CONTENT ANALYSIS OF NATIONAL CURRICULUM DEVELOPMENT APPROACH OF CHEMISTRY GRADE IX- X IN PAKISTAN

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Abstract

Purpose of the study: This study was designed to the analysis of curriculum development approach of the National Curriculum for Chemistry Grade IX- X in Pakistan.

Methodology: The study was related to theoretical and content analysis based.

Main Findings: National Chemistry Curriculum for grade IX- X is majorly based on the subject-centered curriculum. To meet the need of society, it demands to cope up with the demands of technology. To enhance the skills of students, activities, and construction of knowledge on their own is stressed in the aims of the curriculum. National Curriculum for Chemistry grades IX- X, 2006 reflects the eclectic approach. It is dominant with subject-centered while assessment is leading with the traditional and teacher-centered approach.

Applications of this study: The curriculum of Chemistry emphasis developing higher order thinking and skills in students.

Novelty/Originality of this study: This study was based on documented content analysis. The curriculum developmental approach was observed in this study.

Keywords: National Curriculum, Chemistry, Approach, Grade, Content Analysis.

INTRODUCTION

As a result of globalization, knowledge production and sharing have become the most important precondition for long-term community development (Akkoyunlu & Ylmaz, 2005; Akpinar & Aydin, 2007; Dogan, 2012). In response to these situations, the educational system evolves and renews (Kosterelioglu & Ozen, 2014). There have been initiatives to revise the curriculum to reflect constructivist concepts as a result of changes in the educational system. Furthermore, the constructivist viewpoint holds that knowledge is generated individually and that this process is facilitated by an individual's active engagement with their surroundings (Baki, 2008).

The students play an active role in the process of developing information that is generated by one's social environment and culture to make learning permanent and functional (Gurol, 2002). This approach, which can be described as student-centered and lifelong education (Akpinar & Gezer, 2010), introduces fresh viewpoints and concepts to education. The curriculum is unquestionably acknowledged as the roadmap of educational activities. This is the most obvious indicator that education systems are being shaped by new understandings. The most important central components of a country's educational system are curricula (Tas, 2007; Yesilyaprak, 2006).

Because innovations in the education system are visible to the extent that they are represented in the curriculum (Gozutok, 2003), the curriculum is always open for improvement. The validity and effectiveness of a curriculum can only be determined after its implementation. So, curricula must be evaluated on a frequent and systematic basis for prospective adjustments (Erturk, 1972; Saylan, 2001). Although these evaluations are critical for finding factors to consider when building curricula to make them more successful.

These descriptions are reliant on their various originations of training and the elements of school and the sorts of items they anticipate from instructive organizations. The basis of the word curriculum was from the Latin word "currus", which intends to run a race. This implies once a kid begins to learn, he/she starts to run the race. This race is exhaustive because, throughout the race, the student experiences a ton of encounters, which might be scholarly, social, good, profound, divine, or physical. These experiences are given to produce the absolute man. The experiences might be formal and arranged or casual and inadvertent or spontaneous. Throughout the race, the youngster may likewise experience a few hindrances which he/she should surmount either through his/her endeavors or by the help of another person to empower him/her to accomplish the desires for the general public. The student is the primary focal point of the educational program and curriculum (Bhuttah, et al., 2019; Talla, 2012).

The term curriculum is frequently used to refer to the aims, objectives, or plans of a program. Each of these elements is necessary for successful learning. Each of them should be treated as a separate component when developing a curriculum. Goals, techniques, resources, and assessment are the four essential components of the curriculum in a wide sense.

Table 1: Definitions of factors

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Goals	The benchmarks or expectations for teaching and learning are often made explicit in the form of a scope and sequence of skills to be addressed.
Methods	The specific instructional methods for the teacher, often described in a teacher's edition.
Materials	The media and tools that are used for teaching and learning.
Assessment	The reasons for and methods of measuring student progress.

Curriculum Development

It directs the flow of educational program contents to encourage their completion. When Ivowi (2009) recognizes the three edges of curriculum: planning or development, execution, and educational curriculum plan assessment, he regards developing educational plan and curriculum as planning of both. Curriculum development precedes curriculum planning (Mohanasundaram, 2018). It considers everything that will make the educational plan beneficiaries useful for society. Curriculum development is a step-by-step procedure for making constructive changes to a school, college, or university's course offerings (Druzhinina, et al., 2018; Stutt, 2021; Uljens & Rajakaltio, 2017).

Curriculum Development Approaches

A strategy for managing a curriculum, a way for doing/making/structuring/contemplating a curriculum, is the educational plan approach. There are numerous approaches to curriculum development and improvement, as evidenced by one's focus on the components of educational plan progression and the degree of curricular activity. To develop or design a curriculum, its components are organized in certain patterns. These patterns are derived from the grounded philosophy of the country or the need of the society (Oliva, 2009; Ornstein & Hunkins, 2009). Through these parameters, certain approaches remained focused to develop or design a curriculum. Literature also provided some approaches for curriculum development as:

1. Teacher-Centered Approach

2. Subject-Centred Approach

3. Student-Centered Approach

4. Eclectic Approach

Talla (2012) discussed the interconnected relationship of philosophy with the components of curriculum development i.e., objectives, content, methods of organization, and evaluation. This relation is presented in figure 1.
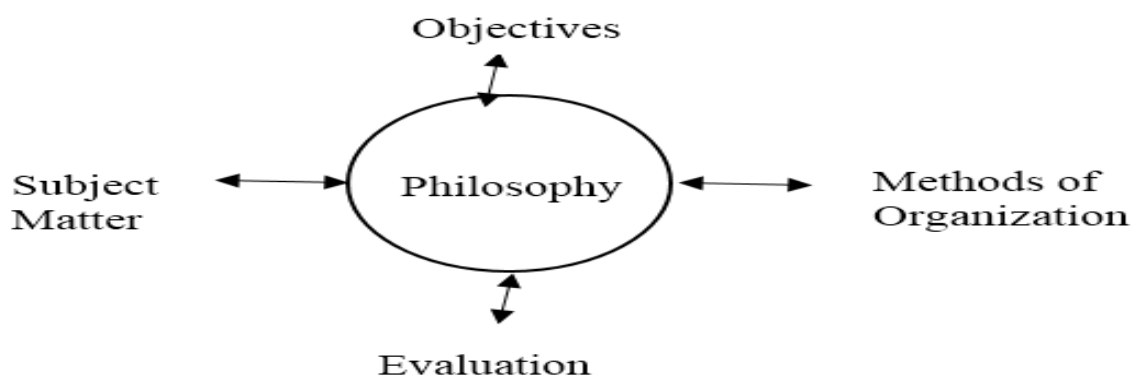
Figure 1: Relationship of philosophy with components of curriculum development

Source: Author

Teacher-Centered Approach

With the roots of idealistic philosophy and behaviorist school of thought, the teacher-centered approach is focused to develop a curriculum. This is the traditional way to develop or design a curriculum. As the name reflects teacher occupies the centre position in this approach. Aims and objectives focused on developing students' behavior. One-way communication and passive learning occurred for the transmission of knowledge.

Subject-Centred Approach

It focuses on the nature of the subject material. Natural sciences including chemistry, biology, physics, and mathematics are the subjects majorly demand to curriculum based on this approach. Teachers, here too, remained in the central position, but flexible and active teaching takes place. Students' demands to be curious and active learners to develop their higher-order thinking capabilities.

Student-Centered Approach

Students remained in the dominant position in this approach. The curriculum is developed to enhance student's skills and their potential through group works or individual projects. In literature, this approach is further classified into two categories, i.e.,

- Activity-based/ Society based approach

- Learner-centered approach/ Problem Solving approach

In both approaches, the student remains in a dominant position. But the difference is that in a society-based approach mostly group works according to the needs and demands of social activities held on. Based on the pragmatist school of thought society remains focused. The curriculum is developed by focusing on the need and demands of society. Students do activities, and investigations to create on their own.

While in a problem-solving or student-centred approach, the existentialist school of thought reflects. Students' inner potential is nurtured. Students create things on their own and the curriculum is designed great focused on the needs and demands of students at their particular age group.

Eclectic Approach

An eclectic approach is a blend or merging of two or more approaches. This blend can be focusing on dominating as a major or minor share of approaches or could be with an equal share in the blending of two or more approaches.

RATIONALE OF THE STUDY

It is impossible for an educational system would be unconcerned about educational changes in the twenty-first century. In reality, these curriculum revisions are a critical component of school reform. Education reform is a structural shift that all governments have emphasized in recent years (Sahlberg 2006). Attempts to reform the educational system, on the other hand, have not proven successful yet (Erdogan, 2012). Changes in the curriculum regularly are an example of this (Siddiqui, 2020).

RESEARCH OBJECTIVE

This study was designed to the analysis of curriculum development approach of the National Curriculum for Chemistry Grade IX- X in Pakistan. The study was related to theoretical and content analysis based.

METHODOLOGY

This study is based on a qualitative approach. The document analysis technique is used in this study. A document is a written source of information that allows for a detailed description and explanation of the topic under study. Document analysis is the process of examining textual sources that convey information on the topics being researched (Cepni, 2007; Yildirim & Simsek, 2008). Moreover, it is a well-established research strategy for drawing meaningful and accurate conclusions from texts (Krippendorff, 2004). The population was books of grades IX and X and a sample was selected on Chemistry book for curriculum analysis through content analysis.

Two qualitative analytical methodologies, descriptive and thematic content analysis, were employed for data analysis. Sozbilir, et al., (2012) and Bengtsson (2016) define descriptive content analysis as systematic analyses that entail the discussion of studies on a certain topic leading to a descriptive assessment of trends and research outcomes. In other words, independent quantitative and qualitative studies are reviewed and categorized, resulting in the identification of general trends in the field from the perspective of researchers who are shown the general trends that are associated or linked to the field (Roller, 2019; Selcuk, et al., 2014).

Kain (2018) and Luo (2021) on the other side, thematic content analysis requires constructing themes or basic templates (matrices/templates) to synthesize and evaluate works on a specific topic from a critical viewpoint. Such efforts result in a detailed depiction of the issue's general structure, which is subsequently explored holistically (Au, 2007). It is a qualitative approach to studies conducted in a field that results in a comparative presentation of contrasts and similarities (Aksan & Baki, 2017).

RESULTS AND DISCUSSION

National Chemistry Curriculum

It centres on substance, process abilities, critical thinking, request, and basic and explanatory reasoning aptitudes. This subject curriculum for classes IX to XII expands on the vertical movement of the K-VIII Science Syllabus. It currently offers a moderately top to bottom investigation of Chemistry as a noteworthy, autonomous science. This offers an extreme move from the customary educational plan and curriculum. It characterizes both vertical and horizontal sequence in the spiral curriculum form of curriculum.

Aims and Objectives of Chemistry Curriculum

Goals are broad statements of intended learning outcomes. They are stated using broad terms that are not measurable until they are broken down into action verbs. Objectives are specific statements of intentions of what is expected of the

learners at the end of the teaching session. They are stated in measurable action verbs. Once the problems are identified the needs of the targeted group analyzed, the broad goals are formulated and broken down to specific objectives. In selecting the objectives, the three behaviors: cognitive, affective, and psychomotor are born in the mind. This is to ensure that the curriculum is comprehensive. The objectives drive every other activity in curriculum development. This is why it is important to use specific and clear action verbs to avoid misunderstanding. Objectives and destinations are significant because they help direct the decision of curricular substance; propose what learning strategies will be best; empower assessment of students and the educational plan; recommend what assessment techniques are suitable; convey to others what the educational program delivers and would like to accomplish (Offorma, 2002).

National Chemistry Curriculum for grade IX- X is majorly based on the subject-centered curriculum. But on the other hand, to meet the need of society it demands to cope up with the demands of technology. Therefore, STS as Science-Technology-Society is focused on a great deal. To enhance the skills of students, activities, and construction of knowledge on their own is stressed in the aims of the curriculum. In short, this part is dominated by the subject-centered approach as a whole based on an eclectic approach.

This curriculum aims to produce students who will be capable of doing independent thinking, asking questions, and looking for answers on their own (to be) competent in a complex, scientific, and technological world society. It should therefore be evident that schools have a gigantic duty to get ready logically educated personnel. The key is to get ready youngsters with long-lasting learning abilities to enable them to get a decent handle of the new information that they should endure (National Curriculum) (Government of Pakistan, 2006).

Standards and Benchmarks of Chemistry Curriculum

The curriculum of Chemistry emphasis developing higher-order thinking and skills in students. It concentrates on the subject matter along with its touching activities and STS links which again mix more than one approach. But predominantly base on a subject-centered approach. There are three standards as mentioned in the curriculum, i.e.,

1. Use of scientific knowledge,
2. Constructing new scientific knowledge and
3. Reflecting on scientific knowledge.

These standards further set their benchmarks accordingly. All standards and benchmarks are aligned with their approach as an eclectic approach of subject and student-centered (activity-based) approach, instead of one standard and benchmark. Standard reflects the eclectic approach while its set 5 benchmarks based on only subject-based approach.

Contents of Chemistry Curriculum

In the contents for IX- X, the curriculum describes 16 chapters. These include chapter numbers with their names and respective headings and sub-headings accordingly.

Learning Outcomes of Chemistry Curriculum

In the learning outcomes, a list of specific objectives concerning the chapter is presented. It reflects the pure subject-centered approach leading with the central position of the teacher.

This section of the curriculum gives a detailed description i.e., chapter number, name, list of major and minor concepts of the chapter. Conceptual linkage is also clearly mentioned in this document which represents the horizontal linkage with previous and upcoming grades. The next declaring segment is prominence with skills and STS (Society-Technology-Science). Both sections are activity-oriented, which determines the student-centeredness regarding the activities and societal requirements. Therefore, all chapters' approach is eclectic with dominating the subject centeredness.

List of Practical, Chemicals and Equipment in Chemistry Curriculum

The document of the Chemistry curriculum also provides the list of practices associated with the chapter. It also mentions the related equipment and chemicals used to perform the practical activity. This represents the student activity approach which is demanded by the subject of study that's Chemistry. Chapter 1, 5, 6, 7, 8, 10, 11, 12, 13, and 15 are linked with the practical part.

Based on 20 students' quantity of chemicals and amount of equipment (apparatus) is given. As Chemistry is the subject of science so it is connected with laboratory work. Therefore, activities in the form of practical are dominated with subject-based. But because group work is performed during the activities and after performing them they would be enabled to construct their thoughts as higher-order thinking, therefore this also overlaps with the student-centered approach. In combination, the mix of the subject-centered and little intersection of student-centred, we got an eclectic approach to the content of the Chemistry curriculum.

Time Allocation in Chemistry Curriculum

Chapter-wise time allocation determines the number of teaching periods, assessment periods for evaluation, and weightage percentage of each chapter. This shows the importance and the placement of each chapter in the book. High teaching periods number echoing the teacher centeredness but because this teaching is flexible in two-way communication therefore that is the subject-centered approach. Assessment is again representing as the traditional way, so here leading approach is a teacher-centered mix with subject-centeredness.

Teaching Chemistry in Curriculum

Educational strategies are the detailed means of facilitating learning. It involves the manipulations of the learning environment to motivate learners to learn. Implementation is putting into action, the planned curriculum. It calls for teacher-learner, learner-learner, and learner-classroom environment interactions (Wheeler, 1978). In teaching the subject of chemistry, the high role of teacher dominance in instructing the classroom and major focus is on teacher-centered approach. But as it discusses the chemistry content, talk about dialogue with the student, give chance to develop high order thinking and scientific attitude represents the subject centeredness leads to student-centered approach in point no.8.

In teaching-learning program curriculum address, multiple approaches but greatly stressed the student-centred approach. It represents that chemistry teaching-learning calls for student-centeredness but the content must be concentrated. So students cannot get out from the boundary of subject-centeredness. While the rewarding opportunity in point no.6 represents the behaviorist school of thought. Curriculum also discourses and offers some recommendations for teachers' training and refresher courses.

Assessment and Evaluation in Chemistry Curriculum

Evaluation deals with determining the success of the curriculum. Through the attainments of the learners, the strengths and weaknesses of the curriculum are identified and the feedback is used to update the curriculum. Appropriate instruments are developed and used to evaluate the attained curriculum. The feedback is used to restructure, modify, review, or the curriculum (Offorma, 2002).

The traditional model of assessment and evaluation is existing in the curriculum as a summative assessment. Along with it, the drawback is given to fill up this trendy fashion with the continuous formative assessment which is the strength of the curriculum document. This would lead to a subject-centered approach further modified towards student-centred to enhance the responsibility among them. The curriculum document also shares the plan of formative assessment and weightage of evaluation strategy. This evaluation weightage illustrates chapter-wise distribution. Higher traditional and lower practical skills assessments lead to the teacher-centered approach which is 60%. Higher abilities only 40% assessed that based on subject-center approach.

CONCLUSION AND RECOMMENDATIONS

The National Curriculum for Chemistry grades IX- X, 2006 reflects the eclectic approach. It is dominant with subject-centered while assessment is leading with the traditional and teacher-centered approach. On other hand from the beginning of the aims and objectives throughout the curriculum emphasize higher thinking abilities along with STS and student activities.

Table 2: The approach used in Developing and Designing Chemistry Curriculum

Component of Curriculum	Approach
Aims and Objectives	Subject Centered +Student Centered (Activity, STS, Skills and Constructive) Approach
Content	Subject Centered (High Teacher role) + Student-Centered (Activity, Skills, STS)
Teaching in Classroom	Traditional Teacher-Centered Approach + Subject Centered. This blend of equal concentration
Assessment and Evaluation	Traditional Teacher-Centered Approach + Subject Centered. This blend of dilute subject and minute student-centered approach.

Analysis of the National Curriculum of Chemistry 2006 reveals that it has been developed by using an eclectic approach. The advancement of the operative curriculum plan guide is a multi-venture, ongoing, and recurrent or cyclical procedure. There are many approaches to curriculum development. No matter the choice of approach, the curriculum developer must be guided t by the following principles. The educational plan and curriculum designer must build up philosophy and a reasonable way of thinking and set larger objectives that guide the whole educational plan and the choices that influence every part of the curriculum. He ought to set up arrangements both inside and among levels and guarantee an intelligible and verbalized movement starting with one level then onto the next. An essential and primary structure must be laid out for what to do, how to do it, when to do it and how to know whether it has been accomplished. The educational program and curriculum must advance interdisciplinary methodologies and the incorporation when require. Techniques for surveying the accomplishment of the curriculum objectives and goals must be proposed and methods for update and improvement ensure. The direction for the obtainment of personnel, material and financial assets to actualize

and implement the educational plan and curriculum ought to be provided. There is no perfect approach. However, to be effective, an approach must attract acceptance of the teachers and other stakeholders in the education of the learners.

LIMITATIONS

It was documented content analysis study of the curriculum developmental approach used in Chemistry subject in grade IX-X.

IMPLICATIONS

It may fruitful for students, teachers, curriculum developers, and other stakeholders.

AUTHORS' CONTRIBUTION

Dr. Ayesha gave idea and showed her relevant expertise during content analysis.

Dr. Saghir Ahmad Ch., reviewed the idea, participated in writing the different sections, and in formatting of the paper.

Ms. Uzma holds a grip on chemistry subject that's why she contributed in developing the subject understanding and analysis.

Ms. Sadaf also subsidized her skills by take part in analysis and write up.

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