Alignment between Biology Curriculum Objectives and Assessment at Higher Secondary Level

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ABSTRACT
Curriculum alignment is basically the process of formally evaluating a course or an educational programme to address the changing needs of society and the workforce, which is done by educators across all levels. In this study, researcher investigated to what extent the curriculum objectives are aligned with assessment of Biology, explored the available laboratory facilities for Biology students, and find out the opinion of teachers and students about the implementation of the Biology National Curriculum 2006. A mixed methods approach was employed to get a clear understanding of the problem. All biology students and teachers from Islamabad Model Colleges of Islamabad were the population of the study. The samples were chosen by a random sampling technique. The researcher used a checklist for students, semi-structured interviews for biology teachers, and lab observation was also done to check the available resources for conducting practicals. The researcher personally visited all institutions for data collection. Researcher used percentage for the analysis of students’ checklist. Qualitative data got from interviews of teachers were analyzed using NVIVO. It was found that the objectives were not fully aligned with assessment; students were not satisfied with curriculum objectives; learning activities were partially aligned with the curriculum; assessment plans were also partially aligned with the curriculum; time is not enough to cover the whole content; teachers are not satisfied with the performance of the learners; teachers try their best to cover the content. It is recommended that courses may not be so lengthy. The assessment may be aligned with the objectives of the National Curriculum, the focus of the students may change from getting marks to concept clarification, lab equipment may be provided to institutes, lab equipment may be updated and according to the quantity mentioned in the Biology National Curriculum 2006.

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1. Introduction

The education system of each country decides its progress. Socio-economic independence has directly depended on the high standard education system; which in result safeguards the right of ideological freedom of nations. Every nation has its goals which are predetermined and documented in the form of curriculum document. National curriculum document provides a direction to achieve our National goals. The National goals can be achieved by aligning the textbooks with the National goals. The success of the education system is depended on the achievement of National goals and which can be achieved by alignment of textbooks with curriculum If there is no alignment in the text books and curriculum document, it is very tough to achieved national goals to the desired extent which effects on education system. Textbook plays an important role in the implementation of curriculum if text books are aligned with curriculum, then we can achieve our national goals and our country can progress in the field of science and technology. Because the progress of each country is determined by the progress in science and technology.

Alignment is the agreement level of objectives and assessment and correspondence with one another to lead the educational system towards what is expected form students to learn (Webb, 2002). From a practical standpoint, alignment is important since grades are important. One of the few methods for effectively communicating the assessment of students' learning is the use of grades (Shaltry, 2020). The research questions for this study are:

- Is there any gap between National Curriculum objectives and assessment of Biology at higher secondary level?
- What are the available laboratory facilities for Biology students?
- What is the opinion of teachers and students about the implementation of Biology National Curriculum 2006?

2. Literature Review

In the area of education, alignment may refer to a variety of things. Curriculum alignment refers to the extent to which the curriculum across the grades builds on and supports what is learnt in earlier grades on a school-wide basis (Tyler, 2013). In EFL higher education contexts, the curriculum is crucial to the planning and execution of courses and is frequently seen as directing or informing best practices in the classroom (Wotring, 2021). Alignment looks at "the degree to which expectations and assessments are in accord and function in combination with one another to lead the system toward students learning what they are expected to know and accomplish" in addition to curricular alignment (Webb, 1997).

Content standards should drive an instructional system, which should be translated into examinations, curricular materials, and professional development that are all firmly related to the content standards. The premise is that a consistent communication about desirable content will impact instructors' judgments about what to teach, and that those decisions will, in turn, influence teachers' instructional practice and, eventually, student learning of the desired material (Biggs, 1996). Assessments, standards, and teaching are all critical to student success, yet they were all developed and implemented at different levels of the educational system. State content standards (embodied in state curricular frameworks) are policy papers at the state level, but the assessments are not created by policymakers, and they are applied at the local level. Alignment studies allow academics to examine many components of an educational system in order to evaluate their content and make judgements about how well they are aligned (Martone, 2009).
Learning objectives are inextricably linked to assessments. Faculty are urged to develop educational goals (i.e., learning objectives) before designing examinations using backward design (Dávila, 2017). Early in a course, faculty expectations of students may be established by employing learning goals to specify what students must be able to do and know following training (Momsen, 2013). Learning objectives may help faculty construct class activities and assessments that are aligned with the same subject and cognitive levels, and they can also serve as criteria for evaluating students (Aviles, 2001). Students can use learning goals to help them prepare for summative assessments (O’Neill A, 2010). Alignment is the state of having criteria that match between learning objectives, classroom teaching, and assessments (Cohen, 1987).

There are several different forms of alignment in post-secondary education (Aviles C. B., 2001). Curriculum, learning standards, assessments, and policy are examples of several sorts of alignment that can be focused on alone or in combination in a classroom or programme. We utilize a specific definition of alignment in this work, which is limited to a single classroom. The agreement between the Bloom's taxonomy level of an instructor's learning objectives and the Bloom's level of their assessments is referred to as our alignment. While many definitions contain an aspect of in-class teaching, our measure of learner-centeredness considers not just the cognitive level of learning but also the classroom culture. As a result, we concentrated our alignment research on the cognitive level of learning objectives and evaluations, rather than include in-class activities in our definition.

Curriculum can be aligned to standards acknowledging that standards are general, while curriculum is more specific (Squires, 2012). A "coherent model of curriculum, pedagogy, and assessment" is formed when a classroom is aligned. This coherence is seen as advantageous since it may assist teachers in developing course materials and ensuring that their students achieve their educational objectives. (Gitomer, 2011). Specific methods, like as curriculum mapping, are utilized to assist instructors and departments in determining how well their courses correspond with learning objectives (Lam, 2013).

Alignment is frequently linked to "excellent teaching (Biggs J. , 1996) and has been predicted to increase student learning (Antes, 2014). Misalignment of learning objectives, in-class instruction, and evaluations is unfortunately widespread (Momsen, 2010). Furthermore, no previous research has shown a quantifiable relationship between higher levels of Bloom's taxonomy alignment and increased student learning (Blumberg, 2009) or its relative importance compared to other instructional methods. While individual in-class training strategies have been associated to higher-order cognitive skill attainment (Freeman, 2011) and (Meltzer, 2002) the level of assessments and classroom alignment (Blumberg, 2009) There hasn't been a single research that looks at their individual and combined impacts on student learning gains. In a new approach, our research looks at the combination of all three instructional modalities to see what causes student growth in higher-order cognitive skills (Martone A. , 2009).

The process of creating well-structured instructional materials employing objectives, associated teaching methodologies, systematic feedback, and assessment is known as instructional design (Kearsley, 1996). A variety of instructional design approaches have been created to aid users in the process of creating educational materials. The ADDIE (analysis, design, development, implementation, and evaluation) method is a general instructional design paradigm with a framework that assists users in the creation of instructional content for any form of learning, including print and web-based learning. The model is a dynamic, adaptable framework for creating successful educational materials.
Educational alignment is the process of connecting the various instructional parts and, as a result, making the instructional content more effective. It’s crucial, for example, to match the goals to the lesson’s objectives. The content, examples, practice/feedback, and review must all be in line with the instructional objectives. All of the different parts must be linked with the instructional medium and methodologies (Martin, 2011).

The three components of curriculum identified by Fenwick English (1992): written, taught, and tested, give a framework for assessing alignment research. The written curriculum is generally the school district’s curriculum document or textbooks and/or standards. Teachers apply the written curriculum to create the taught curriculum. This might be in the form of lesson plans or recordings of real classroom instruction, such as videotaping. The curriculum that has been assessed includes standardized or state assessments, curriculum-embedded tests, and student written assignments submitted for review. The references are sandwiched between two of the categories, implying that the study referenced with these examples is concerned with the alignment of the two categories, such as "taught" and "tested" curricula (Squires D., 2012).

3. Methodology

Mixed methods research design was used. Three instruments were used to check the alignment of National Curriculum 2006 objectives with assessment of Biology, the study explored the opinion of teachers and students about the implementation of curriculum and also find out the alignment of curriculum objectives with assessment of Biology. Data were collected through checklist for students, observational checklist and semi structured interviews. Semi structured interviews were made for teachers to know their views about the alignment of 2006 Curriculum objectives, assessment and implementation of the Biology National Curriculum 2006.

The instruments were based on some points from National Curriculum 2006 for Biology at higher secondary level which includes scientific understanding of the living world, limitations of science, respect for evidence and rationality and ability to work with others.

3.1 Population

All the 980 students and 30 teachers from Islamabad Model colleges of Islamabad was the population of the study.

3.2 Sample and sampling technique

Sample was selected from IMCG's 30 teachers were selected as a universal sample. A random sampling technique was used for selecting biology students.

3.3 Data analysis

Descriptive statistics were used for data analysis. For quantitative data, a percentage was used. The observational checklist and the checklist for students were analyzed by percentage. Interviews of teachers were analyzed using NVIVO.

4. Results

4.1 Result of Quantitative Study

Quantitative research explores the correlations between variables in order to test objective notions. Instruments can then be used to measure these variables, resulting in a number of variables that can be analyzed using statistical methods. The final written report includes an introduction, literature, theory, methods, findings, and comments (Creswell, 2009).
Table 1: Students Checklist

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Statements</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Students are satisfied with the Curriculum objectives</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>2.</td>
<td>Students are Clear about the Objectives of Content</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>3.</td>
<td>Students know what to learn for an examination.</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>4.</td>
<td>The exam covers whole content.</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>5.</td>
<td>Students motor skills are refined by the Curriculum of Biology.</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>6.</td>
<td>The exam is based on what you have learned in the classroom.</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>7.</td>
<td>Students are satisfied with the teaching method of Biology.</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>8.</td>
<td>The instruction helps to develop scientific understanding of the living world.</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>9.</td>
<td>Students can understand separate biological concepts.</td>
<td>81%</td>
<td>19%</td>
</tr>
<tr>
<td>10.</td>
<td>Students can apply biological concepts.</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>11.</td>
<td>Students have understanding about nature of scientific activities.</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>12.</td>
<td>Students have understanding about the limitations of scientific activities.</td>
<td>66%</td>
<td>34%</td>
</tr>
<tr>
<td>13.</td>
<td>Students have access to all resources which are needed for Biology practical’s assessment.</td>
<td>31%</td>
<td>66%</td>
</tr>
<tr>
<td>14.</td>
<td>Students have ability to work with other Class fellows.</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The above table shows that students are clear about the objectives of content, they are satisfied with the teaching methods of Biology, students are agreed that Biology Curriculum refined their motor skills, the exam is based on what students learn, the exam covers the whole content and students knows about what to learn for exams. Students are agreed that instructions help them to develop scientific understanding of the living world students can understand separate biological concepts, students have understanding about the nature of scientific activities. Students are not satisfied with curriculum objectives, they cannot apply biological concepts and they have no access to all the resources needed for the practical knowledge of Biology.

4.2 Result of Qualitative Study

Qualitative research entails looking into and understanding the importance that individuals or groups place on a social or human issue. Data collected in the participant's surroundings, data processing that evolves inductively from particular to broad themes, and the researcher's interpretations of the data are all part of the research process. The final written report’s structure can
be changed. Those that conduct this form of research advocate for an inductive approach to research, a focus on individual meaning, and the importance of expressing a situation's complexity (Creswell, 2009).

4.2.1 Observational Checklist

The required amount of lab equipment like Biology supporting materials list (balance, beaker, spirit lamp etc.), Biology prepared slides and Biology chemical (formalin, distil water, ethanol, glycerin etc.) which were mentioned in the National Curriculum of Biology 2006 were observed in each college. The required amount of the lab equipment were not present in the colleges, equipment were in less number and many equipment were broken.

4.2.2 Interview of Teachers

Participants were asked different questions about the objectives, content and assessment of Biology.

- **Teacher's involvement in Curriculum decision making**
  Teacher are not involved in Curriculum design/ design associated with course objectives/assessment/marking/criteria used. They said that they are only involved in paper marking.

- **Teachers have ever a chance to discuss the objectives of Curriculum with Curriculum developers**
  Teachers are not involved at any stage. All the teachers said that they do not get a chance to discuss the objectives of the Curriculum with Curriculum developers for more detail.

- **Satisfaction of Teachers**
  Teachers are not satisfied with the performance of the learners. They said that the major focus of the students is to gain maximum marks and they do not focus on the concepts. Their focus is to get marks and not enhance their intellect. The students spend more time in academies and they do not have time for self-study.

- **Learners know what they need to learn**
  Students are aware of what to learn for an examination by consulting old examination papers. Their focus is to get good grades.

- **What to teach**
  Teachers are restricted to follow the prescribed syllabus provided by Federal Board. Due to shortage of time they cannot manage the other activities which are mentioned in the textbook. Sometimes time is limited for doing practical's.

- **What is relevant**
  Teachers said that they are equipped with prescribed course and they are bounded to follow that syllabus. Some of the teachers said that their experience also enables them to know what is relevant. Self-interest of teachers also enables them to know what is relevant.

- **Guidelines for delivery of content**
  Teachers said that there is no proper mechanism of providing guidelines that how to deliver, guidelines are very necessary to provide an idea to a teacher that how to deliver specific content. In Curriculum objectives only number of classes/periods are mentioned, that in how many periods teacher must cover a chapter. They suggested that there should be involvement of teachers in Curriculum development process, and teacher’s guides must be provided to teachers that how to deliver this specific content.

- **What to assess**
  Teachers said that they are not involved in decision making about what should assess at board level. Educational Board decides the major outline of Assessment and method.
• **Key considerations of Assessment related decisions**
  Teachers explained these key considerations while taking assessment related decisions. Teachers said that they can discuss with their seniors and colleagues. Some of the teachers consider quizzes, application of concepts, in-depth knowledge of students, learning power of students.

• **Students have ability to apply the concepts to real life situations**
  Teachers said that students cannot apply the concepts learned, they mentioned some reasons. They said that the student’s concepts are not clear, they do not have any concern with the knowledge, they only focus on getting high marks/scores rather than concepts. Some teachers said that students can apply the concepts in real life situations, many concepts are related to medical so they can apply e.g. How to check BP. The major portion of the Curriculum is applicable.

• **Deal with problems**
  All teachers deal with the problems at personal level. They said that we try to solve our problems by discussing it with our colleagues and seeking guidance from our seniors. Some teachers said that they consult different books, library resources and internet to find a solution of their problems.

• **Teachers attend workshops**
  45% of the teachers said that they attend very few workshops because of so many problems. They are not free as the time of academic session is very low to cover the content so they cannot attend workshops, in some colleges there is shortage of staff so teachers cannot attend workshops. All the teachers said that they are willing to attend workshops, when workshops are organized and they get an opportunity they will attend those workshops.

• **Workshops are useful**
  80% of the teachers said that those workshops are very useful which are conducted by some foreign experts. 20% of the teachers said that these workshops are not useful.

• **Time is enough for conducting practicals**
  All the teachers said that this time is not enough to conduct practicals. Course is very lengthy and very little time left behind for practicals so they conduct practicals in hustle and bustle.

• **Fully equipped lab**
  Teachers said that up to some extent lab equipment is enough but they need new and upgraded equipment with raised quantity and they need a proper lab attendant.

• **Mental and Motor abilities of students are polished by Biology National Curriculum**
  Teachers have different opinion like some teachers said that mental and motor abilities of students are polished by Biology National Curriculum. They mentioned the many reasons like It is very polished syllabus, it helps to polish the skills of students, it has a science and technology connection. And some teachers said that mental and motor abilities of students are not polished by Biology National Curriculum because of so many reasons the reasons are that students Do not assess or polish higher order learning skills, course is very lengthy and time is very short, it is not coverable in the one academic session, there is only reproduction of knowledge, Scientific activities are not included.

• **Biology Curriculum enhances the rational power of students**
  Teachers said that the Biology National Curriculum does not enhance the rational power of students because their focus is getting higher scores and students focus on route memorization rather than concept clarification.
  Some teachers said that students do self-study, some concepts are very tough, the curriculum is evolution focused, reasoning exists in the content and there is scientific understanding with Qur’anic reference.
Curriculum enables Students to have respect for evidence, rationality and intellectual honesty

Teachers said that the students do not have respect for evidence, rationality and intellectual honesty because they do not understand the limitations of scientific activities and their concepts are not clear.

5. Analysis and Discussion

The present research was aimed to investigate the alignment of National Curriculum 2006 objectives with Biology textbook objectives, and examine the alignment of National Curriculum 2006 objectives with Biology textbook and assessment of Biology. Random sampling was used to select students, and teachers were selected as a universal sample. Instruments included a Checklist for students, an interview of teachers, an observational checklist for lab observation, and a content analysis rubric and checklist used for textbook content analysis.

Based on the findings of the study, results revealed that assessment is an inclusive process to guarantee alignment between learning objectives and classroom practice. Students are not satisfied with curriculum objectives. This result is supported by (Cohen, 1987) revealed in their study that curriculum objectives are not properly clear to all students. The study's revealed that students are clear about the objectives of Biology content. This finding is similar to the findings of (Squires, 2012) who revealed that the content of the textbooks is clear to students. This finding contradicts the findings of (Gitomer, 2011) who reported that their respondents were highly dissatisfied with the objectives of textbook content.

The findings of the study revealed that students agreed that exams cover the whole content and it is based on what students have learned in the classroom. The finding is consistent with the findings of (Dávila, 2005) who reported that the examination system covers the whole content of textbooks and questions that come from the textbook which teachers practice in the classroom. The findings of the study also revealed that students are satisfied with the teaching methods of Biology which helps students to understand separate biological concepts. It is in line with the findings of study conducted by (Lam, 2013) whose findings revealed that an effective teaching method is beneficial for learning fastly and smartly. Moreover, it was also found that teacher’s instruction helps to develop a scientific understanding of the living world which helps students to understand the biological concepts. Students motor skills are refined by the Curriculum of Biology.

According to findings, students' have an understanding of the nature of scientific activities and their limitations of scientific activities. This finding is consistent with the findings of (Martone, 2009) who reported that students' have knowledge about scientific terms and they know how to implement biological activities. The findings of the study also revealed that students cannot apply biological concepts because they do not have access to all resources which are needed for Biology practical's assessment during classroom teaching. This finding is similar to the findings of the (O'Neill A, 2010) who reported that the majority of respondents only have a grip on theoretical concepts rather than practical work. But this finding contradicts the findings of (Tyler, 2013) who reported that students implement biological concepts in laboratories and in daily life.

The study revealed that teachers are not directly involved in curriculum design and they do not get a chance to discuss the objectives of the curriculum with curriculum developers in more detail. The findings of the study depict that teachers are not satisfied with the performance of the learners as they only emphasize getting marks instead of concepts and they learn by consulting old examination papers.
Academies are becoming trends nowadays and students spend a lot of time there rather than self-study. It is contradicting with the findings of study conducted by (Biggs, 1996) teachers are essential to any endeavor to construct curriculum because of their knowledge, experiences, and abilities. Because they are the most informed about the practice of teaching and are in charge of delivering the curriculum in the classroom, better instructors facilitate greater learning.

The study revealed that teachers are restricted to follow the prescribed syllabus which is provided by Federal Board. They do not have time to conduct activities given in the textbook due to limited time and lengthy courses. Time is also limited for practicals. The study's finding is similar to the findings of (Aviles, 2001) who reported that teachers have limited time to conduct all activities in the classroom which is given in textbook.

It is decided by the curriculum wing what should be taught. The findings of the study also revealed that all teachers agreed that there is no proper mechanism for providing guidelines that how to deliver content. They said that in Curriculum objectives only the number of classes/periods is mentioned and that is how many periods the teacher must cover a chapter. Some of the teachers said that proper guidelines are not available and clear. In curriculum 2006 time is mentioned in the book for every chapter that how many days are required for a teacher to complete a unit. Teachers are not satisfied with this distribution because some chapters are too long and cannot be covered in a prescribed time.

The findings of the study revealed that Assessment is not fully aligned with the curriculum. There are many gaps between curriculum and assessment. These findings are similar to the findings of (Antes, 2014) who reported that there is little alignment exists between Assessment and National Curriculum objectives. The competencies, benchmarks were aligned with the SLOs. But the SLOs of the textbook are not the exact copies of the SLOs of the curriculum which decreases the alignment between curriculum and textbook. Assessment exercises given at the end of each unit were not assessing the SLOs narrated in National Curriculum and assessment exercises only assess students’ knowledge ability and to some extend comprehension and application ability.

Teachers are willing to attend workshops but they attend very few workshops due to some problems like they are not free as the time of the academic session is very low to cover the content so they cannot attend workshops, in some colleges, there is a shortage of staff so teachers cannot attend workshops. These findings are consistent with the findings of (Wotring, 2021).

6. Conclusion

The Mixed Methods study provides an insight of the fact that the Assessment of Biology is not fully aligned with the National curriculum, Teachers are not involved in decision making, curriculum development and exam policy making. The content is very lengthy and teachers do not have enough time to complete practicals and Lab equipment are not enough according to the quantity which is mentioned in the National Curriculum document. Some equipment is broken.

References


