry content.
 9. Very few teachers used audio video aids during teaching.
 10. Mostly teachers agreed that for formative assessment homework, quiz, written test, group discussion, oral presentation and lab report writing are supportive tasks.
 11. Most of teachers agreed that examination of chemistry subject is based upon the matter which test the knowledge application, scientific skills and memorization of the students, they also described that the examination of chemistry assesses the content of course, application and understanding of concept, skill and memorization.

Recommendations

1. Equipment, science facilities and labs should be provided in all secondary schools according to the syllabus as in majority of schools, there is shortage of well-equipped laboratories.
2. Scientific inquiry based teaching should be promoted for teaching chemistry in all secondary schools and teachers should be trained by arranging regular workshops as majority of respondents do not use these techniques.

3. Sufficient audio visual aids should be provided to teachers in order to boost teaching learning process because majority of schools lack the facility.
4. Researches and projects should be assigned to pupils according to their mental approach to advance scientific literacy in students as no such practice is carried out in schools according to the respondents.
5. Chemistry content in the textbooks should be revised on a regular basis and should be made according to global standards.

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