

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**IN THE NAME OF
"ALLAH"**

**The Most Merciful
The Most Gracious**

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**A STUDY OF THE NATURE OF CHANGES IN THE
SECONDARY LEVEL BIOLOGY CURRICULUM
SINCE 1960**



**By
Miss Shafqat Perveen**

**Institute of Education and Research
University of Peshawar**

*A Thesis submitted to University of Peshawar in partial fulfillment for the award
of Degree of Doctor of Philosophy in Education*

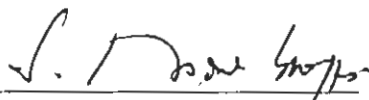
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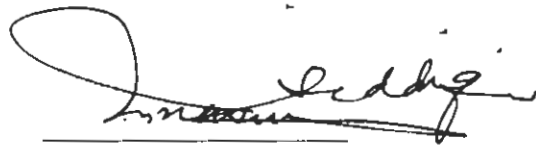
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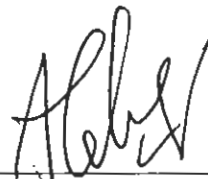
**be accepted as fulfilling this part of the requirement for the Degree of
DOCTOR of PHILOSOPHY in education.**



RESEARCH SUPERVISOR
(Dr. S. Abdul Ghaffar)



CO-SUPERVISOR
(Prof. Dr. Mohammad Nasim Siddiqi)



DIRECTOR I.E.R.
(Prof. Abdul Khaliq)

We hereby Approve the Thesis of Miss Shafqat Perveen Entitled

“A Study of the Nature of Changes in the Secondary Level Biology Curriculum Since 1960”

For the award of
Doctor of Philosophy Degree in Education

1. _____

(Internal Examiner)

2. _____

(External Examiner)

3. _____

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Dedication
to

My mother who deprived of my care and sustained untold hardships and whose love and patience was unfailing source of inspiration for me during this study.

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A STUDY OF THE NATURE OF CHANGES IN THE SECONDARY LEVEL BIOLOGY CURRICULUM SINCE 1960

ABSTRACT

Curriculum development is a dynamic and continuous process. It is subject to change in view of the changing socio-economic and political scenario. It is changed when it is not consistent with the national aspirations and goals of education. It is changed when it loses balance, integration and relationship within and among various disciplines. Biology as an important scientific discipline, has been gaining currency during the last three decades, and plays significant role in the field of science. It helps in understanding ourselves, our environment and the world around us. Such were the guiding spirit that inspired the researcher to study in depth the nature and process of changes and developments of biology curriculum offered at secondary level in Pakistan Since 1960.

The main objectives governing the study are to study the nature of changes brought about in biology curriculum, to identify factors and forces warranting such changes, to identify the problems and issues inhibiting proper implementation of the curriculum in the class room and also to formulate guide-lines for not only correcting the situation but to make it more responsive to the challenges of the 21st

century. The study is hoped to influence the policy of the government and will provide feedback on the operational status of the curriculum.

The study is descriptive in nature and is based on documentary analysis and field assessment of the execution of the subject in the class room. Documentary analysis is based on critical review of all related documents formulated from time to time by the government on biology. The field analysis is based on comments observations of the heads of institutions teachers, biologists and educationists on the nature, scope and relevance of biology curriculum, the infra-structure and the instructional facilities provided for effective teaching of the subject.

On the basis of analysis and other situational factors, it is concluded that biology curriculum has been widely diversified in nature and scope and has been sufficiently expanded vertically and horizontally. But wide margins have been left for changing its descriptive nature, ensuring its integration within itself and among other scientific disciplines and projecting more its social aspect and practical approach to the solution of social problems, besetting the society. The subject further needs to be future oriented not only perceiving the future problems of the society but incorporating the explosive nature of knowledge and information, shifting its classical and traditional mode of instruction to the emerging innovative use of sophisticated instructional technology in teaching of biology curriculum in future.

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INTRODUCTION

1. Background of the Problem:-

The scientific and technological development had never before demonstrated so strikingly the extent of their process and potential in our life as seen today. The scientific knowledge is making a prodigious leap forward, Research and innovations are being institutionalized. The change is accelerating with no bounds because of the vast capital of human knowledge and the number of those engaged in scientific activities. At times when an application of a scientific invention took years, now it takes shorter time for its practical application. The unprecedented speed with which man is moving in the universe, the comfortable life he enjoys, cannot be described.

The dilemma the individual faces today is the dramatically changed scenario, the equilibrium, which is being lost, in a community life and traditional norms and

values which are being subjected to shocks, are other manifestations of the scientific and technological explosions. (Faure, Edgar. 1972. P. 89)

There is every reason to believe into the power and progress in human knowledge as indicated earlier, such dizzying speed over the recent past is likely to get greater momentum in the education system as well in the developing countries like Pakistan which is no exception to produce scientific researchers in every field related to man's knowledge, skill and control over his environment. In short, scientific discoveries are innumerable and would have tremendous impact. There is virtually no aspect of physical, social and cultural universe whose basic conditions are not modified or revolutionized. The scientific and technological evolution has affected all countries with out exceptions. (Ibid P. 90).

It is a common place to say that science and technology may be used both beneficially and harmfully. It might turnout to be a central moral problem of our time. The science and technology complex not only justifies hope for solution of humanity problems, but it also provides cause for world wide anxiety. "Save the planet" "save tomorrow" are the slogans of the day. In such situations, development implies adapting a scientific frame of mind integrating science into traditional culture, and universal thought.(Ibid. P.91)

The implication for education of such "scientific humanism" would demand a reasonable educational doctrine which must be based on postulate that present and future solutions will have the capacity to prove that science and technology are not ends in themselves but their focus is mankind. (Ibid. P. 91) science and

technology must become essential components in any educational enterprise. They must be incorporated in to all educational activities intended for all with "Scientific frame of mind". So that it could be promoted with out being slaved to it; (Ibid P.90)

Science education in the spirit of such "humanistic approach will not be limited to show the material side of the nature but would also reflect the spiritual aspect of human life. It would become an integral part of human culture, have a concern for the development of human qualities such as creativity, willingness to adopt, to think, to speculate and have courage to face situational realities in life.

Science education at secondary level provides a sound base for scientific research and technological development of the county. A workable strategy is, therefore, needed to promote science education, to ensure continuity of the policy of the government and more particularly to improve the quality of science teaching through research and innovations. (Asian Bank Project 1985 P.1)

Successive national development plans and national education polices of the country have emphasized the need for development and improvement of science education was thought crucial for the development of scientific and technical manpower. So essential for socio economic development of the county. (Ed Policy 1972, P.35).

No doubt some progress has been made in the development of science education, but substantial deficiencies persist mainly due to low investment in education

sector and low quality of science education at secondary level. Science education is beset with many problems and issues, such as science curriculum has not been formulated on integrated concept, lacks physical facilities, equipment and other instructional material. Moreover, poor quality of teaching leads to higher failures. Untrained teachers, inefficient evaluation procedure and absence of research are such problems which affect its effectiveness at school level. (Ibid P. 14).

In science education, biology enjoys important status, because of its own significance and as a part of major field of science itself. It also plays the role of an integrated agent, brings together the method and result of number of other related disciplines.

The teaching of biology aims at understanding of the world of nature, the meaning and purpose of life and the solutions of the problems of human society. Biology is now an important component of the integrated science curriculum at secondary level.

Great changes had take place in teaching of biology. The biological knowledge is now applied directly to the society. The subject is presented as an integrated course as already indicated, the division of contents in to botany and zoology is less considered.

Due attention is paid to the practical aspect of the subject. Variety of activities and observations are being suggested keeping in view these developments an attempt has been made in this study to analyze analytically the process of changes and

development of biology curriculum at secondary level and to see how the directions of the curriculum are being implemented in the class room.

2. Statement of the Problem:-

The problem of this study is to investigate the nature, scope and process of changes and development of biology curriculum offered at secondary level in Pakistan since 1960.

3. Objectives of this Study:-

The study has been guided by the following objectives.

- ☐ To study the process of changes and development brought about in science education with special reference to biology curriculum at secondary level in Pakistan since 1960.
- ☐ To identify factors and forces that have been influencing the process of changes and development of biology curriculum at secondary level.
- ☐ To identify the specific problems and issues inhibiting the progress and effective implementation of biology curriculum in the class room at secondary level.

- ☐ To forward recommendations not only for correcting the situation but to provide directions for making the subject more responsible to the changes of the next century.

4. Key Questions Raised in the Study:-

For better understanding of the phenomena and more sharply thrashing out the problem; the researcher addressed the following key questions, the answers of which were to be found in the analysis. This is a 20-Points agenda and is hoped to provide a rationale for a thorough analysis of the problem.

- ☐ Is the curriculum of biology research or opinion based?
- ☐ Are the objectives of curriculum well defined and clearly stated in behavioural terms?
- ☐ Whether logical development or sequence in the content/topics and sub-divisions etc. is maintained.
- ☐ Does the cognitive aspect of the curriculum of biology match with the cognitive level of children?
- ☐ Whether the content of biology consistent with the objectives of the curriculum?

- ☐ Why suggest changes and improvements and workable strategies for its effective implementation in future.
- ☐ Does the curriculum provide sufficient opportunities for the practical aspect of the discipline?
- ☐ Does the curriculum present an integrated picture of the course?
- ☐ Does the curriculum caters to individual differences of the children?
- ☐ Does the curriculum meet the requirement of higher education?
- ☐ Whether the curriculum is functional under existing situation.
- ☐ Whether the curriculum takes into account the social and environmental problems?
- ☐ Whether the curriculum is consonant with Islamic values?
- ☐ Does the curriculum reflect recent trends in biology?
- ☐ Whether sufficient guide lines have been provided for evaluation?
- ☐ Whether sufficient guide lines have been provided for practical work?

- ☐ Whether sufficient guide lines have been provided for writing the next text book guide books and other instructional material?
- ☐ Is there consistency in the objectives formulated for the curriculum at various stages of its development?
- ☐ Is the curriculum entirely subject oriented, activity oriented or broad based?
- ☐ Does the formulation of the curriculum involves teachers at the grass root level?

5. Need and Significance of the Study:-

The study of biology curriculum at secondary level is important in nature and significant in character. It is hoped to contribute in the following manner.

- ☐ The study is hoped to familiarize the planners, and policy makers, about the short comings in biology curriculum so that these could be taken in view in the future strategy of revisions, change and improvement.
- ☐ The study is hoped to make aware the teachers and heads of the institutions of the problems and issues obstructing its effective implementation in schools.

- ❑ The study is expected to influence the policy of the government, which is committed to give priority to science education at schools level and particularly to biology subject, which had been neglected in the past.
- ❑ The study is expected to support the notion that curriculum development particularly in the area of science is rigorous and continuous process and that maintaining a status quo, would be an irreparable loss to the nation.
- ❑ The study is expected to provide an authentic resources documents for study to teachers and students and research students.
- ❑ The study is hoped to make aware those concerned with planning and implementation of the curriculum about the emerging trends and developments, so that they could be better adjusted in the future strategies of change and improvement.
- ❑ The study is expected to have international value of having first hand information, on the development of science education in general and biology curriculum in particular to a researcher, who is interested to study such subject at secondary level in Pakistan.
- ❑ The study is hoped to open further avenues for researchers on other aspects of biology curriculum and other areas of the development of science education in Pakistan.

6. Delimitation of the Study:-

- ❑ The study is delimited to the curriculum of biology offered in government secondary schools in Pakistan.
- ❑ The study has been further delimited to the curriculum of biology offered as component of an integrated course in higher classes 9th to 10th in secondary schools in Pakistan.
- ❑ While looking its operational status, field study has been conducted in 120 selected high schools for girls in Peshawar, Nowshera, Mardan, Charsaddah, Swabi, Swat, Daggar, Abbottabad and Kohat of N.W.F.P (Pakistan).

The following dimensions of the teaching of subjects have been specially concentrated.

- ☆ Biology curriculum its nature and operational status.
- ☆ Constraints in effective implementation of biology curriculum.
- ☆ Suggestions invited for improvement of biology curriculum in future.

The study has also been supplemented with interview, guides for educationists, biologists and science teachers, to ascertain their opinions on the role of biology

and its linkage with other courses, its deficiency and merits and needs for further improvement of the biology curriculum.

7. Method Adopted for the Study:-

This study is based primarily on the analysis of documents relating to the formulation of biology curriculum at secondary level in Pakistan, since 1960. Its implementation status in the class room has also been taken into consideration. A detail procedure of the study has been discussed in the next chapter.

METHOD AND PROCEDURE OF THE STUDY

Various dimensions of biology curriculum, characteristics of sample and instrument and the manner data has been treated etc., are presented in this chapter.

1. Nature of the Study:-

As indicated earlier, the present study is descriptive in nature and in its scope. In its descriptive nature, it is of two dimensional; documentary analysis supported by field analysis of the problem under study.

Documentary analysis is one of the pattern of descriptive research refers to content activity, conditions and practices, that exist in organization, institution society and community spots trends, strengths, constraints and weaknesses and its development of any country educational endeavour (Good, carter 1954 P. 256).

The field analysis of the problem denotes its qualitative aspect. Using qualitative analysis is important for the study of any social or educational problem. In this approach certain variables are selected and their comprehensive study is made through a well planned instrument. Observations are recorded, people are interviewed and on their basis conclusions are drawn. The data is considered related, precise and their results are expected to be presented in reliable manner. (Raj Hans 1992, P.14).

2. Steps Followed in Documentary Analysis:-

i. Nature of Analysis:-

The development of biology curriculum at secondary level being a central concern of this study, has been traced out. In the related documents, most particularly in the curriculum committee reports, presented from time to time since independent 1947, The following steps have been followed in reviewing and analysing the related documents.

- ☐ Analysis of the nature and status of the development changes of biology curriculum at secondary level in the pre independence period.
- ☐ Analysis of the development and changes of biology curriculum at secondary level in the post independence period from 1947 to 1960.

- ☐ Analysis of the development and changes of biology curriculum at secondary level during the period 1960-1976.
- ☐ Analysis of this development and changes of biology curriculum at secondary level during the period 1976-1985.
- ☐ Analysis of the present state of biology curriculum offered at secondary level.

3. Steps Followed in Field Analysis of Biology Curriculum:-

ii. Authenticity of Sources:-

While using documentary sources, effort has been made to ascertain the authenticity and meaningfulness of the documents. The sources thus relating to the development of curriculum on the subject were thought reliable and authentic, were of primary nature and have been provided by the formal bodies of the government both at Federal and provincial level.

Such sources are mainly comprised of the reports of conferences, commissions and curriculum committees and policies issued from time to time since independence 1947 to 1992.

❑ *An appraisal of the operational status of biology curriculum in secondary schools*

Apart from analyzing its relevant documents, on the subject, the study has been further supported by an appraisal of the situation, conditions in which the curriculum is implemented. For this purpose, a questionnaire has been developed to get information on physical facilities, direction of learning evaluation system and the attitude of teachers, towards the subject. The data has been personally collected by the researcher from girls high schools in nine districts of Peshawar, Mansehra, Malakand, Hazara and Kohat divisions of N.W.F.P (Peshawar). The analysis and findings have been presented in chapter V. The questionnaire is given in appendix.

❑ *Sample*

A list of secondary school was collected from the Directorate of Education (Secondary) N.W.F.P. Peshawar. One hundred and twenty secondary schools for girls (from districts of Peshawar, Nowshera, Charsadda, Mardan, Swabi, Swat, Abbottabad, Dir and Kohat) have been randomly selected for the field work. The list of schools has been given in the Appendix. The requisite data has been collected personally from the schools accessible in the related districts, Peshawar, Nowshera, Charsadda, Mardan, Swabi. The distant districts. Swat, Dir, Abbottabad and Kohat were managed to

be visited by students, deputed for this purpose. The questionnaire was administered to science teachers and heads of the institutions.

4. The Nature of the Questionnaire:-

Data collection is a serious problem. Different tools for collection of data e.g. questionnaire and interview guide/schedule are used. These tools are not only given careful consideration but also proper planning before they are administered to the concerned respondents.

Questionnaire method is one of the popular and feasible method for the study of any important educational problem.

- ❑ A comprehensive questionnaire was prepared both in closed and open ended form so that it could contain the merits of both styles and to see that all relevant aspects of the problem have been covered. The personal visit to schools by researcher or by special messenger, facilitated the removal of any ambiguity, confusion or difficulty of any item/statement/questions responded by the teachers and principals.

- ❑ **Important Aspect of the Questionnaire**

The questionnaire as described earlier has been designed with clear purpose of ascertaining views/comments/observations of science teachers, who were teaching science at higher classes at secondary level on the

nature of biology curriculum and identifying the problems they are facing in implementation curriculum in the class room. The questionnaire consisted of statements/items, covering various aspects of biology curriculum and embraces the following aspects.

- ✧ *Biology curriculum; its nature and operational status.*
- ✧ *Physical facilities.*
- ✧ *Staff characteristics.*
- ✧ *Instructional activity.*
- ✧ *Instructional material and*
- ✧ *Evaluation.*

The questionnaire has been constructed mostly in closed form as indicated above to focus the attention of the respondent on the specified conditions. It has also been supplemented by open ended, questions, so that respondents could express their own view not provided in the structured form questions. Those mainly center round such issues.

- i. In what respect there is greatest need for improvement in biology curriculum?
- ii. In what respect there is greatest need for improvement of physical facility in raising the professional competence of teachers.

5. Criteria for Evaluation:-

The criteria for evaluation of biology curriculum and its implementation in teaching learning situation, rests on Three-Point, Scale. The qualitative magnitude of each point is explained below:

- | | |
|---|--|
| ☐ <u>Exists/possesses to considerable extent</u> | If the provision/conditions are extensive and function well. |
| ☐ <u>Exists/possess to some extent</u> | If the provision/conditions are limited and function poorly. |
| ☐ <u>Not at all</u> | If the provision/conditions are missing and needed. |
| ☐ <u>Adequate</u> | If the provision/conditions are extensive and function well. |
| ☐ <u>Inadequate</u> | If the provision/conditions are limited and function poorly. |
| ☐ <u>Missing.</u> | If the provision/conditions are missing and needed. |

Guide lines for filling the questionnaire have been provided in the covering letter. The data through the questionnaire has been collected in the first phase of field work.

6. Interview Guide:-

An Interview Guide was structured for biologists, educationists, curriculum planners and science teachers. The Interview Guide includes six questions covering the views of all concerned about the role of biology curriculum in science education including linkage with other levels, identify the deficiencies and strength in the present course of biology, locating margin for further improvement and tracing new concepts in the course. Concerned persons have been personally contacted for this purpose. The data through this instrument have been collected in the second phase of the field work.

7. Treatment of Data:-

The data so received through the questionnaire was organized, tabulated and interpreted separately. The data about each and every item/statement was work out in percentage. The formula of percentage was thought simple and understandable by the researcher as the technique of percentage according to Garette “exhibit a certain behaviour or possesses a definite attitude or other characteristics when it is difficult to measure these attributes directly” (Garette 1967 P. 197).

The responses obtained through Interview Guide, were analyzed. Overlapping and duplicated were discarded. The most significant one were retained and according to their frequency they have been listed in order of merit.

ANALYSIS OF THE CHANGES AND DEVELOPMENT OF BIOLOGY CURRICULUM OFFERED AT SECONDARY LEVEL DURING PRE AND POST INDEPENDENCE PERIOD

This chapter is devoted to the analysis of the development and changes in Biology curriculum offered in secondary schools during the pre and post independence period. The period of analysis spreads over since the first policy statement on education was issued in 1813 by the British Government, to the revision of curriculum by the Government of Pakistan in 1986. The discussion on the problem is presented in chronological order for better understanding of the issue. The analysis has been divided in to four sections, a brief description of which is given below:

Section A:- It deals with the development of curriculum with special reference to Biology offered at secondary level during the alien rule.

Section B:- It discusses the nature and scope of curriculum inherited at the time of independent 1947, and the first formal attempt in 1960 to formulate curriculum for secondary schools with considerable diversification as recommended by the Commission on National Education 1959 in which Biology was accorded due recognition in the schemes of studies.

Section C:- It highlights the nature, scope, problem and issues in Biology curriculum restructured under the directives of Education Policy 1972-80 in 1976.

Section D:- It signifies the nature of Biology curriculum revised in 1986, under the mandate of National Education Policy 1979.

A. Development of Curriculum with Reference to Biology Offered at Secondary Level During the British Period (1785-1947):-

Education is an indispensable factor in the development of a nation. It is a purposeful instrument for the realization of ideological aspirations and socio economic needs of the country. It is, therefore, through the curriculum that such goals are to be realized. To what extent the process of curriculum development and changes particularly at secondary level has been guided by these goals in the colonial rule? or to what extent it possessed such characteristics, needs to be analyzed. Therefore, a brief survey of the curriculum development with special reference to biology at secondary level, has been attempted in this section so that it could provide a better base for further analysis on the problem.

1. Early Developments and Changes:-

The decline of the Mughal Empire and the establishment of the company rule in the sub-continent led to an era of both political and economic exploitation. The company was least interested in the education of the people; at time when it was engaged in the "consolidation of its political power". Some institutions such as Calcutta Madras in 1785, and Sanskrit Benaris College in 1791, were established more on political expediency than on educational consideration; (Nurallah, Naik 1962 P.31). The curriculum of Madrassa for Muslim was limited to arithmetic, geometry, Quran, theology, law, logic, grammar, and natural philosophy. It was inferior to that of such curriculum existed in the Mughul period. Even in such

institutions the Muslim traditions of comprehensive nature of curriculum was not followed. The curriculum designed by Ibne-Khuldoom had provided a wide range of disciplines including biology as an important subject in the scheme. (Yasmin 1986 P.5)

The Charter Act of 1813 issued a vague and imbigious Statement of education "The revival and improvement of literate, encouragement of learned natives of India and to promote knowledge of science among the inhabitants of the British territories". (Opcit, P.47)

This led to a long and bitter controversy among the Anglicisists and orientalisists. It was Charles Grants observation which provided the philosophy to communicate to the ignorant Indian people the western "knowledge and light" through the medium of English". (Ibid, P. 41). Moreover it was Macaulays Minutes, which provided a strategy to realize the ultimate objective of supremacy of English language and propagation of western education, though it might not be "good for their health, but palatable to their taste", (Ibid, P.61) such was the system of modern education in this sub continent. The product of which was surely conceived to be Indian in blood and colours, but English in moral in intellect in taste and is opinion". (Haq 1965 P.33). The suppression of oriental institutions and the discontinuation of Persian as court language in 1837 and the zeal with which the missionaries continued their enterprise, changed the whole situation in the new system. English was used the only medium of instruction and all the available resources were

diverted towards this purpose. During the period 1835-1854, missionaries became the pioneers of English education. (Yasmin 1984 P.87)

2. The Government's Formal Policy on Education Development in India:-

The Wood Dispatch 1854, formally and gradually encouraged educational activities in the sub continent. The main recommendations of the Dispatch included establishment of high schools in all districts, system of grant India for assessing private institutions, the establishment of universities with high schools affiliated to them for the purpose of Matriculation Examination. It also recommended two types of schools i.e. English and non English schools. The medium of instruction of non English high schools through mother tongue or any other modern Indian language, gradually faded away in most of parts of the sub-continent. (Ibid, P.9).

English was taught as a compulsory subjects in English high schools. Matriculation examination was conducted in pure arts consisting of subjects of English, mathematics history and geography and languages. The teaching of natural sciences was neglected which was started as late as in 1879 and even then they were not subjects for Matriculation examination. (Ibid,. P.9)

3. Suggested Reforms in the Curriculum of Secondary Education:-

In 1882, the Indian Education Commission suggested the enlargement of the scope of secondary education. According to its recommendations, vocational courses were introduced at the upper secondary stage. Punjab university affiliated high schools had an entrance examination in science subjects for the first time, later on drawing, agriculture and physiology were added to science as additional option out of which, a student had to offer one subjects (Ibid, P. 107).

The Government Resolution on Education Policy issued in 1904, affected secondary education in several ways. It suggested diversified curriculum corresponding with the varied needs of practical life. (Aziz 1965 P.1947). It also proposed the introduction of Schools Leaving Certificate examination other than the Matriculation examination so that the proposed examination would be adapted and would not dominate the courses of study, would also form a terminating from a culminating point of secondary education. (Ibid, P.195). But the scheme of separate examination did not work. The changes brought in SLC examination close to matriculation examination, defeated the very purpose for which it was initiated (Ibid, P. 195).

In Punjab, the first SLC Examination was held in 1921 and the Matriculation examination was composed of subjects, viz English, arithmetic's as compulsory subjects and three elective subjects to be chosen either from group A or from group B. The detail of which is given below:

Group - A:-

- ☐ Shorthand and Type Writing
- ☐ Book keeping and Commercial Correspondence.
- ☐ One subjects from.
 - ☆ Language of the sub continent
 - ☆ A Classical language.
 - ☆ History and Geography.

Group - B:-

- ☐ Agriculture
- ☐ Physics and Chemistry
- ☐ Drawing
- ☐ History and Geography
- ☐ ☆ A language of sub-continent/modern language.
 - ☆ A classical language.
- ☐ Physiology and Hygiene.

The subjects of history, geography and general knowledge were made compulsory after a few years on the demand of students. However, the whole scheme did not include biology or any of its component partie botany and zoology (Yasmin 1984 P.11).

The Resolution of 1913 once again emphasized the need for curriculum Reforms, and to change its too classical character. But no serious efforts were made to implements the content of its resolution. The secondary school curriculum was exclusively preparing the university Entrance Examination. There was no uniformity in the courses offered in different universities. (Aziz P. 195).

The Calcutta University Commission 1919 did not discuss in detail the curriculum of secondary schools, however, the outline of such curriculum as indicated, is given below:

Group A Required (Compulsory):-

- ☐ Bengali/Urdu for Muslims.
- ☐ English.
- ☐ Elementary Mathematics.
- ☐ Geography.

Group B Optional (Elective):-

One of the following.

- ☐ One classical language
- ☐ An applied scientific subjects
- ☐ Additional mathematics
- ☐ History of India/History of British Empire.

There was no mention of technical and vocational subjects to be included in the curriculum of secondary schools.

The reorganization proposed by the Calcutta University Commission was ignored in many of provinces (Ibid, PP.200-201).

The Auxiliary Committee of the Indian Statutory Commission 1929 discussed only in principle that secondary education should provide both terminal and college preparatory courses and did not recommend a detail curriculum (Ibid, P.201).

The Punjab University Enquiry Committee in 1932-33, suggested that apart from school providing literacy education of a purely college preparatory nature, there should be a good preparation of higher secondary schools, which should provide subjects for adopting them as career. (Yasmin 1984 P.12) In this programme, there is indication of variety of subjects of literary as well as of professional nature.

4. The Post War Educational Development Scheme 1944:-

The Sargent Scheme in 1944, recommended that a system of compulsory and free education be introduced for all children, to the age of 14, years, and further, 3 years for talented students who would be sent to high schools.

The Central Advisory Board of Education once again took the question of curriculum reforms of secondary education. It proposed two types of schools (i) Academic High Schools to impart instruction in arts and pure science and (ii) Technical High Schools to impart instruction in applied sciences and industrial and commercial subjects. The medium of instruction in all high schools would be the mother tongue of the pupils. English should be taught as compulsory second language. Physical Training should be obligatory. The rigid distribution between compulsory and optional subjects should be discarded. It was also considered that the range available should be as wide as circumstances permit and the individual pupil should be allowed to select any subjects according to his/her interest and aptitude, and also according to his requirement of his/her probable future career.

The list of subjects at Academic High Schools included:

- ☐ Mother tongue
- ☐ English
- ☐ Classical language
- ☐ Modern languages
- ☐ History
- ☐ Geography
- ☐ Mathematics
- ☐ Physics
- ☐ Chemistry
- ☐ Biology

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- ☐ Physiology and Hygiene
- ☐ Economics
- ☐ Agriculture
- ☐ Civics
- ☐ Arts
- ☐ Music
- ☐ Physical Training

The list of subjects for Technical High Schools included the following:

- ☐ Mother tongue
- ☐ English
- ☐ Modern language
- ☐ History an Geography
- ☐ Mathematics
- ☐ Physics
- ☐ Chemistry
- ☐ Biology
- ☐ Economics
- ☐ Technical subjects.
- ☐ Agriculture
- ☐ Arts
- ☐ Physical Training.

(Yasmin 1984 P.12)

5. The Scheme of Studies of Intermediate College:-

Quite earlier, according to the recommendation of the Calcutta University Commission 1919, the integral components (botany and zoology) of biology have been included as elective subjects in the curriculum of science education at intermediate level. The commission had discussed the problem of intermediate education in detail and has recommended that intermediate classes should be transferred to the institutions of new type as intermediate colleges. The subjects in intermediate colleges were two fold to provide adequate preparation for university admission and to make available facilities for training of those who proceed direct into various practical occupations (Aziz 1965 P.204).

The commission did not favour the sharp differentiation between these two categories, but suggested a broad outline of the differentiated curriculum such as (a) general education or common core of subjects and (b) combination of subjects in the facilities of Arts and Science. The description of which is given below:-

I. General Core Curriculum:-

(A) Arts

- ☐ Language
 - ☆ Mother Tongue
 - ☆ English
- ☐ Natural Science

(B) Science

- ☐ Language
 - ☆ Mother Tongue
 - ☆ English
- ☐ ☆ History
- ☆ Geography
- ☆ Economics
- ☆ Logic

II Elective:-

Three of the following:

(A) Arts

- ☐ Language
- ☐ History
- ☐ Economics
- ☐ Logic
- ☐ Mathematics
- ☐ Civics

(B) Science

- ☐ Physics
- ☐ Chemistry
- ☐ Zoology
- ☐ Botany
- ☐ Mathematics

(Aziz 1965 P.206)

6. Curriculum at the Time of Independence:-

In 1947, when Pakistan came into being as an Independent country, the Punjab university had been providing two types of curriculum at secondary level. One for School Leaving Certificate their subjects were divided into two groups, compulsory and electives as stated below.

1. For Matriculation Examination:-

A. Compulsory subjects:-

- ☐ English
- ☐ Mathematics or Arithmetic's and House Hold Accounts for girls
- ☐ History and Geography

B. Electives:- (Any two of the following).

- ☐ A Pakistani language such as Urdu, Punjab, Pashto, French or Grammar.
- ☐ A classical language, Arabic, Persian, Latin or Greek.
- ☐ Physics and Chemistry
- ☐ Drawing
- ☐ Agriculture

- ☐ Physiology and Hygiene or Civics and Hygiene or Domestic, Economics for girls.

II. Curriculum for Schools Leaving Certificate:-

A. Compulsory:-

- ☐ English
- ☐ Arithmetic's including Commercial Arithmetic's.

For those taking up a group A or for those taking up group B electives.

Electives From Group A:-

- ☐ shorthand
- ☐ book keeping
- ☐ one subjects with the following
 - ☆ A classical language
 - ☆ A Pakistani language
 - ☆ History and Geography
 - ☆ Civics and Hygiene

Group B:-

Two subjects must be taken from a,b,c.

- ☐ Agriculture
- ☐ Civics and Hygiene
- ☐ Physics and Chemistry
- ☐ One more elective from
 - ☆ Language
 - ☆ Drawing
 - ☆ History and Geography
 - ☆ Civics.

(Yasmin 1984 PP.14-15)

7. Conclusion:-

We had inherited a system of education from the British rule in a chaotic state. The deficiencies that have been observed during this brief review of that part development, were the product of the system itself and which had been perpetuated over a long period of hundred year. Whenever, the need for reforms and change were felt, a commission or a committee was appointed to make, appraisal of prevailing situation and gave suggestions to the government for improvement. All such reports have been accepted an official documents, but none of them could be implemented because of the indifferent attitude of administrators and the traditional conservation.

The system had been highly centralized and had left little margin for independent initiative and other innovative efforts to be made to make the system a "Modern System" in the real sense of the term. Consequently, it could not provide leadership needed for speedy progress and improvement of education in the sub-continent.

The key note of the reforms in secondary education was its curriculum organization to make it diversified, productive egalitarian and consistent with the need of the emerging scientific and technological environment. But such objective inspire of repeated commitment of the government could not be realized. The limited scope of liberal education could only provide opportunity to well to do children to enter higher institutions "The system, infact had been functioning as a highly selective process not on an intellectual but also on an economic basis, in which the poor but talented could not be benefited on the ground of poverty. The system was also built on the weak foundation. The government had placed greater emphasis on higher education, some times at a greater expense of other levels of education.

The scheme of the two types of high schools i.e. Academic and Technical provided since the government. Resolution 1904 failed to be materialized effectively. The programme of vocational education did not enjoy the privilege and prestige, which was availed by the Academic High Schools. Such scheme is appreciated because, it was not only comprehensive and innovative but was also broad based and had particularly included biology as an elective subjects.

The subject of biology or its constituent part i.e. botany and zoology in view of its importance had been provided in the scheme of science education in the intermediate colleges, but such consideration has not been taken in view as a permanent feature in science course of high schools. This is revealed from the fact that the curriculum which was inherited at the time of independence was limited in nature and scope. The whole scheme was limited to their compulsory subjects, and six other electives out of which a student had to offer two subjects. The science courses was again limited to physics and chemistry. There is no indication of biology courses or its any integral element i.e. botany and zoology to be taken either separately or in integrated manner. Such situation continued for a long time during the post Independence period till the Commission on National Education recommended guide lines for the reorganization and restructuring of secondary education in 1959.

**(B) Development, of Curriculum with Reference to
Biology Offered Secondary Level in Pakistan During
the Post Independent Period (1947-1960)**

The Independence in August 1947, brought with it tremendous problems of rehabilitation of millions of refugees and the re-organization of the entire machinery of the state. The leaders were however, equally aware of the overriding importance of education and its urgent need to meet the requirements of the new born country. It was the interest of Father of the Nation, which led to the holding the First Education Conference at Karachi, from 27th November to 1st December 1947. In his historic message to the conference, he provided guide lines for the development of education in future.

He stressed the need for a "right type of education and scientific and technological education". He further emphasized that such education should built the character of the future generation, be consonant with the history and culture and also having regard to the vast developments that have been taken place around the world. (Proceedings of Education Conference 1947 P.2)

Mr. Fazlur-Rehman, the Federal Minister for education in his inaugural address to the conference, forwarded concepts on which the future system of education could be built on them. Religious education, physical training and integration of spiritual, social and vocational elements was the main theme of the future programme, while specially points at inherent weakness of education system

inherited from the alien rule. He said that it was inherited to serve a limited utilization purpose and its development. (Ibid, P.3)

Similar feelings have been expressed by Dr. Mohammad Shamsul-Haq the Federal Minister of Education in Pakistan that the system lacked balance and it was not articulated with an adequate elements of scientific and technical education. It was also limited in the filed of its academic objectives and could not create the spirits of inquiring research (Haq 1965 P.13). The conference thought that education must fight against the disintegration of personality in the modern world. A well balanced educational system can only do away such disintegrated nature of education system. (Opeit P.41)

A Commission on National Education was pointed by a resolution adopted by the Government of Pakistan on 3rd, December, 1958 for re-organization and reconstruction of the present educational system so as to evolve on national system which could truly reflect the spiritual, moral and culture aspirations of the nation and their socio economic growing needs. (Commission 1959 P.17).

The report is a comprehensive document dealing with all the education problem and issues. The matter of re-organization of secondary education has particularly been looked into. There were certain defects, in the secondary school system such as it remained static, isolated from social, economic and industrial requirements. Moreover, the commission laid down as first principle of re-organization secondary education a complete stage in itself. (Ibid, P.121)

The commission observed that the present secondary school curriculum was predominately theoretical and bookish and was dominated by examination requirement. Science education has not been given due importance in the whole scheme. (Ibid, P.122).

The concept of curriculum as laid down in the report by the Commission for Secondary Education has been clearly defined. The importance of science and technology has been emphasized and their place has been determined. The need of making education more close to life and to build relationship between school and community have been particularly emphasized.

The Government set up Curriculum Committee for, Primary, Secondary and Higher Secondary Education to implement the recommendations of commission and worked out new curriculum keeping in view the objectives laid down by the commission and the existing situation of the country. The Committee had kept in view two main objectives.

- ❑ To introduce uniform academic standard, through out the country and
- ❑ To generalize education. (Curriculum Committee 1960 P.34)

Teaching of Science:-

As elaborated in this first chapter of this study. Modern advances in science have changed the life of man and given him a new civilization. They have placed in his

hand tremendous power, enabling him to control the forces of nature and change his environment to his needs. It has also been mentioned the basic advantage of learning science is not so much the understanding of the scientific laws and theories but the development of scientific spirit and out look on life. (Ibid, P.35)

General Scheme of Studies:-

The general scheme of studies for secondary stage as formulated by the curriculum committee in the spirit of the recommendation of the Commission on National, Education constitutes a basis for providing trained manpower, educated citizenry and leadership to the country. At this stage, the special aptitude, interest of pupils are considerably strengthened and they are able to select courses of study according to their special inclination. The number of compulsory subjects, therefore have been reduced as compared with middle stage and wide range of elective subjects have been provided. Pupils will be able to select from a wide variety of elective subjects, and prevocational groups of subjects, designed to suit their professional career which they may wish to take up. As the secondary stage is terminal for the majority of pupils, the courses of study have been brought close to the needs of life. They also include basic scientific knowledge required to enjoy and utilize the fruits of discoveries and inventions. (Ibid, P.39)

Subjects of Study:-

There will be as proposed 5 compulsory subjects. The study of science shall be compulsory for every students. Those who do not choose to study physics, chemistry as elective subjects will have to take up the paper of general science. There will be out of 10 or 11 papers carrying 1000 or 1100 marks. In addition to these physical and manual work will be compulsory in addition. (Ibid, P.41).

The outline of this Scheme is given below:

Compulsory Subjects:-

- ☐ Urdu or Bengali (200 marks)
- ☐ English (200 marks)
- ☐ Social studies (100 Marks)
- ☐ General Maths (100 Marks)
- ☐ General Science (100 Marks)
- ☐ Physical Education (3 periods in a week)
- ☐ Manual work (Two periods)

Elective Subjects:-

In addition to the compulsory subjects students will take up subjects carrying 300 marks from the Humanities group.

Science Group:-

- ☐ Mathematics (100 marks)
- ☐ Physics (100 marks)
- ☐ Chemistry (100 marks)
- ☐ One of following.
 - ☆ Biology
 - ☆ Physiology and Hygiene
 - ☆ Geometrical and Technical Drawing
 - ☆ Geography
 - ☆ One paper carrying 100 marks not included in the above group on a subject not included above from any other group.

Other Related Points:-

In Home economics group Chemistry, Physics and Biology have been integrated subjects carrying 100 marks each.

In Agriculture group (i) elementary Botany or (ii) Elementary Zoology, Animal Husbandry 50 marks each have been offered. (Ibid, PP.62-63)

Detail Course of Biology:-

The biology, course for secondary schools has been divided in to two parts, the detail of which is described below.

Part I:-

- ❑ External morphology and functions of Root, Stem, leaf and flower of the Mustard plant with particular emphasis on.
 - ☆ **Root:** absorption of water.
 - ☆ **Stem:** ascent of sap.
 - ☆ **Leaf:** photosynthesis and respiration demonstration, that CO_2 is absorbed and O_2 is produced during photosynthesis
 - ☆ Transpiration demonstration, experiments to show loss of water by transpiration.
 - ☆ **Seed:** condition necessary for germination.

- ❑ Pollination in flowering plants.

- ❑ Dispersal of seed & fruits.

- ❑ Economic importance of plants.

- ❑ A broad distinction between flowering and non flowering plants e.g. conifer, fern, moss, lichens and algae.
- ❑ Adaptation of plants to the following ecological condition.
 - ☆ Desert life.
 - ☆ Water logged area.
 - ☆ Epiphytic life in jungle.

Part II:-

- ❑ The frog or toads to be studied as a type, animal with particular attention, the following system of its body.
 - ☆ Digestive system; feeding, digestion and assimilation.
 - ☆ circulatory system and function of the blood.
 - ☆ Respiratory system & excretory system.
 - ☆ Nervous system; brain, spinal cord, nerves and sense organ.
 - ☆ Reproductive system: life history.
- ❑ The cell and its structure.
- ❑ A difference between plants and animals.
- ❑ Difference between living and non living things.

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- ❑ Demonstration of the following experiments to be given by the teacher and record should be made by the students.
 - ☆ Osmosis through membrane.
 - ☆ Simple reflex action in a frog leg.
 - ☆ Flow of blood in a web.
 - ☆ Action of enzyme on starch.
 - ☆ Embryo formation in fowl egg.

- ❑ A broad, distinction to be made between the following animals on the basis of primary, external homologous features, worm, grass hopper, snail, toad, lizard, pigeon and rabbit.

- ❑ A general practical demonstration should be given in respect of locomotion, feedings, association stages in life history of the above type.

- ❑ Habits of adaptation of animals and association, animals, plants community should be studied either in a pond or an orchard.

Marks allocated

Paper = 75

Oral exam = 25

Total = 100

(CCR. PP 184-185)

Comments and Observations:-

It seems that course of the subject has been designed as of elementary nature. A detailed biology course has been formulated and given due place along with other scientific disciplines.

The subjects has some relationship with the curriculum at middle level as two units on plants and animals have been provided in the course of general science which is compulsory for all students.

An other important point which has already been indicated is that Home Economy programme for girls in High classes chemistry has been introduced in IX class, while physics has been offered in X class. Biology has been shown at the end of the syllabus.

The distribution of 100 marks into theory and practical has not been indicated as provided for other courses of science subjects. Apparently therefore course consists of units, relating the physical phenomena and about one forth or the last unit of the course is relating to biological topics.

The marks to be allocated for examination purpose, have also not been given. It is also not mentioned whether certain practical work will be required of students in examination or not and how much marks should be allocated for this purpose.

The characteristics of Home Economics course over other courses is that basic objectives have been formulated to direct its implementation, but the importance of the component of biology which has been included in the course has not been spelled out in any specific term. (Curriculum Committee 1960 P.224, P.226). Similarly, Elementary Biology and Elementary Zoology have been introduced in the Group in Part II respectively. In short the overall nature of Biology curriculum is rudimentary. It consists of two parts part I consists of botany and part II has been devoted to the elements of Zoology. The planners have not been intending to formulate the course of high standard and of more differentiated nature. However, the efforts of curriculum planners are appreciated as it is the first serious attempt to introduce biology as a distinct course at secondary level.

C. Analysis of Biology Curriculum for Secondary Schools Formulated in 1976:-

1. The Directive of Education Policy 1972-80:-

The President of Pakistan, in his address to the nation on March 15, 1972, announced the salient features of Education Policy 1972-80. In his view, in the past whenever any educational reforms were conceived, they were treated as highly sacrosanct and were imposed with such rigidity as if they were the last writ of human wisdom. The result was not unexpected the fate of all previous reforms were sealed by their "unwarranted inflexibility". President Address March 1973, P.1)

It was further pointed out, that the situation prior to the formulation of new policy, was much depressing. There was inevitable pressure of demands created by the growth of population and economic development necessitated a broadening of the educational system. The resources allocated to education sector were extremely low and were dis-proportionately distributed among various subsectors and levels of education. The cause for this ludicrous misplaning, was the total apathy with which the subject of education was treated in the dispensation of power and patronage (Ibid, P.2)

In the after math of such un-salutary tradition, the government thought to reshape the educational policy 'to "clean the jungle", to weedout the complexes of the past

order and to pull out the nation out of sloth without losing the spirit of religion and the ferier traditions of our culture.' (Ibid, P.2).

The Education Policy 1972-80 as forwarded by this government maintained that,

- ❑ The National Curriculum Bureau will be reorganized and strengthened, to enable it constantly to review the curricula for all stages and to revise and modernize them at regular intervals.
- ❑ Complete revision and modernization of the curricula for all stages will be taken up immediately.

The Education Policy 1972-80 expected that the curricula so revised would emphasize learning of concepts and skills and encourage observation, exploration, experimentation practical work and creative expression. The policy further laid great stress on a shift towards scientific and technological education. Moreover, according to policy an integrated science courses including mathematics, biological and physical sciences was also to be introduced at high and intermediate stages with a view to giving students a more comprehensive and diversified preparation enabling them to have a wider choice at the time of entry into higher institutions of professional and general education. (Education Policy 1972-80 P. ii. P.7) With these directions in view, the National Bureau of Curriculum in close collaboration with the Provincial Bureau of Curriculum prepared a daft of the goals and aims of education in Pakistan to pave the ground on which further syllabi could be framed.

The National Curriculum Committee in the light of provision of the above policy with great vigour and enthusiasm prepared biology curriculum for secondary schools (class IX-X) in 1976. This task was undertaken by representative committee of specialists, educationists, practicing teachers and curriculum research experts.

2. Biology Curriculum: Its Nature, Scope and Other Features:-

The curriculum planners while formulating the new biology curriculum at secondary level, recognized its significance in science education as, it brings together the methods and results of a number of science and more particularly draws on physical sciences and acts as an integrating agent, (Biology curriculum 1976, P. 1.7)

(i) Objectives for teaching of Biology at Secondary School level:-

The following objectives were set for teaching of biology.

- ☐ To understand the world of nature, physical and biological and be able to interpret natural phenomena.
- ☐ To gain a better understanding of the meaning and purpose of life.

- ☐ To participate more effectively in solving problems of the human society.
- ☐ To maintain and improve their health and share the responsibility for protecting the health of the community by applying their knowledge of biology.
- ☐ To attain an emotionally stable personality and make a worthy social adjustment and
- ☐ To utilize a scientific approach towards solving problems dealing with the society and human welfare (Ibid, P I.I).

(ii) Review of the Existing Biology Syllabus:-

The National Curriculum Committee on Biology before framing the new curriculum, analysed and identified the following deficiencies.

- ☐ The syllabus did not conform to both standard of the goals and objectives of teaching of biology.
- ☐ More emphasis was placed on memorization of useless details than on understanding of useful principles.

- ☐ Morphological and structural detail showed a pre specialization bias.
- ☐ Social aspect of biology was entirely neglected.
- ☐ There was no emphasis on practical work (Ibid, P. 1).

iii. Guide Lines for Framing the New Syllabus:-

The National Biology Curriculum Committee formulated the following guide lines for framing a new syllabus:-

- ☐ It should contribute to a gaining of knowledge about biological phenomena as well as to a training in scientific methods.
- ☐ Instead of being an exercise in memorization it should convey an understanding of principles underlying the living phenomena.
- ☐ Biological knowledge must be used in direct application to society and to provide skills and attributes, which are relevant to social living.

- ❑ It should present an integrated course in biology. The division of content in to Botany and Zoology should be done away with (Ibid, P.1)

iv. Other Consideration for Better Implementation of the Proposed Curriculum:-

The National Biology Curriculum Committee suggested certain measures to be taken in view while launching the proposed curriculum.

- ❑ One text book and one teacher's guide be prepared for the whole country, so that uniformity in standard of teaching of the subjects could be ensured.
- ❑ All the provincial Text Book Board should jointly produce a manuscript for writing of which each board should approach a senior biologist. Moreover, the panel of authors should include both botanists and zoologists.
- ❑ Other formalities such as allocations of chapters to authors, preparing guidelines of determining size and scope of the text book and teachers guide should also be jointly be decided by the panel of experts.

- ❑ Only trained science graduates who have studied Botany/Zoology in B.Sc. should be employed to teach biology in secondary schools.
- ❑ A regular 6 to 8 weeks, teachers training programme should be launched immediately in cooperation with the universities. Such training programme should be carried out through out the year.
- ❑ In training programme due attention should be given to practical work.
- ❑ It was further suggested that a course on teaching of biology should be introduced in B.Ed. curriculum.
- ❑ In order to teach the subject effectively each school should be provided necessary laboratory facilities.
- ❑ Survey should also be conducted in schools before the introduction of subjects to ascertain whether there exists the requisite laboratory facilities (Ibid, P.2).

3. Outline of the Course:-

In the following lines an outline of the new biology course is presented. The detail syllabus is given in the appendix No. D.

IX Class:-

(i) Theory:-

- ☐ Introduction
- ☐ Nature of origin of life.
- ☐ Structural organization of organism.
- ☐ Diversity in living organism.
- ☐ Food and energy.

(ii) Practicals:-

Twenty four practical of various types have been provided in the course to be performed by the students and will be recorded in their practical books each practical will consist of two practical.

B. Class X:-

(i) Theory:-

- ☐ Excretion
- ☐ Movement and locomotion
- ☐ Coordination and behavior

- ☐ Growth
- ☐ Reproduction and Development
- ☐ Hereditary.
- ☐ Evolution
- ☐ Interrelationship of organism and their environment.
- ☐ Biology and human welfare.

(ii) Practicals:-

Fourteen practicals of various type have been recommended in the course to be performed by students in laboratory situation. Similarly, each practical will consist of two periods. The results of practicals will be recorded by students in their Practical Books and will be presented to the examiners at the time of Examination. (Ibid, PP. 3-5).

4. Improving Laboratory Situation:-

The National Biology Curriculum Committee further suggested laboratory equipment to be provided to secondary schools so that the practical component which has been specifically emphasized and laid down in the syllabus, could be implemented effectively and meaningfully. The detail of such equipment has been given in the appendix. The nature in general is noted below:

- ☐ Apparatus
- ☐ Class work

- ☐ Natural History Specimen
- ☐ Prepared microscope slide
- ☐ Model
- ☐ Charts
- ☐ Chemicals. (Ibid, P. 6)

5. Improvement of Biology Curriculum Revised 1976, over the Previous Curriculum Designed in 1960:-

Biology curriculum under the directive of Education Policy 1972-80, revised, is more comprehensive as compared to the curriculum designed in 1960. The new curriculum includes an introducing unit on the importance of Biology as a major discipline and contribution of Muslim Biologists has also been high lighted. The course is more sophisticated, sufficiently diversified. The unit on cell has been sufficiently elaborated. The course includes new concepts i.e. diversity, excretion, movement, reproduction and development, hereditary, evolution, environment and Biology in human welfare. Other formalities in the formulation of curriculum i.e. determining objectives, formulating guidelines for writing of text books, lab management.

Teachers training programme and long lists of practical, have been carefully observed.

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In short, the present biology curriculum enjoys many attributes over the previous curriculum planned in 1960 for secondary schools in the country.

**D. Analysis of Biology Curriculum for High Classes
(IX-X) at Secondary Level Re-Formulated in 1986-**

1. Background:-

The entire curriculum at secondary level had already been changed according to spirit of Education Policy 1972-80. The curriculum so revised was expected to have attributes of conforming to the aims and objectives of teaching of biology, laying more emphasis on understanding of useful principles than on memorization of useless details; giving more attention to practical work and projecting the social aspect of biology as had been entirely neglected in the past.

Great changes had taken place since the restructuring of curriculum in 1976. Recognizing the change, the education policy was also thought to be harmonized with the changing demands of the society. While feeling the need of a great change, the Martial law regime convened a National Education conference in October 1977, which was fully represented by varied shades of thoughts of the society to recommend bold new ventures for the reorientation of education in the country. On the recommendations of the Conference, a new education policy i.e. the National Education Policy was announced in October 1978. The National Education Policy recognized the great potential of indigenous institutions, deviation from alien models and inculcating the content and spirit of ideology of Pakistan in the future system of education in the country. The policy has given special attention for bringing about quality in education and promoting scientific

and technological education. More particularly, the policy has assigned high priority to the revision of curricula with a review to reorganizing the entire content around Islamic thought and giving education an ideological orientation. (National Education Policy, 1979 P.1).

2. Revision of Biology Curriculum in 1986:-

(i) Rationale:-

The revision of biology curriculum at secondary level had been long over due. This had been so in view of the aspirations to bringing curricula in consonance with national objectives with emphasis on scientific concepts and methods leading to creative thinking, achievements of skills and appreciations of importance of science for the development of the society.

Therefore, a meeting of the National Committee was held in Islamabad from October 29, to November 1, 1984 to critically examine and evaluate the existing biology curriculum at different levels, keeping in view the short comings of the prescribed text book, institutional resources, problems of teachers and mental level of children. (National Curriculum committee 1984 P.2)

ii) Shortcoming Identified by Curriculum Committee in Biology:-

After a thorough analysis of the existing biology curriculum, the committee had been in a position to pin point the following shortcomings.

- ☐ The approach used did not conform to the aims and objectives of teaching of biology.
 - ☐ More emphasis was based on memorization of facts and less on the understanding of basic themes.
 - ☐ The approach to the subject as evident was descriptive and not thematic.
 - ☐ There was absence of integration of botany and zoology.
 - ☐ There was lack of balance between different disciplines of biology.
 - ☐ The emerging crucial issues relating to environment, public health and agriculture aspect of biology had been entirely neglected.
- (Biology Curriculum 1986 P.3)

iii) Guide Lines Adopted for the Revision of Biology Curriculum:-

The National Committee for the revision of Biology curriculum adopted the following guide lines for developing the new syllabi.

- ☐ The emphasis should not been on teaching of botany and zoology as separate subjects in the same book but to elucidate biological themes and concepts applicable both to plants and animals.
- ☐ Presentation of subjects should stimulate thinking about the subjects and appreciation of the biology themes.
- ☐ The subject should encourage observation, explanations and experimentation and creative expression and,
- ☐ To inculcate the ability in students and apply biological knowledge to their problems. (Ibid P.4)

iv) Objectives, Formulated for Revised Biology Curriculum at Secondary Level:-

The following objectives have been reformulated to direct the construction of curriculum, preparation of text book teaching methods of biology in high classes (IX-X) at secondary level.

- ☐ To understand the world of nature, physical and biological process and liable to integrate the natural phenomena.
- ☐ To have some appreciation of the background of the work done by the Muslim scientists in the field of biology.
- ☐ To appreciate more effectively in solving problems of human society and survival.
- ☐ To develop our understanding of the primary needs of mankind.
- ☐ To maintain and improve human health, and to ensure the health of the community by applying knowledge and skill by teaching biology.
- ☐ To attain emotionally stable personality by applying skills learned by teaching biology.
- ☐ To gain a better understanding of the meaning and purpose of life.
- ☐ To understand the relation and importance of organism, environment and their effect on each other.

- ❑ To utilize the scientific processes towards, solving problems dealing with the individual, society and human welfare. (Ibid P.5)

v) **Characteristics of the Revised Biology Curriculum:-**

In the above discussion relating to the revision of biology curriculum at secondary level, the intent of curriculum makers is clear. The revised curriculum was, expected to contain in itself the desired changes and the emerging trends and needs felt in the discipline.

- ❑ In the revised biology curriculum full consideration has been given to future academic pursuits of students in the discipline of biology.
- ❑ An effort has also been made to achieve a balance in exposure of students to biological, botanical and zoological concepts and information.
- ❑ Vertical linkage with a view to achieving continuity, introduction of new concepts and the quantum of information at different levels, have also been given due consideration.
- ❑ Moreover, subject content and themes have been indicated to ensure that students learn new concepts as they progress from classes (VI-VII-VIII).

In addition to the attributes stated above the restructured biology curriculum possesses other characteristics such as

- ☐ Integrated subject.
- ☐ Presentation of the subject in such a way as to stimulate thinking and appreciation of biological themes.
- ☐ Encouraging observation, exploration, experimentation, and creative expression.
- ☐ Inculcating the ability in students to apply biological knowledge to their social problems. (Ibid PP.6-7)

vi) Outline of Biological Themes of the Course:-

The detail of the curriculum is given in the Appendix. An outline of the major themes of the revised course is given below:

- ☐ Introduction
- ☐ Nature and origin of life
- ☐ Structural organization
- ☐ Diversity
- ☐ Food and energy

- ☐ Transport
- ☐ Respiration
- ☐ Excretion
- ☐ Reproduction, Development and Growth
- ☐ Coordination in multicellular organism
- ☐ Environmental biology
- ☐ Genetics
- ☐ Evolution
- ☐ Biology and Human welfare. (Ibid P.8)

3. Improvement of Biology Curriculum Redesigned in 1986 over the Previous Curriculum in 1976:-

The Biology curriculum re-structured in 1986 has been inspired by the spirit of National Education Policy 1979, which laid stress on quality improvement of education and instruction. The revision is based on a thorough analysis of the prevailing situation, identifying weakness and strengths of the subjects.

Some shortcomings existing in the previous course have been re-stated such as:

- ☐ The syllabus does not conform to the goals and objectives of teaching of Biology.
- ☐ The approach to the subject is more descriptive than thematic.

- ☐ Biological knowledge is not used in direct application to society as the solution of its social problems.

The planners of the present course have gone a step forward. They have made an appraisal of the present course and have further pinpointed the following lackings such as.

- ☐ The existing course does not show any integration of Botany and zoology.
- ☐ It does not show any balance between different disciplines of biology.
- ☐ There is little emphasis on practical work.

4. The Attributes of the Present Course Over the Previous Course:-

These are briefly stated.

- ☐ The chapter, reproduction and excretion which were sub units of the units "Food and energy" have been indicated as separate unit and its content has also been enlarged.
- ☐ The term used in the previous unit on coordination and behaviors in animals have been changed. Instead a new term as coordination in

Multicellular organism, has been used in the revised course. The scope of the unit has also been broadened.

- ❑ Growth has been treated as a separate unit in the previous course while it has been treated a part of the unit of "Reproduction and development in the revised course.
- ❑ The unit on "hereditary" in the previous course has been replaced by a unit "Genetics" the nature of which is considerably different.
- ❑ The unit on "Evolution" in the previous course has been delimited only to the theories and origin of variations. Other details given in the previous unit has been avoided.
- ❑ The significant features of the present course is that it, includes a separate unit on "Environmental biology".
- ❑ In view of environmental consideration, the scope of unit on "Biology and Human welfare, has been enlarged.

ANALYSIS OF THE IMPLEMENTATION STATUS OF BIOLOGY CURRICULUM AT SECONDARY LEVEL

This chapter has been devoted to the analysis of data obtained from 120 government girls Secondary schools, from the selected districts of Peshawar, Mardan, Swabi, Charsadda, Swat, Dir, Haripur and Kohat. The main purpose of this exercise was to ascertain the views of biology teachers on the nature of biology curriculum currently implemented in the class room and further to find out the nature, scope and adequacy of the related facilities, staff characteristics, instructional activities, material and evaluation. Questions in closed form have been framed in this section for the above purpose: These have been put on three-point scale so that one could get a realistic view of the situation. This section has also been supported by a few openended questions, so that the respondents views are not confined only to the expected answers. The detail of the schools visited for collection of requisite information and the nature of instrument designed for the purpose of field exercise are given in the Appendix G.

I. Biology Curriculum: Its Nature and Scope:-

**TABLE I NUMBER AND PERCENT OF TEACHER EXPRESSING
THEIR VIEW OF THE NATURE OF CURRICULUM ITS
ADEQUACY, RELEVANCE AND REACTION TO
SITUATIONAL REALTIES AT SECONDARY LEVEL**

Respondents = 120

Statement	Exists to Considerable Extent		Exists to some extent		Not at all	
	No.	%	No.	%	No.	%
1. The emphasis is on Scientific principles discovery understanding & application.	9	7.5	79	58.3	12	7.0
2. The emphasis is on development of desirable attitude interests and application relate to the students	20	16.6	67	56.0	13	1.8
3. There is recognition of and preparation for the role of biology in evolving a better human life of environment	23	20.0	59	49.2	16	13.3

Analysis of the Implementation Status of Biology Curriculum at Secondary Level

	Exist to Considerable Extent		Exist to some Extent		Not at all	
	No.	%	No.	%	No.	%
4. The curriculum in biology offers opportunity to students to study biological phenomena	32	26.6	59	49.2	14	11.6
5. Provision is made to met the needs of students with special interest & ability in the subject	16	13.	65	54.2	21	17.5
6. Efforts have been directed in the curriculum towards studying the subjects at higher level and seeking carrier in its learning.	15	12.5	51	42.5	35	29.2
7. Emphasis is on learning in class-room lab situation which provide opportunities for group instruction, investigation & experimentation.	24	20.2	60	50.0	18	15.0

Analysis of the Implementation Status of Biology Curriculum at Secondary Level

Statement	Exists to Considerable Extent		Exists to some extent		Not at all	
	No.	%	No.	%	No.	%
8. Opportunities have been provided to students to participate in the activities so that to apply methods & provides of the subsist to the Instruction of problems of living .	18	15.0	34	28.3	55	45.8
9. Provide opportunity for students to design & Construct equipment/material required for the students.	6	5.0	54	45.0	42	35.0
10. Acquaint students with recent trends & development in biology	10	8.3	55	48.8	31	25.8

The above table reveals that 58.3 percent of teachers one of the view that there is less emphasis of biology curriculum as a scientific subject emphasizing on principles, discovery, understanding and application. Such ideal nature has been expressed only by 7.5 percent.

So far as the emphasis of the subject on development of desirable attitude, interest in students and application is concerned, it has been indicated by 16.6 percent of concerned teachers. Fifty six percent of teachers are of the view that to some extent the present curriculum plays the role in evolving and better human life, and environment. The existence of such characteristics to considerable degree, has been expressed only by 19.0 percent of biology teachers. The nature of curriculum as offering opportunity to children to study biological phenomena, has been indicated by 49.2 percent of teacher, However, 26.6 percent to them are of the view that the curriculum possesses such quality.

Fifty four percent of teacher have forward view that less provision has been made in biology curriculum to meet the special needs and interest and ability of students who have opted for the subject. Such provision exists only according to the view of 13.3% teachers.

The scope of existing curriculum as to encourage students to study the subjects and seek career is limited as pointed out by 42.5 percent of teachers. While 29.16 percent are of the opinion that such quality does not exist at all.

It is further revealed that there is less emphasis on teaching of the subject in laboratory situation which provides opportunities to students for group instruction, investigation and experiments as indicated by 50.0 percent of teachers. Such characteristics of the curriculum have been expressed only by 20.0 percent of teachers.

Forty Six percent of teacher further indicate that the curriculum has a limited scope to provide opportunities to students and participate in outdoor activities so that to apply the methods and principles for investigation of problem of living.

The practical aspect of the curriculum is deficient in respect of designing and constructing, apparatus by students as revealed by 45.0 percent of teachers.

Moreover, the table shows that the subject is less extensive to acquaint students with recent trends and developments as forwarded by 48.8% of teachers.

While expressing their own views on the nature. Scope and relevance of biology curriculum, at secondary level, majority of them are not satisfied. Their responses are listed in order of merit.

- ☐ The course is not balanced, activity oriented.
- ☐ Diagrams of various systems have not been properly defined.
- ☐ Environmental aspect in the course is inadequate.

Analysis of the Implementation Status of Biology Curriculum at Secondary Level

- ❑ Biological terminology used in the text is difficult to be understood by students.
- ❑ The concept of life as given in the course is not clear.
- ❑ The idea of bringing about religious relationship with biology, has been appreciated.

II Constraints In Effective Implementation of Biology Curriculum in the Selected Secondary Schools:-

TABLE II NUMBER AND PERCENT OF BIOLOGY TEACHERS INDICATING THE NATURE AND ADEQUACY OF PHYSICAL FACILITIES PROVIDED FOR TEACHING OF BIOLOGY

Respondents = 120

Nature of Physical Facilities	Extent of Adequacy				Missing	
	Adequate		Inadequate			
	No.	%	No.	%	No.	%
1.Classroom /Lab space for teaching/demonstration	22	18.4	57	49.5	9	7.5
2. Water, power, storage & other necessary facilities.	16	13.0	56	46.7	25	20.8
3. Provision of equipment materials & aids	20	16.7	68	56.7	11	9.16
4. Safety arrangement in the Lab	15	12.5	32	26.7	48	40
5. Light, ventilation, exhaust fan etc.	25	20.83	47	39.2	27	22.5

The above table reflects both the nature and the extent of adequacy of physical facilities made available in the selected government girls secondary for teaching of biology. The data contained in the table on individual item reveals that forty eight percent of teachers have pointed that the class room accommodation according to enrollment of students and Laboratory space provided for practical work is inadequate. Only 18.3 percent schools have such facilities while in 8.0 percent schools such facilities are entirely missing.

Similar is the case for the provision of other related facilities i.e. water, electricity, storage and other supporting equipment. Only in 13.0 percent schools these facilities are adequate while in 46.7 percent schools, these have been shown as inadequate,. Moreover, there are 21.0 percent schools where such facilities are not existing at all.

The situation relation to provision teaching material, is more depressing. Only in 16.7 percent, schools the related facilities are adequately available, while in 57.0 percents schools the provision of such material, is inadequate.

Safety arrangements as revealed from the above table, have been neglected. Such facilities exist only in 13.0 schools.

Similarly, other facilities such as proper lighting, ventilation, exhaust fans are available only 21.0 percent schools. In 39.0 percent schools such facilities are not available at all.

TABLE III NUMBER & PERCENT OF BIOLOGY TEACHERS INDICATING THE CHARACTERISTICS OF THEIR PROFESSIONAL PREPARATION FOR TEACHING OF THE SUBJECT

Respondents : 120

Characteristic	Posses to Considerable Extent		Posses to Some extent		Not at all	
	No	%	No	%	No	%
1. The teaching staff give guidance for understanding of the subject.	36	30.0	58	48.3	4	3.4
2. The teaching staff give guidance of up to date knowledge of the methods of teaching.	21	17.5	58	48.4	21	17.5
3. The teaching staff give guidance of recent developments in the area of biology in which they are teaching	15	12.5	48	40	39	32.5
4. Teachers are familiar with community, resources to be used in teaching of biology.	21	17.5	46	38.4	30	25
5. Teachers keeping themselves abreast of the recent developments in knowledge of biology & methods of teaching.	21	17.5	46	38.4	30	25

Analysis of the Implementation Status of Biology Curriculum at Secondary Level

The above table indicates that thirty percent of teachers give evidence of the mastery of the subject matter while 48.0 percent of the possess such attribute to some extent. The percentage of those who have no command on the subject matter, is very low.

The table further reveals that 18.0 percent of teacher possess up to date knowledge of the subject and also aware of the pedagogical aspect of teaching . While 48.0 percent of them are to some extent professionally prepared in these attributes. There are 18.0 percent teachers who are not well prepared to teach the subject.

Biology is a dynamic subject, but only 13.0 percent teachers are aware of its nature of its development. Biology is closely related to life situation. Community resources provide the best opportunity to children to observe biological phenomena in real situation. As observed from the above table , 17.0 percent, teachers are familiar with such resources and use them in teaching, Majority of them i.e. 38.0 percent are giving least importance to this aspect. Similarly the percentage of teachers intending to keep themselves abreast of the emerging trends and changes, taking place in the discipline is very low.

TABLE IV NUMBER AND PERCENT OF THE BIOLOGY TEACHERS INDICATING THE NATURE OF INSTRUCTIONAL ACTIVITIES CARRIED OUT IN TEACHING OF SUBJECT

Respondents = 120

Nature of Activities	Activities Carried out adequately		Activities Carried out inadequately		Activities are missing	
	No.	%	No.	%	No.	%
1. Instruction is different in view of the individual differences.	12	10	63	52.5	25	20.8
2. Community and environmental resources are used in instruction	16	13.33	53	44.2	31	25.8
3. The emphasis is on problem-solving.	16	13.33	40	33.33	43	35.8
4. Audio-Visual Aids. Field trips and exhibition are used in instruction.	05	4.16	41	34.1	53	44.1
5. Students are encouraged to undertake projects	03	25.0	38	31.6	58	48.3

Analysis of the Implementation Status of Biology Curriculum at Secondary Level

It is observed from the above table that only 10.0 percent teachers have indicated that individual differences have been taken into consideration in instruction while, such consideration has not been taken by majority of teachers.

Only 13.0 percent teachers have indicated that community and environmental resources are used in instruction. It further supports the situation stated earlier that the teaching of the subject has not been brought close to life.

The subject is taught through traditional methods. The interest in the problem solving approach has been shown only by 13.0 percent. The table further reveals that activities like preparation of aids, field trips exhibition etc. are performed by 4.0 percent teachers. In 44.0 percent schools such meaningful activities are not carried out at all.

Similarly, is the situation for performing group activities by students in biology subjects only 3.0 percent of teachers have stated that children are encouraged to undertake projects. Twenty five percent of teachers have made some efforts in this respect, while 48.0 percent of them have not take interest in such activities.

TABLE V **NUMBER AND PERCENT OF BIOLOGY TEACHERS INDICATING THE NATURE AND ADEQUACY OF INSTRUCTIONAL MATERIAL PROVIDED FOR THE SUBJECT**

Respondents = 120

Nature of Instructional Material	Adequate		Inadequate		Missing	
	No.	%	No.	%	No.	%
1. Equipment/material for demonstration	15	12.5	77	64	6	5.0
2. A.V.Aids relevant to the subject.	13	10.9	65	54.2	19	15.8
3. Books, Periodicals pamphlets, references	06	5.0	42	35.0	48	40.0
4. Study guides, Lab manuals, project etc.	02	1.66	28	23.4	65	54.2
5. Resources, units.	08	6.7	57	47.5	32	26.7

The meaningful teaching of subject depends upon the availability of related instructional material adequately. The situation is depressing. The above table shows that 13.0 percent of teachers have stated that instructional material for teaching of biology are adequately available in their schools. In 64.0 percent schools such facilities are not available. Audio-Visual aids relevant to the subject

are available only in 11.0 percent schools. In 54.0 percent schools such material are available in poor condition. .

Similarly, books, periodicals and other printed relevant reading material on the subject, are not available in proper manner. In 54.0 schools such material are not available at all.

Study-guides, Lab manual and projects are as useful to be used as other teaching material are but only 6.0 percent teachers have indicated the presence of such material in their schools.

Modern approaches in instruction of biology such as the use and preparation of resource units but such tradition has not been established in secondary schools.

TABLE VI NUMBER & PERCENT OF THE BIOLOGY TEACHERS INDICATING THE MANNER OF EVALUATION CARRIED OUT IN TEACHING

Respondents = 120

Mode of Evaluation	Exist to Considerable Extent		Exist to some Extent		Not at all	
	No.	%	No.	%	No.	%
1. Evaluation is an integral part of instruction	33	27.5	57	47.5	10	8.4
2. A variety of standardized test are used.	11	9.16	30	25.0	55	45.8
3. Evaluation is made of the lab experiences of students	11	9.16	52	43.3	35	29.16
4. Pre-test of knowledge and attitude & ability of students is used before opting for the subjects.	20	16.6	38	31.6	39	32.5
5. Teachers made objective type test are used in the subject.	31	25.83	60	50.0	08	6.6

Evaluation is an important and integral part of teaching of biology. The situation in general is not encouraging. The above table reveals that only 28.0 percent of teachers believe evaluation an integral part of instruction. In 48.0 percent schools evaluation is carried out casually. In 80 percent schools such activities are not carried out at all. The use of variety of standardized tests in biology is not known to 46.0 teachers. Only 9.0 percent teacher have given indication of the existence of such material. Such is the situation of evaluation of the lab experiences of student in instruction of biology.

The table further reveals that only in 17.0 percent schools, teachers take test based on knowledge, ability and aptitude of students before they are allowed to opt for the subjects. In 32.0 percent schools, some care is taken for the selection of the subjects in right manner.

Teachers are expected to prepare and use their own objective type tests, but 25.0 percent of teachers have indicated the presence of such types of activity. In majority of schools, teachers do not take part to prepare and use their own made objective type test in the subjects.

III. Ascertaining Views/Comments of Biologists, Educationists and Senior Science Teachers on Certain Issues Relating to Biology Curriculum:-

Though the thrust of the problem is on the analysis of the changes and development of biology curriculum introduced at secondary level however, to get insight into the problem an "Interview Guide" was prepared for biologists, educationists and senior Science teachers, to ascertain their view/comments on certain crucial issues that may likely affect the nature, scope and future role of the subject.

The answers to questions contained in the "Interview Guide" are briefly analysed.

- ❑ In response to question 1, "What is the significant role of biology curriculum at secondary level?" majority of the respondents are of the view that biology signifies the climatic, ecological, health, agriculture and environmental aspects of human life.
- ❑ In reaction to question 2, "Do you feel that a proper linkage with science courses, and between the courses of biology at upper and lower levels has been built up? majority of the respondents are of the view, that linkage exists, between the courses of biology and other science courses both at upper and lower level. Such linkage has to be maintained to considerable extent when more new and complex concepts are introduced in future.

- ❑ In response to question 3, "In your view, what are the deficiencies in the present biology curriculum at secondary level?" Majority of the respondents have indicated that deficiencies like lack of illustrations, presence of obsolete knowledge and the problem of understanding of biological terms by children particularly studying in multi languages system exists in the curriculum.
- ❑ While reacting to Question 4 "What are the strengths in the present biology curriculum at the secondary level?" majority the respondents have not clearly expressed their view on this aspect of the course. However, some have indicated that current problems relating to environmental deterioration and health hazards have been incorporated in the course. The contribution of Muslim biologists, has been properly projected.
- ❑ In response to Question 5. "In what respect the present biology curriculum needs improvement?" Majority of respondents have suggested that the content of the course should be presented in more Islamic perspective. The linking elements should be further strengthened. Logical sequence should be maintained in the organization of the content. interrelate ship should be brought about between the units of the course. The courses should be continuously kept updated, and future revision should be based on research rather than on the opinion of the experts.

- In response to last question, "What new concepts in biology curricular should be introduced at secondary level, so that it could be made more consistent with the changing demands of the next century".

Majority of the respondents have indicated that new concepts like immunity, diseases i.e. aids, leprosy police cancer the should be leprosy introduced in the course. Moreover drugs, microbiology, industrial and pathological concept should be introduced in future. Other matters should also be looked into such as the terms be simply and clearly defined and diagrams be clearly drawn.

IV. Educationists, Biologists and Science Teachers View on the Present State of Biology Curriculum:-

- ☐ Biology provides useful information on medicine, climate, ecology, health, habitat, life adjustment and human welfare.
- ☐ A linkage between in course of biology and other science courses exists to some extent. Such relationship exists to considerable extent at lower and upper levels.
- ☐ Lack of illustration, absence of criteria for selection the content, absolute knowledge, difficulty in understanding of the biological terms by children particularly studying in multi-languages system, are some of the weaknesses pointed out by the respondents.
- ☐ The respondents have also identified certain strengths in the present curriculum such as the courses in balanced as compared to the previous course. Environment being a crucial problem, has been given due place, and the contribution of Muslim biologists has also been properly projected.
- ☐ The respondents have indicated that the present curricula should be further improved in respect of presenting the content in more Islamic perspectives. Language be made simple, sequence be maintained in the content and within the prescribed units. The emerging trends be gradually incorporated. The revision of the courses be based on research rather than

on opinion of the experts in future. The linkage between biology with other science courses be also brought about.

- ❑ In view of the respondents, the concepts like diseases (aids, cancer, polio, leprosy etc.) be introduced in the curriculum. Moreover, drugs, microbiology (industrial and medical pathological) are expected to become a part of the content in future.

FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter is devoted to principal findings derived from the study, conclusions drawn and recommendations forwarded for correcting the situation and for further improvement of Biology curriculum and its implementation position in class-room. In view of the two significant dimensions of the study, i.e. the analysis of Biology curriculum development since 1960 and looking into its operational status in the secondary schools of the selected districts of N.W.F.P. The major findings have been put into two parts. Part I summarizes findings relating to the analysis of the Biology curriculum in the historical and immediate perspectives. Part II focuses on the status of curriculum being implemented in the class room.

A. Findings:-

Part I Analysis of Biology Curriculum Development During British and Post Independence Period:-

i) British Period:-

- ☐ In early British period the rulers were not interested in education. They were more interested in consolidating political power than having concern for education for Indian people.
- ☐ Even the reconciliation policy (1785) of the government was based on political expediency than on educational consideration.
- ☐ The curriculum of 'Madrassa' for Muslims for instance, was limited to theological learning and study of classical languages. They had not adopted the true Muslim traditions of a comprehensive plan of curriculum which included Biology as an important Subject.
- ☐ The Charter Act 1813 was the first policy statement of the government on education. Its content being vague, could not provide clear direction to the development of the system but led to a long period of controversies.

- ❑ Macaulay Minutes (1835) provided a vantage point to policy makers to adopt English as a superior language and the only medium for promotion of western learning.
- ❑ Later the suppression of oriental institutions, the discontinuation of Persian as a court language in 1837 further led to the supremacy of English and the missionaries became the pioneers of the English education.
- ❑ It was the Wood Depateh 1854, which forwarded the first formal and comprehensive policy of the government on education in India.
- ❑ In secondary schools established under the direction of Depateh, English was taught as a compulsory subject. Matriculation Examination was conducted in pure arts. Teaching of natural science were neglected though their needs and importance had been recognized in 1879.
- ❑ It was in 1882, when Indian Education Commission suggested enlargement of the scope of secondary education, but no efforts were made in this respect.
- ❑ The Punjab University in its affiliated high schools had been conducting Entrance Examination in science but the subject were limited to physics and chemistry only.

- ❑ The Government Resolution 1904 affected secondary education. It suggestion diversified curriculum more related to practical life situation.
- ❑ The Government Resolution on Education of 1913 had emphasized the need for curriculum reforms, but again secondary education remained exclusively preparatory for university Entrance Examination.
- ❑ The Calcutta University Commission 1919 was silent on re-structuring secondary school curriculum.
- ❑ In Punjab, the first SLC examination was held in 1929 composed of subject viz English, Arithmetic as compulsory subjects and the elective to be taken from Group A or Group B. Group A consisted of arts subjects and Group B contained science subjects i.e. Physics, Chemistry, Physiology and hygiene. Though the importance of science subjects had been recognized in the scheme, yet biology or any of its integral component i.e. botany or zoology, had not been incorporated in the curriculum.
- ❑ The Auxiliary Committee of the Indian Statutory Commission 1929 had agreed in principle that secondary education should provide both technical and college preparatory subjects but it did not forward a detail curriculum.

- ❑ The Punjab University Enquiry Committee 1932 had suggested variety of subjects of both literary and of professional nature but again there was no clear indication of biology in the proposed curriculum.
- ❑ During the Postwar Educational Reforms Movement; the Central Advisory Board of Education Plan popularly known Sargent Scheme 1944, once again took the issue of curriculum reforms at secondary level. Two types of secondary schools i.e. Academic High Schools and Technical High Schools were proposed to be established in future. For the first time in the history of education in sub-continent biology was included in his scheme of studies of both types schools.

ii. **Post Independence Period (1947-1960):-**

- ❑ Immediately after independence the First Education Conference (Nov. 1947) provided guide-lines for the type of education to be introduced in the country. Integration of spiritual, social and vocational elements and overhauling the entire education system, were the key issues addressed in the conference.
- ❑ The participants were dissatisfied with the system of education inherited from the alien rule which intended to serve limited

utilitarian purpose and was not articulated with adequate elements of scientific and technical education.

- ❑ The Commission on National Education 1959 made a thorough analysis of the prevailing system of education, identified core problems and issues and forwarded a detailed strategy for reorganization, and re-orientation of education.
- ❑ Moreover, it regarded secondary education as a complete stage in itself.
- ❑ The Government set up separate committees for various levels in 1960, to formulate curriculum in the light of recommendations of the commission.
- ❑ The commendable work done by the Committee on Secondary Education was that it provided a highly differentiated schemes of studies.
- ❑ In science group besides core course, physics and chemistry were to be offered and one elective from variety of courses i.e. biology, physiology, hygiene, geometrical drawing and geography, were taken by the students.

Findings, Conclusion and Recommendations

- ☐ It is interesting to note that biology was offered as required course in Home Economics programme for girls in secondary schools.
- ☐ The biology course was designed as of elementary nature and high standard was not expected at this stage.
- ☐ The course left wide margin for enlarging the scope and improving the content and its organizational structure for future planner.

iii. Re-Structured Biology Curriculum at secondary Level in 1976:-

- ☐ Biology curriculum at secondary level was re-structured in the context of spirit of education policy 1972-80.
- ☐ The importance of biology in science education because of its own significance and integral part of major fields of science was recognized for the first time.
- ☐ The biology curriculum was formulated in a more formal and organized fashion.
- ☐ The content of the curriculum was extensive in nature and scope.
- ☐ The practical component of the course was adequate in coverage and development of the desired skills.

Findings, Conclusion and Recommendations

- ❑ Laboratory requirement have been spelled out for guidance of teachers and administration.
- ❑ The curriculum planners after thoroughly reviewing the existing biology curriculum has been able to identify certain weaknesses and have tried to remove them in the new course. such as.
 - ☆ The existing syllabus did not conform to the objectives of teaching of biology.
 - ☆ More emphasis was laid on memorization of irrelevant detail than understanding of principles.
 - ☆ Morphological and structural detail assumed a pre-specialization bias.
 - ☆ Social aspect of biology was neglected.
 - ☆ Due emphasis was not laid on practical work.

iv. Biology Curriculum for Classes IX - X Revised in 1986:-

- ❑ Biology curriculum was revised in 1986 with the belief that curriculum development is a continuous process rather than a sporadic efforts.

Findings, Conclusion and Recommendations

- ❑ The revision of curriculum was inspired by the spirit of the National Education Policy 1979 which aimed at improving the quantitative aspect of education.
- ❑ The revision was based on a thorough study of the existing of biology curriculum to identify strengths and weaknesses for consideration in future.
- ❑ The recommendations of the Curriculum Wing, Ministry of Education were examined by National Curriculum Committee and Provincial Curriculum Centres, Universities and other concerned organizations.
- ❑ The National Curriculum Committee while reviewing the biology curriculum came across to the following shortcomings.
 - ☆ The existing curriculum was not consistent to the aims and objectives of teaches of Biology,
 - ☆ The approach to the subject was more descriptive than thematic.
 - ☆ The syllabus did not reflect any integration of botany and zoology.

Findings, Conclusion and Recommendations

- ☆ It was lacking balance between different disciplines of biology.
 - ☆ Social aspect of biology was entirely neglected.
 - ☆ There was little emphasis on practical work.
- The course so raised is different in many attributes as compared to the previous course such as.
- ☆ Scheme like transport, reproduction and excretion have been treated as separate units, their scope has been enlarged.
 - ☆ The terms "Coordination and Behaviour in Animals" have been substituted by "Co-ordination in Multicellular Organization". The scope of unit has also been widened.
 - ☆ "Growth" has been treated as separate unit.
 - ☆ The unit on "Heredity" in the previous course has been replaced by a unit "Genetics" the nature of which is considerably different.

Findings, Conclusion and Recommendations

- ☆ The unit on "Evolution" in the existing course has been delimited.
- ☆ The revised course includes a separate unit on "Environmental Biology".
- ☆ The scope of unit on "Biology" and "Human-Welfare" has been enlarged, which includes conservation of environment.
- ☆ The new course provides a detailed frame work for preparation of text-book, allocation of time, organization of nature of training, teachers, orientation provision of the type of lab equipment, mode of evaluation and performance of practical work.

B. Conclusion:-

The British interest in education started late in 1854. It forwarded a detailed policy on development of education in India. Lord Curzon's reforms movement, centred round the problems and issues in higher education. Other levels received secondary position in policy initiatives. The concept of diversification in secondary education was provided in Government Resolution of 1904. The first S.L.C. examination in Punjab was conducted in Arts and Science groups in 1891. The science group was limited to Physics, Chemistry, Physiology and hygiene. Biology or any of its component i.e. Botany, Zoology was not included in the course. In the Post War Reconstruction of Education Movement in 1944 for the first time in history of education biology was included as an elective subject in the schemes of studies for secondary schools in India.

Immediately, after independence, government initiative took the form of convening the First Education Conference in November 1947 which provided broad guide-lines for the future system of education of the new born country. The constitution of the Commission on National Education in 1959 was again a right decision for the reorganization of the existing of education. On the recommendations of the report of the said commission, National Curriculum Committee framed a detailed scheme of studies at various levels. Biology was provided as an elective subject in science group and a required subject in Home Economics programme at secondary level. The course was however, of elementary nature.

In the light spirit of Education Policy 1972-80, the entire curriculum at secondary level was re-structured. Biology was included among the components of an integrated science course i.e. physics, chemistry and biology. The nature and scope of biology course was sufficiently broadened. Its objectives were framed guides-lines for textbook writers, teachers training programme and lab management were provided. Moreover, certain deficiencies and weaknesses were also identified to correct them in future. The role of biology as a significant field in science was recognized.

Similarly, the revision of Curriculum at school level was inspired by the National Education Policy 1979. As the thrust of reforms in the policy was on quality and relevance biology curriculum had received special treatment. The shortcomings already pointed out have been repeated. The most striking of them were the inconsistency of the content with objectives of teaching of biology, descriptive instead of thematic approach to the subject, lack of balance and integration in its related components and more particularly, the absence of social relevance and less emphasis on practical work. The content of the new courses reveals that certain pressing issues i.e. environment, human welfare and practical approach to the subject. have been emphasized.

Inspite of the fact that biology has been accorded a distinct place in science education had its operational in the class room is much frustrating. Unfortunately, its infra-structure has not been developed to realize its objectives. Constraints of grave nature are being faced by teachers and administrators of the schools. The significant failings as observed, are the theoretical and description approach to

teaching of biology in the absence of adequate physical and material facilities. Alienation of the subject from the reality of life is an other drawback of the present instructional programme. Teachers teach the subject but they lack sophisticated knowledge, understanding and skill. Students too study the subject without having interest and aptitude for it. In view of such disquieting situation two pronged strategy need to be evolved in future i.e. the development, improvements of infrastructure for effective teaching of biology and to keep the revision of its curriculum a dynamic and continuous process so that it could take cognizant of the emerging trends, changing concepts in the revolutionary nature of scientific and technological development that will characterize more conspicuously the next century.

C. Recommendations:

In this section, the recommendations are based on the analysis of biology curriculum and its implementation status in the class-room. These recommendations centre round issues like consolidation of curriculum requirements, improvement and development of physical infra-structure and further enrichment of the curriculum and its teaching-learning process.

1. Consolidation of curriculum requirements:-

- ❑ Curriculum is a dynamic and a continuous process, and be treated as it is. The policy of adhocism and slipshod approach be stopped. Curriculum should be continuously revised in the light of emerging trends, modern philosophies and changing requirements of the society.
- ❑ Education policies have provided guiding spirit for curriculum change, emphasizing the shift of emphasis from theoretical to more practical approach to the subject. Therefore, concrete steps are needed to be taken towards learning of concepts relating to physical and biological environment, skills and to develop observation, exploration, experimentation, practical work, and creative expression.

- ❑ In spite of the fact, that biology has been recognized as playing a distinctive role in science education but it is still treated in isolation to its interrelated disciplines i.e., physics and chemistry, botany and zoology are taught separately. These superficial boundaries should be given away with at secondary level.
- ❑ The achievement of above objectives i.e., to bringing about integration in the related disciplines depends upon the knowledge, ingenuity and competence of teachers and need to be developed through careful training programme in future.
- ❑ The curriculum in vogue, enjoys certain attributes over the pervious curriculum such as considering the future academic pursuits of students in biology and other related disciplines, achieving a balance in exposure of students to biological, botanical and zoological concepts and information, vertical lineage at lower and upper levels, emphasizing social and practical aspects of the subjects. Again, understanding of all these intricacies by teachers need conscious efforts on the part of planners of teacher training programme in future.
- ❑ The curriculum once formulated or revised is not the last word to be taken for granted, it leaves behind certain deficiencies, which are usually to the identified by successive curriculum planners. Such

deficiencies, instead of repeating them again and again be removed once they are spotted out.

- ❑ The revision of biology curriculum be treated on research basis and not on the ground of opinion of experts in future. The university faculty of science, and IER's are expected to play significant role in such undertaking. The findings of such researches are hoped to provide guide-lines in formulation, revision of curriculum to Ministry of Education.
- ❑ The teaching of biology should not be confined to the teaching of text book only. Guide-books, with sufficient background information for teaches, lab manuals for students for the development of requisite skills, should also be simultaneously prepared and to be regularly used by teachers.
- ❑ Only trained qualified science graduates who have studies botany/zoology at least at B.Sc. level, be appointed to teach biology in secondary schools.
- ❑ A regular at least 4 weeks in-service training programme be launched immediately after the revision of the course. Due consideration be given to the understanding of new concepts incorporated in the curriculum.

- ❑ As observed, all the revised curriculum emphasized practical work to be done by the students. In training programmes. Due attention be given to this important components. The requisite facilities be also provided to teacher during their training.
- ❑ The existing B.Ed programme relating to teaching of biology be correspondingly revitalized because the curriculum in science education has already been changed at secondary level.
- ❑ An exclusive course in Laboratory Management be introduced for teachers as a part of their pre-service or inservice training. Organization and planing of physical facilities, procurement, recording, storage and maintenance of biological material and safety arrangement etc. be emphasized in such courses.
- ❑ Writing of text-book is a serious matter. The text books written in the past, in biology have been deficient in many respects such as presenting unnecessary details, presence of numerous factual and typographical mistakes, incomprehensible pictures, and diagrams, absence of inquiry approach etc. Such situations needs to be corrected in future. It is, therefore, specifically recommended that:
 - ☆ Competent persons for writing of text books be involved in future.

Findings, Conclusion and Recommendations

- ☆ Proper incentives and recognition be given to such authors.
- ☆ Text book be updated in view of changing concepts, principles and trends as a result of tremendous accumulation of knowledge regarding life science during the last two decades.
- ☆ The tendency of over crowding the students with unnecessary details of description and terminology be avoided.
- ☆ Special attention be given to the quality of text book with fully illustrated relevant information.
- ☆ Questions incorporated as part of the teaching method, should test students understanding of concepts, principles rather than inviting simple recall or recognition.
- Teachers be directed to prepare a detailed schedule of work both in theory and practical for the completion of the prescribed course well in time. The progress of work be properly mentioned by head of the institution.
- For inculcating sustained habit of work in students, teachers be encouraged to arrange home-tests on monthly basis. The teachers

should make use of his own made objectives type-tests. The result of these tests be properly recorded and reported to children and parents.

- ☐ In view of linking teaching of biology with life-situation, teachers should be encouraged to undertake extensive field trips to observe and study various ecological situations and diversity of living organisms.

2. *Improvement of Physical Infra-structure:-*

The existing infra-structure for effective teaching of biology needs to be improved and developed. The following types of physical and material be adequately made available in the class-room and laboratory of the school.

- ☐ Class-room space for teaching and its furnishing.
- ☐ Lab space for demonstration/experimentation and its furnishing.
- ☐ Water, gas and power supply and other necessary facilities in the lab.
- ☐ Storage arrangement for equipment and material.
- ☐ Safety arrangement.

- ☐ Exhaust fans.
- ☐ Equipment and material for demonstration and experimentation.

3. **Enrichment of the Curriculum:-**

For more meaningful implementation of biology curriculum requirements, the programme should be further enriched with the types of facilities stated below:

- ☐ Well selected and easily accessible books, periodicals on the subjects for teachers and students.
- ☐ Resource units and teaching guides, for teachers.
- ☐ Study guides, Lab manual and project materials for students
- ☐ Appropriate types of audio-visual aids i.e. charts, models, slides, and projectors.
- ☐ Projects.
- ☐ Catalogue for selection of equipment, supplies and services.
- ☐ A set of item pool to be used in objective-type evaluation.

- ❑ Tests, batteries inventories etc. relating to the course be used for pre-testing of students before they are allowed to opt for the subject.

4. **Other Related Facts:-**

- ❑ The nature and scope of biology curriculum be widened horizontally or vertically and absorb new concepts and trends which are pouring in scientific disciplines.
- ❑ The linkage within biological components, between biology and other science and between the courses of biology at lower and upper levels, be properly built up. Such linkage would become vital when the subject is presented in more sophisticated manner in future.
- ❑ The subject be presented in more illustrative, simple language and logical fashion. The terms be explained both in English and national languages so that the problem of children understanding of the term studying in multi-language system, could be solved.
- ❑ The environment which has been give due place in the curriculum be supported by practical activities so that child could really make contribution to its restoration.

- ❑ Curriculum development is a dynamic process and new concepts will be added in scientific discipline. Such concepts be tested on the criterion of consistency and relevance before there are incorporated or integrated in the curriculum.

5. **New Directions:-**

The country is fast moving towards entering the 21st century whose demands are more complex and challenging. An effective development of science programme at school level, will truly provide a firm bed rock for the super structure of scientific and technological development at higher level in future. In this context science education (with special reference to biology) and teacher's preparation need to be re-oriented. The following "new directions" in the light of overall nature and outcome of the study, are forwarded to provide further vitality and spirit for effective and meaningful teaching of the subject in future.

- ❑ Curriculum does not develop in vacuum. It is inextricably interwoven with social fabric that sustains it. The Curriculum change must take cognizance of institutional and normative developments in society and in education.
- ❑ The "working teacher" must be involved in Curriculum change. This can be done at the grass-root level through discussion, conferences on common problems, research, organizational diagnosis and organizational experiment.

- The emerging trends and the “Changed emphasis” in Curriculum and teaching modalities must be taken in view which are evident in the shift from content values of Curriculum to process values of Curriculum, from controlled and prescribed learning to self-planning self-directions learning, from the subject matter and skills to the growth in behaviour and conduct and from question-answer recitation to children taking initiatives and group discussion. Such are the attributes which have characterized secondary education in the developed countries.

- Moreover, if we intend to prepare perspective teacher well equipped to meet the challenges in science education at school level in the 21st century, then their training programme will have serious implications. Such as:
 - ☆ The objectives of teacher training programme will be more functional. The teacher will need to get opportunities to analyze, investigate and evaluate factors that affect teaching-learning process and situation.

 - ☆ They will need to understand and experience the investigative nature of biology as well as orientation of class room and laboratory experience.

 - ☆ They will need sound understanding of the nature of learning and how it can be applied to learning of biology in the class room.

- The concept of “Practicum” be effectively materialized in teaching of biology in training institutions so that the trainees may have exposure to varied experiences such as:

- ☆ Procedural analysis of curriculum change and development.
- ☆ Analysis of objectives of biology curriculum.
- ☆ Formulation of objectives of biology curriculum.
- ☆ Analysis of textual material in biology.
- ☆ Preparation of model lesson in biology.
- ☆ Observation of teaching of biology in the class room.
- ☆ Development of test items.
- ☆ Development of low cost material.

- The monotonous “teacher-centred” approach be relaxed to “student-centred approach”. Efforts be directed towards adopting new methods such as:

- ☆ Problem-solving.
- ☆ Inquiry-approach.
- ☆ Field Study/trips.
- ☆ Teacher-directed experiment.
- ☆ Open-ended experiment.

□ The use of resources outside the class room and school, are expected to enrich the teaching of biology. The following types are most relevant to be used:

- ☆ Computer Software
- ☆ Teacher resources centre
- ☆ Museum and herbarium
- ☆ Biological garden/corner.
- ☆ Biological club.
- ☆ Biological Bulletin Board/Display

6. **Recommendations for further Researches:-**

The following recommendations are forwarded for similar studies to be undertaken on different aspects and levels of biology curriculum.

- ❑ A comparative study of biology curriculum offered at elementary and secondary level, determining their linkage and integration.
- ❑ A comparative study of biology curriculum offered at secondary and higher secondary levels.
- ❑ A comparative study of the modes of operation of biology curriculum offered in Boys and Girls high schools in N.W.F.P.
- ❑ Assessing the internal efficiency of the instructions offering biology course in High Classes (IX-X)
- ❑ Assessing the competence of teachers who have been assigned to teach biology in secondary schools in N.W.F.P.
- ❑ A comparative study of biology curriculum in Pakistan with other selected Asian countries to determine their scope and relevance.
- ❑ A study of changes brought about in biology curriculum in selected advance countries.

Findings, Conclusion and Recommendations

- ❑ A study of the low cost/no cost material prepared and used in teaching of biology at elementary and secondary levels in Pakistan.
- ❑ A study of the relevance of biological concepts integrated in science curriculum at primary and elementary levels, in Pakistan.
- ❑ A study of the relevance of biological concepts integrated in general science curriculum for higher classes (IX-X) at secondary level in Pakistan.

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**A STUDY OF THE CHANGES AND
DEVELOPMENT OF BIOLOGY CURRICULUM
OFFERED AT SECONDARY LEVEL
SINCE 1960**

Dear Madam,

A study of the Development of Biology Curriculum offered at secondary level, has been undertaken by the researcher. Such an exercise would be incomplete if the views of the concerned teachers on the nature of curriculum, are not ascertained, their problems are not identified and their suggestions are not invited for further improvement of the course and its implementation status.

For this purpose a QUESTIONNAIRE has been prepared and is submitted to you for necessary action. Your responses will be of great value for the study. These will be kept confidential and will be used for research purpose only.

Direction

The Questionnaire is mostly consists of statement/items on different aspects of Biology Curriculum.

These choices are given against each statement/item. Please mark () in blank against each, where it falls according to your view on the scale.

Thank you for your kindness and cooperation.

Yours Sincerely,

RESEARCHER,
Institute of Education & Research,
University of Peshawar.

QUESTIONNAIRE

I. Biological Curriculum: Its Nature and Operational Status:-

S.No.	Statement	Exist to Considerable extent	Exists to some extent	Not at all
1.	The emphasis is on scientific principles, discovery, understanding and application.	_____	_____	_____
2.	The emphasis is on development of desirable attitudes, interests and appreciation related to the subject.	_____	_____	_____
3.	There is recognition of and preparation for the role of biology in evolving a better human life and environment	_____	_____	_____
4.	The curriculum in biology offers opportunity to students to study biological phenomena.	_____	_____	_____

S.No.	Statement	Exist to Considerable extent	Exists to some extent	Not at all
5.	Provision is made to meet the needs of students with special interest and ability on the subject	_____	_____	_____
6.	Efforts have been directed in the curriculum towards discovering able students and encouraging them to seek career in the subject	_____	_____	_____
7.	Emphasis is on learning in classroom laboratory situation, investigation and experiment.	_____	_____	_____
8.	Opportunities have been provided to students to participate in the methods and principles of the subject to the investigation of problems of living.	_____	_____	_____

S.No.	Statement	Exist to Considerable extent	Exists to some extent	Not at all
9.	Provides opportunity for students to design and construct apparatus equipment/materials re- quested for the subject	_____	_____	_____
10.	Acquaints students with recent trends and deve- lopment in biology.	_____	_____	_____
11.	Any other.			

II Constrains in Effective Implementation of Biology Curriculum:-

A. Physical Facilities:-

S.No.	Physical Facilities	Adequate	Inadequate	Missing
1.	Class room/Lab space for teaching/ demonstration.	_____	_____	_____
2.	Water, power, storage and other necessary utilities.	_____	_____	_____
3.	Provision of equipment, material & aids._	_____	_____	_____
4.	Safety arrangement in the laboratory.	_____	_____	_____
5.	Light , Ventilation, Exhaust fans etc.	_____	_____	_____

B. Staff Characteristics:-

Staff Characteristics	Possess to considerable extent	Possess to some extent	Not at all
1. The teaching staff give evidence of understanding of the subject.	_____	_____	_____
2. The teaching staff give evidence of upto date knowledge of the methods of teaching.	_____	_____	_____
3. The teaching staff give evidence of recent development in the area of biology in which they are teaching.	_____	_____	_____
4. Teachers are familiar with community resources in the teaching of biology.	_____	_____	_____
5. Teachers keeping themselves abreast of the recent developments in knowledge of biology and methods of teaching.	_____	_____	_____

C. Instructional Activities:-

S.No.	Instructional Activities.	Exists to Considerable extent	Exists to some extent	Not at all
1.	Instruction in different institution	_____	_____	_____
2.	Community & environmental resources are used in instruction.	_____	_____	_____
3.	The emphasis is on problem & solving.	_____	_____	_____
4.	A.V.Aids/Field trips & exhibition are used in instruction.	_____	_____	_____
5.	Students are encouraged to undertake projects.	_____	_____	_____

D. Instructional Materials:-

S.No.	Instructional materials.	Adequate	Inadequate	Missing
1.	Equipment/materials for demon- stration.	_____	_____	_____
2.	A.V. Aids relevant to the sub- ject.	_____	_____	_____
3.	Books,periodicals,pamphlets references.	_____	_____	_____
4.	Study Guides, Lab manual,proj- ects etc.	_____	_____	_____
5.	Resource units, teaching aids.	_____	_____	_____

E. Evaluation:-

S.No.	Statement	Exists to considerable extent	Exists to some extent	Not at all
1.	Evaluation on an integral part of the instruction.	_____	_____	_____
2.	A variety of standardized texts are used.	_____	_____	_____
3.	Evaluation is made of the labo- ratory experiences of students.	_____	_____	_____
4.	Pre-test of knowledge, attitude & ability of students is used before opting for the subject.	_____	_____	_____
5.	Teachers made objective type tests are used the subject.	_____	_____	_____

III Suggestions for the Improvement of Biology Curriculum. Please Give Suggestions for the Improvement of Biology Curriculum:-

1. In what respects there is greatest need for improving Biology Curriculum?

a. _____

b. _____

c. _____

2. In what respects there is greatest need for improving physical/material facilities for effective implementation of Biology Curriculum?

a. _____

b. _____

c. _____

3. In what respect there is greatest need for improving the professional competence of teacher?

a. _____

b. _____

c. _____

Appendix B

INTERVIEW GUIDE FOR SCIENCE TEACHERS, BIOLOGISTS AND EDUCATIONISTS

Dear Sir/Madam,

I feel pleasure to introduce you Miss Shafqat Perveen, a faculty member of I.E.R who intends to undertake her doctoral research on the 'development of Biology Curriculum at secondary level in Pakistan'. Though the thrust of the curriculum, however, an enquiry into its present nature and determining its future status is also thought desirable to be looked into.

An Interview Guide has been prepared for this purpose. You are requested to kindly give your views, comments on the problem. Such views, comments are considered to be very valuable for this study. Your answers will be kept confidential and will be used for research purpose only.

Thank you for your kindness and cooperation.

Your's sincerely

|

DR. S. A. GHAFAR

Dated 30th June, 1995

Advisor,

Associate Professor,

IER University of Peshawar

PROPOSED QUESTIONS FOR INTERVIEW WITH EDUCATIONISTS, BIOLOGISTS AND SCIENCE TEACHERS

1. In your view, what is the significant role of Biology curriculum in science education at secondary level?

2. Do you feel that a proper linkage with the science courses and between the courses of Biology at lower and upper level has been built up?

3. In your view, what are deficiency in the present biology curriculum at secondary level?

4. In your view , what are the strengths in the present Biology curriculum at secondary level?

5. In what respect, the present Biology curriculum needs improvement?

6. What new concepts in Biology curriculum should introduced at secondary level so that it could be made more consistent with the changing demands of the next century?

**REPORT
OF THE
SECONDARY EDUCATION
PART III
GENERAL INTRODUCTION, SCHEME OF
STUDIES
AND SYLLABUSES FOR SECONDARY
STAGE
(CLASS IX & X)
ECRIU
EDUCATION COMMISSION'S REFORMS
IMPLEMENTATION UNIT
MINISTRY OF EDUCATION
GOVERNMENT OF PAKISTAN
RAWALPINDI
1960**

Biology:-

Part I:-

1. External morphology and functions of Root stem, leaf and flower of the mustard plant with particular emphases on the following :-
 - (1) Root: absorption of water; osmosis.
 - (2) Stem: ascent of sap; experiment with essin.
 - (3) Leaf: photosynthesis and respiration, Demonstration experiments to show that CO_2 is absorbed and O_2 is produced during photosynthesis.
 - (4) Transpiration: demonstration experiment(s) to show loss of water by transpiration.
 - (5) Seed: conditions necessary for germination.
2. Pollination in flowering plants.
3. Dispersal of fruits and seeds.
4. Economic importance of plants.
5. A broad distinction between flowering and non-flowering plants e.g. confer, fern, toad stool, moss, lichen and algae.
6. Adaptations of plants to the following ecological conditions:

- (1) Desert life.
- (2) Water logged area.
- (3) Epileptic life on a jungle.

Part II:-

1. The frog or the toad is to be studied as a type animal with particular attention to the following systems of its body:-

- (1) Digestive system; feeding, digestion and assimilation.
- (2) Circulatory system and functions of the blood.
- (3) Respiratory system and excretory system.
- (4) Nervous system; brain, spinal cord, nerves and sense organs.
- (5) Reproductive system; life history.

Note: Discussion of the subjects enumerated above should be very elementary. Its standard is expected to be far lower than that of the same subjects at the Higher Secondary Stage.

2. The Cell and its structure.
3.
 - (1) Differences between plants and animals.
 - (2) Differences between living and non-living things.

4. Demonstration of the following experiments to be given by the teacher and a record should be made by the pupil:-
- (1) Osmosis through a membrane.
 - (2) Simple reflex action in a frog's leg.
 - (3) Flow of blood in a web.
 - (4) Action of enzyme on (a) starch. (b) butter. (c) albumen.
 - (5) A broad distinction to be made between the following animals on the basis of primary external homologous features:-
Worm, grass hopper, snail, toad, lizard, pigeon, and rabbit.
6. A general practical demonstration should be given on respect of the above types.
7. Habits and adaptations of animals and association animalplant community should be studied either in a pond of an orchard.

Written paper .. 75

Oral Examination .. 25

Total Marks .. 100

Appendix **D**

**GOVERNMENT OF PAKISTAN
MINISTRY OF EDUCATION
&
PROVINCIAL COORDINATION
BIOLOGY CURRICULUM
FOR SECONDARY CLASSES
(IX-X)**

**NATIONAL CURRICULUM COMMITTEE
NATIONAL BUREAU OF CURRICULUM AND
TEXT BOOKS
ISLAMABAD
1976**

Introduction:-

1. Place of Biology in Science Education:-

Biology plays an important role in science education because of its own significance and because it is a part of the major field of science itself. From the education point of view one of the chief values of Biology is that it brings together the methods and results of a number of other sciences. Biology draws on Physics, Chemistry and Mathematics, and acts as an integrating agent.

2. Aims and objects of Teaching Biology at the Secondary School Level:-

The aims and objects of teaching Biology at the secondary schools level are to provide students with necessary knowledge, skills and attitudes so that they may:

- i. Understand the World of nature, physical and biological, and be able to interpret natural phenomena;
- ii. gain a better understanding of the meaning and purpose of life;
- iii. participate more effectively in solving problems of the human society;

- iv. maintain and improve their health and share in the responsibility for protecting the health of the community by applying their knowledge of Biology.
- v. attain an emotionally stable personality and make a worthy social adjustment;
- vi. utilize a scientific approach towards solving problems dealing with the society and human welfare.

3. Review of the Existing Biology Syllabus:-

The National Curriculum Committee in Biology, before formulating the new curriculum, studied and reviewed the existing syllabus and found the following short-comings:

- a. Syllabus does not conform to the standard of the aims and objectives of teaching Biology.
- b. More emphasis placed on memorization of useless details than on the understanding of useful principles.
- c. Morphological and structural details show a prespecialisation bias.
- d. Social aspect of biology entirely neglected.

- e. No emphasis on practical work.

4. **Guidelines:-**

The National Biology curriculum Committee formulated the following guidelines for framing a new syllabus:

- a. It should contribute to a gaining of knowledge about Biological phenomena as well as to training in scientific method.
- b. Instead of being an exercise in memorization, it should convey an understanding of principles underlying living phenomena.
- c. Biological knowledge must be used in direct application to society and to provide skills and attitudes which are relevant to social living.
- d. It should present an integrated course in biology. The division of contents into Botany and Zoology should be done away with.

III. Recommendations:-

1. Textbook and Teacher's Guide:-

Since this syllabus is going to be introduced in all the Secondary Schools of the country, the National Curriculum Committee for Biology strongly recommends that only one Textbook and one Teacher's Guide should be prepared for the whole country. This will ensure a uniform standard of teaching of the subject.

It is suggested that all the Provincial Textbook Boards should jointly produce a manuscript, for the writing of which each Board should approach a senior biologist. The panel of authors should include two botanists and two zoologists. [The Convener of the National Curriculum Committee for biology should act as Editor-cum-Coordinator.]

Immediately after the finalization of the panel of authors a meeting should be called to allocate chapters to the authors, prepare the guidelines and determine the size and the scope of the Textbook and the Teachers' Guide.

2. Teacher's Qualifications:-

Only trained science graduates who have studied Botany Zoology in the B.Sc. should be employed to teach Biology in the Secondary Schools.

3. Teacher's Training Programme:-

A regular 6-8 weeks' teacher's training programme should be started immediately in cooperation with the Universities, and which should run throughout the year. In the training programme due attention should be given to practical work it is suggested that a course on teaching of Biology should also be included in the B.Ed. curriculum.

4. Other Recommendations:-

In order to teach the subject effectively each school must be provided with necessary laboratory facilities. The minimum requirements are given under 'V' below:

Before the subject is introduced in a school, an inspection must be carried out to ascertain whether there exist the requisite laboratory facilities.

IV. Syllabus

(Class IX)

Theory	No. of Lessons ¹
1. <u>Introduction</u>	3
Definition of biology; brief history of biology; contribution of Muslims to biology; major divisions of biology; methods in biology; role of biology in general education.	
2. <u>Nature and Origin of Life</u>	2
Nature of life; origin of life on earth; conditions on the earth when life originated.	
3. <u>Structural Organization of Organisms</u>	29
i) The cell; Cell structure; plant cell; animal cell.	
ii) the structure of single-celled organisms: Euglena, Chlamydomonas, Amoeba, Paramecium.	
iii) The structure of multicellular organism. Brassica,-External characters; internal structure of the root, stem and leaf; study of the flower and the fruit.	

¹The number of lessons suggested for each chapter indicates the scope of the subject matter.

Frog,-External characters; brief account of the digestive, circulatory, respiratory, urino-genital and nervous systems.

4. Diversity in Living Organisms 22

- i) Principles of classification.
- ii) Brief account and examples of the following groups:
Virus; Bacteria; Algae; Fungi; Mosses; Ferns;
Gymnosperms; Flat worms; Angiosperms.
Protozoa; Sponges; Coelenterates; Round worms;
Annelids; Arthropods; Mollusks; Fishes;
Amphibians; Reptiles; Birds and Mammals.

5. Food and Energy 26

- i. Manufacture of food by plants:
Raw materials required; entry of raw materials into plant cells-diffusion and osmosis; absorption of raw materials; photosynthesis.
- ii. Other methods of obtaining food by plants:
Parasites.-Stem and root parasites; saprophytes; insectivorous plants.
- iii. Storage of food by plants:
- iv. Ways of obtaining food by animals:
Herbivores; carnivores; omnivores; parasites; saprophytes; symbionts.

- v. Digestion and assimilation of food by animals:
Digestion of carbohydrates, proteins and fats;
absorption of food.
- vi. Transportation:
Plants.-Ascent of sap; transportation of
manufactured food. Animals.-Blood and lymph;
circulatory mechanism; transport of oxygen and
carbon dioxide.
- vii. Respiration and release of energy;
Aerobic and anaerobic respiration; energy release
as a result of glycolysis and oxidative metabolism.

Practical

- PRACTICAL 1. Microscope: Examination and its handling.
- PRACTICAL 2. Onion peel and frog's skin casting.
- PRACTICAL 3. Examination of living Euglena and Chlamydomonas.
- PRACTICAL 4. Examination of living Amoeba and Paramecium.
- PRACTICAL 5-8. Study of Brassica Plant:
Internal structure of the root, stem and leaf, study of the
flower and the fruit.

- PRACTICAL 9-14. Dissection of frog: Digestive, Circulatory, respiratory, urinogenital and nervous systems; study of skeleton.
- PRACTICAL 15-17. Demonstration of osmosis; demonstration of passage of water (coloured red) in the plant; demonstration of photosynthesis, using an aquatic plant; starch test and starch printing; using light screen; demonstration of transpiration.
- PRACTICAL 18. Storage of food as exemplified by ginger, onion, potato and radish.
- PRACTICAL 19. Study of insectivorous plants by means of models and charts.
- PRACTICAL 20. Enzyme tests on Carbohydrates and Proteins.
- PRACTICAL 21. Demonstration and release of carbon dioxide and intake of oxygen in plants.
- PRACTICAL 22. Demonstration of anaerobic respiration in a germinating seed.
- PRACTICAL 23-24. Field trips to study and collect local plants and animals.

Note.—Each practical will consist of two periods. The candidates will be required to maintain practical book which will be presented to the examiner.

(CLASS X)

Theory	No. of Lesson
1. <u>Excretion</u> Animals.-Excretion of carbon dioxide and nitrogenous waste; working of the mammalian kidney. Plants.-Excretion of carbon dioxide and poisonous substances.	5
2. <u>Movement And Locomotion</u> i. Movement and locomotion in plants: Taxis; tropism (geotropism; phototropism); sleep movement; locomotion in Chlamydomonas/Euglena. ii. Locomotion in animals: Types of locomotion (amoeboid, flagellar and ciliary); locomotion in earthworm; fish and snake, insect flight; bird flight; flying mammals.	6
3. <u>Coordination And Behaviour In Animals</u> i. Nervous coordination: Nerve impulses and their transmission; reflex action. ii. Hormonal coordination:	6

Endocrine glands; hormones and their functions.

iii. Behaviour:

Conditioned reflexes, innate behaviour: learned behaviour.

4. Growth

9

i. The cell multiplication.

ii. Growth in plants:

Germination as illustrated by Castor seed; condition necessary for germination; primary growth and its phases; mechanism of growth; hormonal control of growth; secondary growth; flower formation; photoperiodism.

5. Reproduction And Development

28

i. Asexual reproduction:

Binary fission; budding; fragmentation; regeneration; spores.

ii. Sexual reproduction:

General considerations; biological significance; meiosis.

Plants.-Gametogenesis; pollination; fertilization; seed and fruit formation; dispersal of seeds.

Animals.-Gametogenesis; fertilization; protection and nourishment of the embryo; brief account of the development of frog.

iii. Life cycles of Adiantum and Frog.

iv. Parthenogenesis.

5. Heredity 10

Chromosomes; nucleic acids; genes; mutations; Mendelian laws of inheritance; alleles; genotype and phenotype; dominance and recessiveness; sex-determination; inheritance of sex-linked characters; twins; hereditary diseases and blood groups.

7. Evolution 8

Historical background; evidences of evolution; comparative anatomy, embryology, palaeontology and classification; theories of evolution; Lamarckism and Darwinism.

8. Interrelationship Of Organisms And Their Environment 5

Ecosystem and its components; balance in nature adaptations of plants and animals to their major habitats (marine, freshwater, desert and forests).

9. Biology And Human Welfare 6

Biology and its relation to agriculture, biology and its relation to food, clothing, furniture and fuel; biology and its relation to human health; diseases (tuberculosis,

pneumonia, cholera, typhoid, polio, influenza and ring worm); immunity; antibiotics; genetic improvement of plants and animals.

Practical

- PRACTICAL 1. Demonstration of movement in plants, using a Mimosa plant.
- PRACTICAL 2. Demonstration of reflex action in Frog.
- PRACTICAL 3. Demonstration of Cell division by models/charts and prepared slides.
- PRACTICAL 4. Measurement of growth in expanding leaf and growing root by means of marking methods.
- PRACTICAL 5. Demonstration of meiosis by means of models/charts and prepared slides.
- PRACTICAL 6. Germination of Castor/gram seed.
- PRACTICAL 7. Study of external characters of gametophyte and saprophyte of Adiantum,

- PRACTICAL 8. Study of major parts of fruits: Maize, Brassica, pea, apple, mango and tomato.
- PRACTICAL 9. Demonstration of embryonic stages of frog by means of models, charts and prepared slides.
- PRACTICAL 10. Study of the life cycle of Frog by means of charts, models and preserved specimens.
- PRACTICAL 11-14. General survey of the representatives of the various groups of the organisms mentioned in the textbook.

V. Laboratory Requirements:-

1. Apparatus:- (CLASSES IX-X)

Dissecting Microscopes (TWO); Compound Microscopes, giving a magnification upto 200 (TWO); Photometer (ONE); Dissecting Box (ONE); Dissecting dishes (ONE for a group of 4 students of Class IX); Slide Projector, simple type (ONE).

2. Glassware:-

Bell Jars, Large size (FOUR); beakers, 250 cc, 500 cc, 1000 cc (SIX of each size); funnels, 4" and 6" dia (SIX of each size); measuring cylinders, 100 cc. (SIX); test tubes (TWO dozen); petri dishes, 4" dia (SIX dozen); watch glasses

(SIX dozen); conical flasks (SIX); reagent bottles (SIX dozen); microscopic slides (TWELVE dozen); cover slips (ONE oz.); glass tubing; spirit lamps (SIX); Thistle funnels (SIX); glass aquaria (TWO).

3. Nature History Specimens:-

Preserved specimens of plants and animals mentioned in the syllabus.

4. Prepared Microscopic Slides:-

Amoeba; Paramecium; embryonic stages of frog (one set); T.S. of stem, root and leaf of Brassica; T.S. of stem and leaf of a monocot.

5. Models:-

Mitosis; meiosis, life cycle of a fern; sporangium and prothallus; L.S. and T.S. of stem; T.S. of leaf; anthers; L.S. of ovary; different forms of ovules; models **Amoeba, Paramecium**, dissected frog; developmental stages of frog; models insectivorous plants.

6. Charts:-

[Cell structure; cell division; Paramecium; Euglena; Chlamydomonas; fern; castor seed; cogenesis; spermatogenesis; placentation; development of frog; spermatogenesis; T.S. of root, stem, leaf; flowers; Mendelian Laws.

7. **Chemicals:-**

Rectified spirit; chloroform; formalin; acetic acid; eosin; diastase, trypsin, iodine and glycerine.

Appendix **E**

**GOVERNMENT OF PAKISTAN
MINISTRY OF EDUCATION**

**REVISED
BIOLOGY CURRICULUM
FOR
CLASSES IX-X**

**NATIONAL BUREAU OF
CURRICULUM & TEXT BOOK
ISLAMABAD
1986**

1. Introduction:-

A revision of existing curricula has been long overdue. This has been especially so in view of aspirations to bring curricula in consonance with national objectives, with emphasis on learning of Scientific concepts and scientific methodology leading to creative thinking, achievement of skills and an appreciation of importance of Science for the development of society. The existing curricula have generally not yielded the desired results.

A meeting of the National Committee was held in Islamabad from October 29- November 1, 1984 to critically evaluate the existing biology curricula at different levels and frame the future curricula in the light of working paper developed by a two member authors committee. The shortcomings of prescribed textbooks, present institutional resources, problems of teachers and mental level of students at each level in relation to learning process have also been taken into account while revising the curricula.

In revising the curricula full consideration has been given to future academic pursuits of students in the disciplines of Biology, Botany, Zoology and Medicine. The committee has strived to achieve a balance in exposure of students to biological, botanical and zoological concepts and information. Vertical linkage with a view to achieving continuity, introduction of new concepts and the quantum of information at different levels have been given due consideration. Subject content and themes have been indicated to ensure that students learn new concepts as they progress from Class VI-VII. The members of the committee have thus

attempted to develop curricula enabling the teacher and the student to teach the desired results.

2. Shy Curriculum Change:-

The National Curriculum Committee for revision of Biology curricula for classes VI-XII, studied and reviewed the existing Biology curricula at different levels and found the following shortcomings:

- a. Approach used in existing syllabi does not conform to the aims and objectives of teaching Biology.
- b. More emphasis is based on the memorization of meaningless descriptive details than on the understanding of useful basic themes. In other words the approach to the subject was descriptive and not thematic.
- c. Existing syllabi did not show any integration of Botany and Zoology and there is need to develop syllabi reflecting the spirit of Biological to both the plants and animals.
- d. Existing syllabi did not show any balance between different disciplines of Biology.
- e. Environmental Public Health and Agricultural aspects of biology were entirely ignored.

- f. There was little emphasis on practical and field work.

The National Committee for revision of Biology syllabi formulated the following guidelines for developing new syllabi:

1. The emphasis should not be on the teaching of Botany and Zoology as separate subjects in the same books but to elucidate Biological themes and concepts applicable both to plants and animals.
2. Presentation of subject should stimulate thinking about the subject and appreciation of Biological themes.
3. Should encourage observation, explanations, experimentation and creative expression.
4. To inculcate the ability to apply Biological knowledge to our social problems.

3. Place of Biology at Secondary Level:-

Biology plays an important role in science education because of its own special need and because it is part of the major field of science itself. From view point of education, one of the chief valued of Biology is that it brings together the method and results of a number of other sciences. Biology draws on Physics, Chemistry and Mathematics and acts as an integrating agent. Above all Biology can also help

us understand ourselves and the world we live in. The great ideas of Biology i.e. evolution, Ecosystem, the chemical and physical basis of life have influenced at fields of human thought.

4. Aims and Objective (IX-X):-

- to understand the world of nature, physical and Biological processes and be able to integrate the natural phenomena;
- to have some appreciation of the background of the work done by the Muslim Scientists in the field of Biology;
- to participate more effectively in solving problems of the human society and survival;
- to develop an understanding of the primary needs of mankind i.e. food, clothing and shelter and they are provided by nature;
- to maintain and improve human health and to ensure the health of the community by applying knowledge and skill by teaching of Biology.
- to gain a better understanding of the meaning and purpose of life;

- to understand the relation and importance of organisms and environment and their effect on each other;
- to utilize the scientific processes towards solving problems dealing with the individual-society and human welfare.

5. Content of Biology for Classes IX-X:-

1. Introduction:-

Definition of Biology (Quranic teachings about animals and plants.) Contribution of Muslim Biologists. Major Division of Biology (Botany, Zoology and Microbiology). Methods in Biology. Significance and relevance of Biology to Society.

2. Nature and Origin of life:-

Nature of life; Islamic concept about life and origin of life on earth; Conditions on the earth when life originated (Biogenesis and abiogenesis, Redi's) experiments.

3. Structural Organization:-

- i. Cell as unit of structure and function. Cell and organismal theory; Plan cell and animal cell. A brief description including the ultra

structure of cell organelles. (Brief description of mitosis and meiosis).

ii. Tissues and Tissue systems;

a. Plant Tissues : Meristematic and permanent tissues, dermal tissue, ground tissue, supporting tissue and conducting tissue. (Only the basic structure and functions).

b. Animal tissues : Epithelial tissue, Connective tissue, nervous tissue and Muscle tissue (Only the basic structure and functions).

iii. a. Structure of single celled organisms, Chlamydomonas, Amoeba.

b. Structure of multicellular organisms. Brief description of root, stem, leaf and flower of Brassica. Frog; external characters and brief introductory account of digestion (mouth, stomach and intestine) blood circulation (heart, arteries veins and capillaries); lungs and respiration; kidney and excretion ; gonads and reproduction; brain and spinal cord; Elementary treatment of sense organs.

4. **Diversity:-**

- a. Classification: Aims and objectives; units of classification; naming the organisms.
- b. Major groups of plants and animals with their diagnostic characters and familiar examples (not the life history).

Virus, Bacteria, Alga, Fungi, Mosses. Ferns, Gymnosperms, Angiosperms, Protozoa, Sponges, Goekimntes. Flat worms, Round worms, Annelids Arthropods, Mollusks, Echinoderms, Fishers, Amphibians, Reptiles, Birds and Mammals.

5. **Food and Energy:-**

Nutritional requirements and types of food. Carbohydrates, fats, proteins, proteins. minerals, vitamins, importance of water and enzymes.

- a. **Nutrition in plants.** Photosynthesis raw materials and how these are obtained and conveyed to the sites, where theses are used. Photosynthesis. Mechanism (only the overall reaction), light and dark reacbev. Brief description), Product of photosynthesis. Experiments illustrate the process. Storage of food. Other methods of obtaining food. Saprophytism and insectivorous habits).

b. Nutrition in

i. *Acquisition of food:*

Herbivores, carnivores, omnivorous, parasitic and Symbiotic association.

ii. *Digestion and assimilation of food:*

Elimination of solid wastes.

6. Transport:-

a. Diffusion, osmosis and active transport are basic mechanisms of conduction.

b. Transport in plants: diffusion, osmotic pressure, osmosis and turgor pressure and imbibition in relation to absorption of water and solutes from the soil and the conduction to different parts of the plant body. Root pressure, transpiration, streaming and ascent of sap. Conduction of prepared food materials from leaves to stems and roots through phloem and its storage in vegetative structure, fruits and seeds.

c. Transport in Animals:

1. Concept of transport of materials to and from and in relation to unicellular and multicellular organization. Materials to be transported (food, gases, wastes).

2. Blood and sites where it is formed.

3. Circulatory system (Frog)

Heart as a pump; arteries as vessels carrying blood away from the heart; veins as vessels bringing it to the heart; capillaries as exchange vessels.

7. **Respiration:-**

The process of respiration involving oxidation of food substances and the release of energy in green plants and animals. Breathing mechanisms in unicellular organisms, an insect, a bony fish and frog.

8. **Excretion:-**

Significance of excretion in regard to excess of salts and water, nitrogenous wastes:

a. **Excretion in animals** : Human kidney organization ; Nephron as a functional unit, filtration-filtrate. urine of formation as a product of reabsorption of necessary materials, storage of urine in bladder and its excretion. Brief concept that other animals also excrete but use a variety of methods (vertebrates and others such as Amoeba, liver-fluke, earthworm, insects).

- b. **Excretion in plants** : Water loss through transpiration, gaseous wastes, nitrogenous wastes lost as crystals and as latex in some cases.

9. **Coordination in Multicellular Organisms:-**

Concept of relationship with external environment and responses to stimuli in plants. Introduction and significance of movements in plants. Various types of plants movements (to be explained by examples). Tactic movements, Tropic movements and Nastic movements. Animals, Sense organs; brief structure and functions of eye, ear, taste and smell as illustrated by frog.

Nervous Communications :

- a. Brain and spinal cord as central components.
- b. Nerves from sense organs and to effector organs.
- c. Neuron and reflex arc.

Chemical Communications :

- a. Concept of hormones and endocrine glands.
- b. Pituitary and organs it regulates, thyroid, adrenal, pancreas, parathyroid, gonads.
- c. Hormone imbalance and diseases.

Locomotion in animals : Types of locomotion in animals such as amoeboid, flagella and ciliary: locomotion in water (fish) on land (lizard and mammal) and in air (bird and insects).

10. Reproduction, Development and Growth:-

Types of reproductions : Asexual and sexual (brief account).

a. *Reproduction in plants:*

1. Vegetative reproduction and its significance ; natural methods such as fragmentation and regeneration.
2. Budding : bacteria and yeast. Artificial methods as grafting, cutting, layering; asexual reproduction (spore formation). Sexual reproduction in Brassica, Sex organs, their location, formation of gametes, pollination (one insect and one wind pollinated flower, fertilization seed and fruit formation dispersal of seeds and fruit.
3. Seed formation without sexual fusion : apoximis, parthenogenesis and parthenocarp.

b. Growth : definition, regions of cell multiplication and growth in stems and roots, Germination of castor oil seed, conditions necessary for germination: epigeal and hypogeal germination. Primary and Secondary growth. Hormonal control of growth. Flower formation. Photoperiodism and verbalization. Differences between plant and animal growth.

c. Reproduction in animals. Asexual reproduction in Amoeba. Sexual Reproduction : description of reproductive organs in frog, gametes,

fertilization, development of frog embryonic development, organogenesis (only fate of three germinal layers), metamorphosis.

11. Environmental Biology:-

Population and Community: human population growth; distribution of organisms; establishment in a habitat; extreme environments. The interdependence of living organisms (animals depend upon plants), carnivores and herbivores. Food chains and food webs, Decomposers. The food cycle, Ecosystems and maintaining the balance between animals and plants. Parasites, Symbiosis.

12. Genetics:-

Variations within plants and animal species. Mendelian laws of inheritance: alleles, genotype, phenotype, dominance and recessiveness. Sex chromosomes and sex determination. Introductory concept of genes. Some hereditary diseases in humans. e.g. haemophilia, colour blindness, sickle cell anemia.

13. Evolution:-

Theories of organic Origin of variation.

14. Biology and Human Welfare:-

- a. Biology in relation to Agriculture and Forestry, Honey bees, silk worm and Lac insect, Dairy products and meat : Poultry; fish and importance of marine life, fuel, furniture and building material. Diseases of plants, causes and remedies with reference to wheat, rice sugar-cane and cotton. Insect pests and their control.
- b. Biology in relation to Health and nutrition. Plants foods, fiber, medicines, useful aspects of bacteria, bacteria and food preservation, diseases due to malnutrition, Bacteria, Viruses, Fungi and parasitic diseases.
- c. Biology and Conservation of Environments. (Pollution of air and water, soil erosion, causes and preventive measures. Conservation of wild life.

CLASSES IX-X

Topics							Weightage (% ages)
1.	Introduction	..	..	..	..	..	1%
2.	Nature and Origin of Life	..	..	..	..	..	1%
3.	Structural organization	..	..	..	..	..	17%
4.	Diversity	..	..	..	..	..	12%
5.	Food and Energy	..	..	..	..	..	10%
6.	Transport	..	..	..	..	..	4%
7.	Respiration	..	..	..	..	..	2%
8.	Excretion	..	..	..	..	..	3%
9.	Reproduction, Development and Growth	..	..	..	..	..	12%
10.	Coordination in multicellular organisms	..	..	..	..	..	5%
11.	Environmental Biology	..	..	..	..	..	10%
12.	Genetics	..	..	..	..	..	10%
13.	Evolution	..	..	..	..	..	3%
14.	Biology and Human Welfare	..	..	..	..	..	10%
Total							100%

OVERALL THEME-WISE WEIGHTAGE

Theme				% Weightage
1.	Introduction (Topic 1+2)	..	..	2%
2.	Structural organization and Diversity (Topics 3-4)	..	..	29%
3.	Functions (Physiology). (Topics 5-10)	..	..	36%
4.	Environment & Organism Interaction. (Topics 11-14)	..	..	20%
5.	genetics and Evolution. (Topics 12+13)	..	..	13%
Total			..	100%

6. Practical Activities Classes IX-X

A. CLASS IX

Activities			No. of Laboratory Periods
1.	Microscope. Examination and its handling. ..	..	1
2.	Onion peel and frog's Epithelial lining of buckle cavity	..	1
3.	Study of Euglena and Chlamydonas ..	..	1
4.	Study of Amoeba and Paramecium with the help of permanent slides and charts ..	..	1
5.	Study of External Morphology of Brassica plant or any other Appropriate Plant. ..	..	1
6.	Dissection of frog and demonstration of internal organs of frog Charts may also be used for demonstration	..	2
7.	Experiment to demonstrate the process of Osmosis and Diffusion	..	1
8.	Experiment to demonstrate the passage of water (coloured red) in the plant ..	..	1
9.	Experiment to demonstrate the process of photosynthesis using an aquatic plant like Hydrilla	..	1
10.	Demonstration of photosynthesis by Printing ..	..	1

Activities				No. of Laboratory Periods
11.	Experiment to demonstrate the process of transpiration	..		1
12.	Experiment to demonstrate the process of respiration by using caustic Potash ..	..		1
13.	Study of different types of roots, stems and leaves which store food materials (carrot, radish, turnip, potato, ginger, onion) ..	..		1
14.	Study of insectivorous plants by means of models and charts.	..		1
15.	To study classification of plants.			
	(i) Bacteria		Bacilli	
	(ii) Algae		Spirogyra	
	(iii) Fungi		Agaricus	
	(iv) Mosses		Funaria	
	(v) Feiti		Selaginella	
			Adiantum	
	(vi) Gymnosperm		Pinus and	
			Thaja	
	(vii) Angiosperm		Grass,	4
			Rose,	
			Brassica	

Activities				No. of Laboratory Periods
16.	To study classification of Animals:			
	(i) Phylum Protozoa	..	..	Amoeba
	(iii) Phylum Coelenterata	..	..	Jelly fish
	(iv) Phylum Platyhelminthes	..	..	Tape Worm
	(v) Phylum Aschelminthes (Nematoda)	..	..	Round Worm
	(vi) Phylum Annelida	..	..	Earth- Worm
	(vii) Phylum Mollusca	..	..	Snail
	(viii) Phylum Arthropoda	..	..	Prawn and Butterfly

B. CLASS X

	Activities	No. of Laboratory Periods
	1	2
1.	To Study Nastic Movement using a Mimosa Plant	1
2.	To Study Mitosis and Meiosis by using charts and Models	2-3
3.	To Study the Process of growth in leaf and root by marking method	1
4.	To study hypogeal and epigeal germination in castor oil/bean and gram seed.	1
5.	To Study the development of frog by means of models, charts and preserved specimens.	2
6.	To Study different types of fruits like Maize, Brassica, Pea, Mango, Tomato and Apple	2
7.	Field trips to study and collect and present 10 herbarium sheets and to present 5 animals representing different groups at the time of examination.	2
8.	Study of a plant community in a lawn and a pond	2
9.	Study of salient features of different extreme habitats (Polar regions, Deserts and Mountain types with help of pictures and charts.	1
10.	Study of animal dependence on plants from study of inhabitants of a tree	1
11.	Study of Herbivores, Carnivores and Omnivores in the field and also from charts.	1

7. Laboratory Requirements for Classes IX & X:-

1. Apparatus.-Dissecting Microscopes (Ten); compound Microscopes, giving a magnification upto 200 (Ten) Box (Five); Dissecting dishes (ONE) for a group of 4 students of ; Slide projector, simple type (ONE) Forceps (5). Fine needles (5) Plans (5), Magnifying glasses (10) Thermometers (10). Potometer (2).
2. Glassware.-Bell Jars, Larger (Ten); Beakers, 250 cc. 500 cc. 1000 cc (SIX of each size); funnels, 4" and 6" Six (of each size) measuring cylinders. 100 cc, (SIX); test tubes (Two Dozen) flasks (SIX); reagent bottle (SIX dozen); microscopic slides (Twelve dozen); cover slip (ONE doz.); glass tubing; spirit lamps (SIX); Thistle flasks (SIX) glass aquaria (Two).
3. Natural History Specimens.-Reserved specimens of plants and animals suggested in the list of activities.
4. Prepared Microscopic Slides.-Amoebae; Paramecium; developmental stages of frog (one set);
5. Models.-Mitosis; meiosis life cycle of a Selaginella; sporangium and prothallus; of leaf; L.S. of ovary; models of Amoeba, Paramecium, dissected frog; developmental stages of frog; models on insectivorous plants.

6. Charts.-Cell structure; cell division; Paramecium; Euglena; Chlamydomonas; fern (Selaginella) Brassica; pea; dissected frog; insectivorous plants; germination of Bean, Gram and castor seed; Mitosis and Meiosis; spermatogenesis; development of frog; flowers; Mendelian Law.
7. Chemicals.-Rectified spirit; chloroform; formaline; acetic-acid; eosin. diastase, tyrosine, iodine and glycerine. alcohol starch, KOH, lime.
8. Potted Mimosa Plants.
9. Cellophane (membrane).
10. Aquatic plants e.g. Hydrilla.
11. Cotton.
12. Wax (Ilb).

8. Expected Outcomes:-

Curriculum development is a dynamic process. It has to be so, if we are to keep pace with the developments in our society, In order to prepare the children and to acquaint them with the modern developments in the field of science and biology. necessary revisions have to be made in the light of the urgent needs of the society.

Keeping in view the objectives, the following outcomes are expected to be achieved by implementing the revised curriculum for classes IX-X.

At this stage since the child is mentally advanced, he can think logically. The expected outcomes of the proposed curricula would be the following:

1. The student would be able to develop a concept of Biology, Botany and Zoology.
2. He would be able to learn scientific methodology and develop a reasonable appreciation of science and its importance in the progress of society.
3. He would be prepared to pursue studies in biology, Botany, Zoology and to opt for professional and technical advances.

9. Guidelines for Textbook Writing:-

A textbook is undoubtedly an effective tool of learning and the dissemination of teaching methods. At present the textbooks for secondary level are deficient and defective in many respects. The descriptive part at many places has been made unnecessarily complicated and involved. The text contains numerous mistakes and errors, both factual and typographical. Most of the pictures and diagrams are incomprehensible and do not relate to the text. The enquiry approach has not been adopted and the questions given at the end of each chapter are mostly of recall

type. There is tendency to over-burden the students with unnecessary details of description and terminology. There is need for re-writing the textbook.

It is recommended to:

- a. Involve the best talent in the country in textbook writing and developing teaching materials both for students and teacher. This can be done by providing proper incentives and recognition.
- b. Incorporate basic concepts and principles of biology which have emerged as a result of the tremendous accumulation of knowledge regarding life Science during the past two decades.
- c. Avoid overburdening the students with unnecessary details of description and terminology. Pay emphasis on more important and basic materials.
- d. Pay special attention to the production of quality textbooks with fully illustrated information from which the students can readily find the facts they need.
- e. Provide comprehensive instructions for the experimental and field work.
- f. The questions which should be incorporated as part of the teaching material should test the reader's understanding of the concepts/principles rather than invite simple recall.

11. Evaluation of Courses:-

1. Practical aspect of the study be strengthened at secondary level
2. Teacher supervised field trips should be organized. Students should collect a variety of animals and plants and sort them out in major groups and this exercise should be assigned some marks.
3. The examination paper should be set in such a way so as to cover the entire course.
4. Before start of the session teachers should give out a written schedule as to how the entire course will be completed during the academic session and submit monthly reports.
5. A teacher should hold at least two hose-tests during the academic session and submit results to the head of the institution.
6. A teacher should persuade students to write essays on Biology topics of general interest, and organize exhibition in their laboratory.

12. Recommendations:-

1. The revised curriculum cannot be fruitfully implemented unless (i) suitable textbooks based on it is ready, and (2) at least the minimum requirements for laboratory work (equipment, glassware, chemicals, biological supplies, laboratory supervision) are ensured prior to implementation of the revised curricula. Science education has to be based on observation, exploration, enquiry in field/laboratory situations. To achieve the desired appreciation of science and its place in society, the teaching of science demands that at least the minimum requirements to do so be available in educational institutions.
2. Keeping in full focus the past constraints, practice and experience as part of the process of curriculum development and the ensuing substandard quality of science education at levels I-XII, the committee further recommends that where and if necessary few textbook must be developed under the guidance and supervision of the present National Committee. This committee would ensure critical expert review and proper editing of chapters before approving the book for publication. It is further stressed here that a departure from this recommendation is bound to result in (1) mis-interpretation of revised curriculum in terms of concepts and content quantum, (2) lack of uniformity in style, continuity in content and suitable illustrations, and (3) breakdown of vertical linkage. If curriculum developers are seriously interested in reaching the national science

education objectives (and they are) then the above recommendation remains one of the foremost pre-requisites for success.

3. Draft of the book should be circulated in parts in selected schools in all the provinces of Pakistan as a test material and the feed-back should be reviewed by a select committee to comply with the needful accordingly.
4. It is recommended that the Biology book for higher secondary level should not exceed 350 pages.
5. Proportionate weightage given to various themes/topics should be strictly followed.
6. Each chapter should be followed by different type of questions.
7. Objectives of the curriculum should be given in the preface of the book.
8. A glossary should be provided at the end of the book.
9. For writing up of books guidelines suggested by the committee should be strictly followed.

Annexure 'A'

NATIONAL COMMITTEE

1. Dr. M.H. Kazi, Convenor
Professor,
Department of Biological Science
Quaid-i-Azam University, Islamabad.
2. Dr. M.A. Hafeez, Member
Professor,
Department of Biological Science
Quaid-i-Azam University, Islamabad.
3. Dr. Razi Abbas Shamsi, Member
Associate Professor,
Department of Botany,
University of the Punjab,
Lahore.
4. Dr. Saeed Awan, Member
Associate Professor,
Zoology Department,
University of Sind,
Jamshoro.

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|----|---|--------|
| 5. | Miss Barjees,
Senior Science Teacher,
Government Comprehensive High School,
Wahdat Colony, Lahore. | Member |
| | | |
| 6. | Mr. Fazal-i-Rabbi,
Subject Specialist,
Bureau of Curriculum and
Education Extension Wing, Sind,
Jamshoro. | Member |
| | | |
| 7. | Dr. A. R. Malik,
Associate Professor,
Botany Department,
University of Sind,
Shah Abdul Latif Campus,
Khairpur Mirs. | Member |
| | | |
| 8. | Dr. Mohammad Nasim Siddiqui,
Chairman,
Zoology Department,
University of Peshawar,
Peshawar. | Member |

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| 9. | Miss Naseem Akhtar,
Subject Specialist,
Government Comp. Girls High Schools, Abbottabad. | Member |
| | | |
| 10. | Mr. Ali Raza Hasan,
Assistant Professor/Principal,
Government College, Bela,
Baluchistan. | Member |
| | | |
| 11. | Dr. Zahur R.
Head of the Botany Department,
University of the Punjab,
New Campus,
Lahore-20. | Member |
| | | |
| 12. | Dr. Mrs. Kausar J. Cheema,
Head of the Botany Department,
Government College,
Lahore. | Member |
| | | |
| 13. | Dr. R. A. Siyal,
Assistant Educational Adviser,
Ministry of Education,
(Curriculum Wing),
Islamabad. | Organizer |

SELECT COMMITTEE

1. Dr. M. Saeed Awan,
Associate Professor,
Zoology Department,
University of Sind,
Jamshoro.
2. Dr. A. R. Malik,
Professor, Botany Department,
University of Sind,
Shah Abdul Latif Campus,
Khairpur Mirs.
3. Mr. Fazal Rabbi Yousufzai;
Subject Specialist,
Bureau of Curriculum and
Education Extension Wind, Sind,
Jamshoro.

4. Miss Nasreen Jafrey,
Subject Specialist,
Bureau of Curriculum and
Education Extension Wing, Sind,
Jamshoro.
5. Dr. A. R. Shakooti,
Associate Professor,
Zoology Department,
University of the Punjab,
Lahore.
6. Dr. R. A. Shamsi,
Associate Professor,
Botany Department,
University of the Punjab,
Lahore.
7. Mr. Ali Raza Hussan,
Professor, (Botany)/Principal,
Government College Bella,
Distt. Lasbella,
Baluchistan.

8. Mr. Nasim Siddiqui,
Chairman,
Zoology Department,
University of Peshawar,
Peshawar.
9. Dr. R. A. Sual,
Assistant Educational Adviser,
Ministry of Education,
(Curriculum Wing),
Islamabad.

Appendix F

LIST OF BIOLOGISTS, EDUCATIONISTS AND SENIOR SCIENCE TEACHERS, INTERVIEWED ON THE NATURE AND SCOPE OF BIOLOGY CURRICULUM:

A. Biologists:

1. Mohammad Altaf-ur-Rehman Govt. High School Haripur
2. Mrs. Budrud Duja Govt. Girls High School Zaida (Swabi)
3. Mrs. Yasmin Aziz University Model School University of
Peshawar.
4. Mrs. Roshan Pari Govt. Girls High School Hoti. No.I Mardan
5. Miss Rehana Aziz Govt Girls High School Bukiguj (Mardan)

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|-----------------------------|--|
| 6. Miss Shamim Riaz | Beacon House Peshawar |
| 7. Mrs. Safia Gul | Frontier Girls College Peshawar. |
| 8. Mrs. Anjum Ara | Govt. Girls High School Swat. |
| 9. Miss Aqeela Bano | Govt. Fazli-Haq College Mardan |
| 10. Miss Shabana Gohar Posh | Wapda Degree College Tarbella. |
| 11. Mr. Mohammad Tahir Khan | Islamia Collegiate School, University of Peshawar. |
| 12. Mr. Faridullah Khan | Islamia Collegiate School University of Peshawar. |

B. Educationists:-

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|--------------------------|--|
| 13. Khair Mohammad | Govt. Girls Schools Mazdoor Abad. Takhat Bhai (Mardan) |
| 14. Mrs. Mehmooda Rehman | I.E.R. University of Peshawar |
| 15. Mr. Zarin Gul | Govt. High School Sanju (Swat) |

16. Mrs. Iffat Ara Hussain I.E.R. Peshawar University.

17. Mr. Javed Sikdanar Rana I.E.R. University of Peshawar.

C. Science Teachers:-

18. Mrs. Humera Jabben Govt. Girls high School Akora Khattak.

19. Mohd Qamar Govt. High School Dherai Swat.

20. Miss Shaqar Rana Govt. Girls high School No.2 Kohat

21. Mr. Farman Ali Govt High Swat

22. Mrs. Iqbal Begum Govt. Girls High School No.I Mardan

23. Miss Fazilat Charsadda High School for Girls.

24. Mr. Shamshood Khan Govt. High School TaruJabba Distt.
Nowshera

25. Mr. Habib-ur-Rehman Govt. High School Saleem Khan Swabi

26. Miss Liaqat Ali Govt. High School Baghdada Mardan.

27. Mr. Khan Badsha Islamaia Collegiate School University of
Peshawar.

28. Mr. Inayat Ullah Islamia Collegiate School University of
Peshawar.

29. Mr. Sultan Mohammad Islamia Collegiate School University of
Peshawar.

**LIST OF GOVERNMENT
GIRLS HIGH SCHOOLS
PARTICIPATED IN THE STUDY**

District Peshawar:-

1. Government Girls High School Yakatoot.
2. G.G.H.S. Lady Griffith, Peshawar.
3. G.G.H.S. Tarnab Farm.
4. G.G.H.S. Tehkal Bala
5. G.G.H.S. Jowgiwara
6. G.G.H.S. Mathra.
7. G.G.H.S. Dabgari Gate
8. G.G.H.S. No. 2 Peshawar Cantt
9. G.G.H.S. Civil quarters.
10. G.G.H.S. Gul Bahar
11. G.G.H.S. Nistar Abad
12. G.G.H.S. Islamia Collegiate.

District Nowshera:-

1. Government Girls High School Akora Khattak.
2. G.G.H.S. Ziarat Kaka Sahib.
3. G.G.H.S. Nowshera Kalan. No.I
4. G.G.H.S. Nowshera Kalan. No.II
5. G.G.H.S. Nowshera Cantt.
6. G.G.H.S. Badrashi
7. G.G.H.S. Shaidu.
8. G.G.H.S. Akbar Pura.
9. G.G.H.S. Pir Pai.
10. G.G.H.S. Pabbi.
11. G.G.H.S. Jalozi.

District Charsadda:-

1. Government Girls High School Charsadda.
2. G.G.H.S. Rajjar.
3. G.G.H.S. Utmanzai.
4. G.G.H.S. Torongzai.
5. G.G.H.S. Umerzai.
6. G.G.H.S. Dosehra.
7. G.G.H.S. Shabqadar Fort.
8. G.G.H.S. Harichand.

9. G.G.H.S. Sherpao.
10. G.G.H.S. Tangi.

District Mardan:-

1. Government Girls High School Kharaki.
2. G.G.H.S. Takkar
3. G.G.H.S. I. Mardan
4. G.G.H.S. Gujar Gari.
5. G.G.H.S. Katlong
6. G.G.H.S. Bicket Gunj.
7. Hoti No. 2
8. G.G.H.S. Gujrat
9. G.G.H.S. Rustam khel.
10. G.G.H.S. Par Hoti
11. G.G.H.S. Bagheeha Deheri
12. G.G.H.S. Jalala.
13. G.G.H.S. Mayan.

District Swabi:-

1. Government Girls High School Dagi.
2. G.G.H.S. Zaida.
3. G.G.H.S. Marghuz.

4. G.G.H.S. Panj pir.
5. G.G.H.S. Kohtha.
6. G.G.H.S. Swabi.
7. G.G.H.S. Ismaila.
8. G.G.H.S. Shewa.
9. G.G.H.S. Bam Khel.
10. G.G.H.S. Yar Hussain.
11. G.G.H.S. Dobian.
12. G.G.H.S. Lahore.

District Kohat:-

1. Government Girls High School Shakardara.
2. G.G.H.S. Lachi.
3. G.G.H.S. Gumbat.
4. G.G.H.S. Babri Banda.
5. G.G.H.S. Billitang.
6. G.G.H.S. Jungle khel.
7. G.G.H.S. No. 3 Kohat.
8. G.G.H.S. No.2. Kohat.
9. G.G.H.S. Thall.
10. Jough Sarai.
11. G.G.H.S. No.1 Kohat.

District Abbottabad:-

1. Government Girls High School Kunj.
2. G.G.H.S. Lora.
3. G.G.H.S. No.2. Abbottabad.
4. G.G.H.S. Birote.
5. G.G.H.S. Sherwan.
6. G.G.H.S. Malakpura.
7. G.G.H.S. No.1 Abbottabad.
8. G.G.H.S. Sheikhal Bandi.
9. G.G.H.S. Samandar Katha.
10. G.G.H.S. Bandi Dhundan.
11. G.G.H.S. Kakul.

District Swat:-

1. Government Girls High School No. 1 Shaidu-Sharif.
2. G.G.H.S. No. 2 Shaidu-Sharif.
3. G.G.H.S. Mingora.
4. G.G.H.S. Kabal.
5. G.G.H.S. Charbagh.
6. G.G.H.S. Matta.
7. G.G.H.S. Khawaza Khela.
8. G.G.H.S. Barikoto.
9. G.G.H.S. Odigram.
10. G.G.H.S. Bahrain.

District Haripur:-

1. Government Girls High School Kalabal Town Ship.
2. G.G.H.S. No. 1. Hari pur.
3. G.G.H.S. Sirekote.
4. G.G.H.S. No.2. Haripur.
5. G.G.H.S. Panian.
6. G.G.H.S. Kot Najibullah.
7. G.G.H.S. Sarai Saleh.
8. G.G.H.S. Kahal.
9. G.G.H.S. Ghazi.
10. G.G.H.S. Bagra.

Daggar:-

1. G.G.H.S. Pneca Keri.
2. G.G.H.S. Totalri.

District Dir:-

1. G.G.H.S. Timergara.
2. G.G.H.S. Ouch.
3. G.G.H.S. Hajiabad.
4. G.G.H.S. Dir.

5. G.G.H.S. Kombar.
6. G.G.H.S. Chakdara.
7. G.G.H.S. Sado