Comparing Alignment of Content and Activities of Single National Curriculum with Respective Textbook of General Science at Primary Level

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Abstract

It is an alignment study between Single National Curriculum (SNC) and textbook of general science of primary level. The objectives of the study were: a) to compare the alignment of content of general science textbook and SNC for grade V; and b) to critically analyze the suggested plan of activities between SNC and textbook. During the study three tools were used; 1) Curriculum Textbook Alignment Framework, 2) Curriculum Textbook Alignment Rubric which were adapted from Saeed and Rashid (2014); and 3) Curriculum Textbook Alignment Checklist. Checklist was developed by the researcher and validated through two experts' opinion. Study was ended with consequences as; the content in the textbook were largely matched with the guidelines given in the SNC. Furthermore, the textbook does not completely helpful to achieving the plan of activities as per curriculum instructions. Textbook follows 30 plan of activities out of 39 as per curriculum guidelines. It was recommended that, PCTB team should give instructions to authors while developing textbook in accordance with the SNC of general science.

Keywords: Alignment, General Science, Primary Level, SNC, Textbook, Content, Activities

Introduction

Curriculum document is the reflection of educational policies of the nation and educational policies are made as per societal and global need. Nations in the world are flourished by upgrading educational standards. It is one of the reliable document having complete set of guideline to attain educational goal of the country (Saeed & Rashid, 2014). Curriculum reflects cultural values of the country and transferred them to next generation (Bhutto, Syed, Rajput, Shah & Chachar, 2022).

Pakistan, being a third world country needs to raise the education system by aligining the educational goals with the global criteria. By aligining with global standards our educational goals meet the challenges of 21st century (Saher & Kashif, 2020).

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Curriculum formulation is a dynamic process, as knowledge upgrades; it is modernized and reconstruct as per new set of criteria. In 2020, Pakistan developed "Single National Curriculum (SNC)" which was adopted at primary level in academic session 2021-22. Analytical reasoning, scientific knowledge, and to align with "Trends in International Mathematics and Science Study" (TIMSS) were the main key objectives considered during the developing process of SNC for general science.

Before 18th Amendment i.e. 2010, Federal Ministry of Education took the responsibility of formulating curriculum and approving textbook throughout the country. After 18th Amendment, this responsibility was transferred to all provinces of the country. Punjab Curriculum & Textbook Board (PCTB) is the relevant institution in the province Punjab.

Textbook developers formulate textbook as per curriculum set standards and select the content as per curriculum guideline. Textbook is indespensible for students as well as teachers. Degree of resemblance between the curriculum and textbook determines the quality and authenticity of the textbook. (Hashmi, Hussain & Shoaib, 2018).

Goals of the nation to upgrade educational system are acquired through textbook alignment. Country-wide usage of textbook enhanced its reliability (You, Lee & Craig, 2019). Textbook pushes the students towards one of Proximal Development by Lev Vygostsky (Mikk, 2000). The subject general science promotes critical thinking skills (CTSs) which are helpful in enhancing the absorbing capacity of students. Creativity and analytical abilities in students are produces by CTSs (Hasnah, Ginting, Supiatman, Kharisma, & Siahaan, 2024).

Degree of resemblance between the curriculum and textbook is the key consideration for achieving national educational goals (Mahroof & Saeed, 2021). A number of researches has been conducted on SNC (Abbas, Basit, Akhtar, Mehmood, Quratulain & Nazim, 2022; Batool, Shaheen & Iqbal, 2023; Muqadar, Ishfaq, Tahir & Tufail, 2023; Zaman, Saleem & Ali, 2021), but neither of these are on alignment of general science SNC with its textbook with respect to content and suggested plan of activities at primary level.

Objectives of the current research are accomplished by aligning SNC with textbook. Because, this study provides all of those possible gaps between SNC and textbook which are very important for textbook developers. Study indicates the gaps between content and suggested plan of activities.

Curriculum comes in three flavors: formal, enacted, and acquired. The intended curriculum defines the implemented curriculum, and the assessed curriculum defines the student's achievement (Porter, 2004). The degree to which educational objectives are met is determined by the association between all three of these curriculum formats.

The Single National Curriculum (SNC) was introduced by Imran Khan's administration. One Nation One Curriculum is SNC's motto. The major goals are to promote social harmony, national unity, the abolition of discipline-specific disparities, equal education, teacher and student mobility among provinces, and the holistic development of pupils. Advancement in science education was the primary attention of developing new curriculum. Its main consideration is to align with by the worldwide program; TIMSS. Approved curriculum was implemented in different academic session of the annually education system of the country. In session 2021-22, implemented at primary level. In session 2023-24, implemented at elementary level. In session 2024-26, implemented at secondary level.

Selection of content by textbook developers is a crucial process and general science textbook

was prepared to enhance scientific literacy, creativity and problem solving ability in the society. As discussed before, alignment is primary goal to achieve educational standards. All teaching learning activities are based on textbook. Thus, it is necessary to carry out these studies to look at how well curricula match with relevant textbooks (Bhatti, Jumani, & Bilal, 2015). A number of alignment model were used by various researches; "triadic model" (Shaltry, 2020), "Porter Alignment Model" (Sun & Li, 2021), "Tri-partite model prepared by Valverde et al. (2002)" (Kyi & Isozaki, 2023). Current research follows alignment framework which was developed by Saeed and Rashid (2014).

Mahroof and Saeed (2021) investigated a study of alignment which revealed that balance between all cognitive levels of Bloom's taxonomy has not been considered during construction of paper. Some SLOs and their relevant content are also not addressed. They suggest that teachers should create critical thinking skill among student by focusing on their surrounding environment. Hashmi, Hussain and Shoaib (2018) conducted a qualitative research of alignment that revealed two chapters are missing in the subject of science and mathematics, they also found that balance is not exist between HOTs and LOTs. They recommend, textbook author should focus on curriculum guideline for selection of content for textbook. In 2020, Saher and Kashif revealed unbalance between HOTs and LOTs by conducting Surveys of Enacted Curriculum (SEC) method.

Bhutto, Syed, Rajput, Shah and Chachar (2022) revealed that there are two textbook board in the province Sindh; a) Aga Khan Board and b) Sindh Textbook Board. Exploring English textbook by Aga Khan Board was achieved 75% of objectives of speaking and reading skills and 65% of writing and grammar skills while Secondary Stage English textbook by Sindh textbook board was attained only 50% of objectives from grammar, 30% reading and writing and 25% of speaking skills.

Textbook should align with curriculum because curriculum reflects national goals and there is a need to give considerable attention towards alignment researches. Holistic procedure; alignment addressed all essentials. Learners' cognitive development depends upon the standard of textbook material in the form of content and activities especially in the subject of general science. Prosperity of nations depends upon evolution of education system and alignment research continuum upgrade our textbook worth and value.

Alignment of knowledge and skills with emerging global trends like TIMSS and ICT incorporates problem solving ability and inquiry based activities in the general science students. An alignment study at secondary level in the subject of chemistry was conducted by Saeed and Rashid (2014), explore the association between curriculum (2006) and textbook with respect to objectives, content and assessment exercise. Study was ended by resulting; SLOs and assessment exercise were partially aligned while content is largely aligned. There is a need of such type of supervision that ensured the alignment between curriculum and textbook.

Korean textbook was evaluated by You, Lee and Craig (2019) with regards to certain parameters like; alignment of creative content with national curriculum. Researchers concluded that there would be precised criteria for selecting proper content as per curriculum standards and policy should be implemented.

One of Chinese study explored the degree of alignment of curriculum with five textbooks that were published by five different publishers. Textbooks were not developed as per curriculum

guidelines. Inequity has been found among different cognitive levels of revised Blooms' taxonomy. Textbook focused on concept building rather than skill-development (Yu, Li & Li, 2022).

The alignment of a science textbook with curriculum: A case study regarding the topic 'somatic cell division' Semantic network analysis is used throughout the entire study to compare how connected any two given concepts are. For students the notion is ambiguous. Before starting to teaching the topic 'somatic cell division' as per curriculum guideline, we must give the concept or understanding of chromosome in terms. But the notion of chromosome has not yielded to assessment (Kim, Lee, Lee & Lim, 2023).

Comparison between developing and developed countries Kyi and Isozaki (2023) conducted a study in the curriculum guidelines to prepare textbooks of Myanmar, Japan. Results of this study have shown that the learner cognition, acquirements and expertise was a priority in both countries' curricula. The science book of Japan emphasized scientific inquiry while the science book of Myanmar exposed directly on technical and logic based learning in local languages common both "Burmese and English". In recent years, the aims of Japanese science curriculum came to focus on fostering inquiry and a curiosity about nature in students' learning/science. In summary, the Japanese syllabus results in psychomotor learning of its medical students.

The study carried out by Bhatti, Jumani and Bilal (2015) was based on alignment of biology subject for grade IX. Study indicated that textbook is partially matched with curriculum in highest performance objectives. The objectives stated in the textbook were not aligned with higher order levels of questions "Analysis, Synthesis and Evaluation".

Squires (2012) completed a study in relation to alignment. The main purpose of the study was that, alignment may carry to increase and it can be benchmarked as a success in student outcomes. This study demonstrated the connection between instructional curriculum and formal curriculum (also known as written curriculum) and assessment exercises based on using guidance. The study highlights the positive result in all relations between formal curriculum and instructed curriculum, as well as with assessed or vice versa. Compare the content of product curriculum with intended curriculum (transform study) School districts are implementing the intended curriculum and making gains in students' performance.

In 2011, Mahmood conducted a study on alignment, which indicated that the curriculum wing established benchmarks for textbook developers and the evaluation process of textbooks. This led to an improvement in the quality of textbooks contain numerous errors due to absence of specific criteria for evaluating them. SLOs of textbook were not harmonized with national curriculum. Item in exercises were mostly from LOTs. As a result, the curriculum goals are not met by textbooks because there is no established method for making judgments.

The degree of alignment between the science curriculum and textbook at one of the Ethopian University alignment studies was made public. The students were studying science in grade VII. This study used a checklist and a rubric as its two instruments. Researchers employed the quantitative research method. The textbook and curriculum are highly aligned. According to the results; 79.22 % of SLOs were aligned, 89.47 % of question were from LOTs and 10. 53 % questions from HOTs. Overall alignment index is satisfactory (Alemneh & Mengistie, 2023).

Curriculum objectives are the main building block for both teaching and learning which provide basis of teaching methodology. The textbook's activities provide guidance to

educators on how to implement various pedagogical approaches or styles. A textbook is an excellent tool for students to improve their standards of instruction. Ahmad, Lashari and Golo (2023) conducted research in order to examine the English textbooks for grades I, II, III, IV and V in relation to their corresponding curriculum guidelines. Qualitative research design by single tool: checklist was employed. 89.8 % questions were from lower order thinking skills and 10.2 % from higher order thinking skills. Study showed that curriculum needs to be revised with an emphasis on subject matter and learner's need.

Objectives of the Study

1. Explore the alignment of content of general science textbook with Single National Curriculum at grade V.
2. Compare the alignment of suggested plan of activities of general science textbook with Single National Curriculum at grade V.

Research Questions

1. To what extent the content of general science textbook aligned with the Single National Curriculum at grade V?
2. To what extent activities in general science textbook aligned with the suggested plan of activities given by Single National Curriculum at grade V?

Conceptual Framework

The textbook of general science consists of 10 chapters. Textbook incorporate those activities which arose the analytical ability of the learners and think scientifically. Alignment is the degree to which measures the textbook components as per curriculum standards. Krippendorff said "alignment produced valid inferences through content investigation" (Alemneh & Mengistie, 2023).

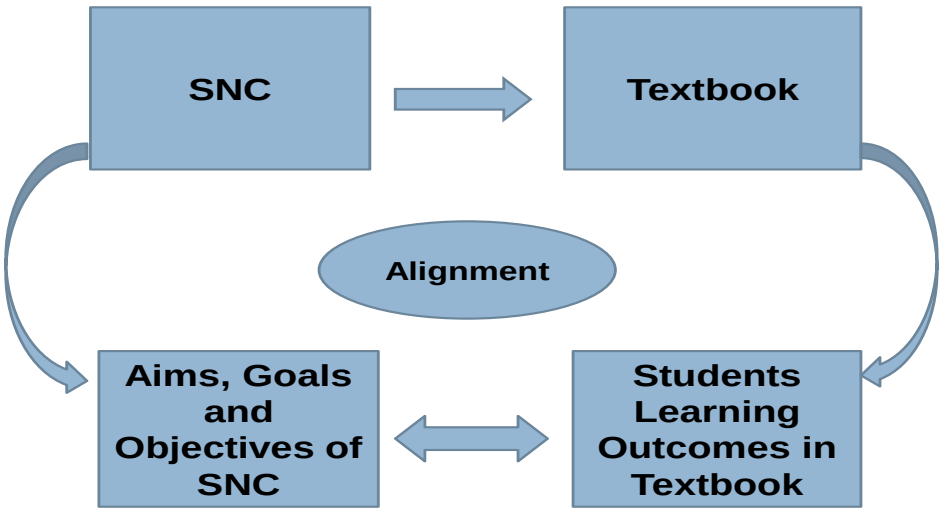

Figure 1: The conceptual framework of the study

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Research Methodology

Qualitative research design was adopted to conduct the research. With the help of document analysis study was preceded. Content and activities were analyzed qualitatively throughout the study by using following three qualitative tools.

1. Curriculum-Textbook Alignment Framework (CTAF)
2. Curriculum-Textbook Alignment Rubric (CTAR)
3. Curriculum-Textbook Alignment Checklist (CTAC)

Degree of association and relatedness was determined by using these research tools.

Instrumentation

Curriculum-Textbook alignment Framework (CTAF) was adapted from Saeed and Rashid (2014); attached in Appendix section. Horizontal organization of all ten chapters of textbook was determined by CTAF. One of its sections; chapter-wise analysis analyzed the collected data (Alignment of content and plan of suggested activities). Descriptive analysis was done by 12 questions asked by the researcher.

Curriculum-Textbook Alignment Rubric (CTAR), second instrument was also adapted from Saeed and Rashid (2014); attached in Appendix section. Collected data was analyzed by filtering through five components of Rubric. Presence of aspects in textbook was measured through four scales. A: 100% presence, B: 75% presence, C: 50% presence and D: 25% presence.

Curriculum-Textbook Alignment Checklist (CTAC), third instrument was developed by researcher and gone through the process of validation; attached in Appendix section. Two sections of checklist inspect the content and list of activities in textbook by comparing them with Single National Curriculum.

Data Analysis and Interpretation

Collected data were presented, analyzed and interpreted qualitatively. Data analysis is a systematic way to answer the research questions. It determines how the textbook is communicative with curriculum standards. Instructional guidelines were measured through following three research parameters:

Table 1: Curriculum Textbook Alignment Framework

Sr. No.	Aspects in textbook	Evidence from textbook	Instructional plan & suggested activities
1	Chapter # 1	Exist	Exist
2	Chapter # 2	Exist	Exist
3	Chapter # 3	Exist	Exist
4	Chapter # 4	Partially Exist	Exist
5	Chapter # 5	Exist	Exist
6	Chapter # 6	Exist	Exist
7	Chapter # 7	Exist	Exist
8	Chapter # 8	Exist	Exist
9	Chapter # 9	Exist	Exist
10	Chapter # 10	Exist	Not Exist

Table 1 shows that chapter # 4 “Environmental Pollution” was partially aligned which need

more explanatory material. There was no any activity in chapter # 10 "Technology in Everyday Life". All the remaining eight chapters contain relevant activities as per instructional plan. Sequence of 10 chapters has been found as per directions.

Table 2: Curriculum Textbook Alignment Rubric

Aspects	Corresponding	A	B	C	D
Objectives	Are the benchmarks describe curriculums' goal		✔		
	Are the SLOs as per curriculum guideline		✔		
Contents	Is the content of textbook inter-related with the SLOs of curriculum		✔		
Learning Activities	Is textbook formulate activities as per curriculum			✔	
Assessment of Students' Learning	Every SLO generates assessment items in the textbook			✔	
	The assessment questions addressed knowledge and skills as per curriculum standards		✔		
	Assessment items measure LOTs		✔		
	Assessment items measure HOTs		✔		
Overall	Effectiveness and judgment of textbook by assessing the SLOs, content and assessment exercise			✔	

Table 2 shows that all aspects were measured by using four point scale; A, B, C and D. A: 100% presence of aspects, B: 75% presence of aspects, C: 50% presence of aspects and D: 25% presence of aspects. 75% of objectives were achieved by curriculum in the form of benchmarks and formulation of students' learning outcomes. Almost 75% of content were selected as instructional plan. 50% of suggestion plan of activities were followed. 75 % of item from exercise cover lower order thinking skills. 50 % of item from exercise cover higher order thinking skills. Worth of textbook was evaluated as the presence of 75% aspects.

Table 3: Curriculum Textbook Alignment Checklist With Respect to Content

Sr. No.	Number of chapters with respect to content	Partially aligned	To some extent completely aligned
1	Chapter # 1		✔
2	Chapter # 2		✔
3	Chapter # 3		✔
4	Chapter # 4	✔	
5	Chapter # 5		✔
6	Chapter # 6		✔
7	Chapter # 7		✔

8	Chapter # 8	✔
9	Chapter # 9	✔
10	Chapter # 10	✔

Table 3 shows that content in chapter # 1, 2, 3, 5, 6, 7, 8, 9, 10 was largely aligned with curriculum standards while chapter # 4 represents partially alignment between textbook and curriculum. Sequence of content and chapter arrangement reflects the instructional plan

Table 4: Curriculum Textbook Alignment Checklist With Respect to Activities

Sr. No.	Chapter no. of textbook	No. of suggested activities in curriculum	No. of activities followed by textbook	No. of activities not followed by textbook
1	Chapter # 1	5	3	2
2	Chapter # 2	3	2	1
3	Chapter # 3	3	2	1
4	Chapter # 4	4	3	1
5	Chapter # 5	4	3	1
6	Chapter # 6	6	5	1
7	Chapter # 7	8	7	1
8	Chapter # 8	4	4	Nil
9	Chapter # 9	1	Not followed	1
10	Chapter # 10	1	1	Nil
	Overall	39	30	9

Table 4 shows the implication of plan of activity in textbook. Three activities out of five were followed by the textbook in chapter # 1. Two out of three activities were followed by the textbook in chapter # 2. Two out of three activities were followed by the textbook in chapter # 3. Three out of four activities were followed by the textbook in chapter # 4. Three out of four activities were followed by the textbook in chapter # 5. Five out of Six activities were followed by the textbook in chapter # 6. Seven out of eight plans of activities were followed by the textbook in chapter # 7. The complete activities plan was followed by the textbook in chapter # 8 as per curriculum directions. Textbook did not follow the plan of activity of curriculum for chapter # 9. Textbook reflects suggested plan of activity of curriculum effectively in chapter 10.

Discussion

Effectiveness of teaching and learning revolves around the authenticity of textbook. Textbook is the basic pillar of our education system. Efficacy of education system depends upon the strength of foundation in the system for implementing reforms. Curriculum put forwards the educational reforms which is the reflection of national educational policy. Impact of policy decisions is measured through degree of alignment between textbook and curriculum. Alignment researches provide continuous feedback for novelty in curriculum.

Qualitative analysis of the study evaluates the textbook by covering content and list of projects. Study investigate the alignment of Single National Curriculum with corresponding

textbook with regards to content and suggested plan of activity in the subject of general science at grade V. Textbook encompasses ten chapters; first chapter select the content about living organism and explain different categories and sub-categories in the form of taxa. Second chapter gathers the content regarding microbes which explain their advantages and disadvantages. Third chapter is about importance of flower and seed in plant reproduction. Fourth chapter addressed the pollution with respect to land, water and air. Fifth chapter explained the changes in matter. Sixth chapter focused on light and sound. Seventh chapter told about electricity and magnetism. Chapter # 8 selected content about structure of earth. Chapter # 9 was about space and satellite. Technology in every-day life was discussed in chapter # 10. During the alignment procedure it was found that textbook is largely aligned excepting the content in chapter # 4.

Therefore the advised activities by the curriculum competences were not fully adhered by the textbook. Out of thirty-nine activities, textbook planned only thirty activities. The SNC document provided 39 lesson plans with activities, while the textbook used 30 lesson plans with activities.

Research found the following discrepancies between the curriculum and the textbook: The material in the textbook was effectively aligned with the updated curriculum; while projects and activities of textbook were not entirely reflect the curriculum standards. Current findings are supported by the previous studies: (Saher & Kashif, 2020), (Hashmi, Hussain & Shoaib, 2018) and (Saeed & Rashid, 2014). Textbook developers should follow the curriculum guidelines.

Conclusion and Recommendations

Finding and discussion concluded the current research as:

Content of textbook is largely aligned with the Single National Curriculum (SNC-2020) with the exception of chapter four at pg.47 there is a need of more explanatory content. Horizontal organization was found between chapter one and two rest of the chapters did not horizontally aligned with previous their chapter. The reason behind this, general science textbook comprises of all basic science subject like; biology chemistry, physics and space-science. Single National Curriculum guided thirty-nine plans of activity for whole textbook while all ten chapters formulate thirty projects or activities.

Under the light of results researcher suggested and recommended that:

Ministry of Federal Education (MFE) and Punjab Curriculum and Textbook Board (PCTB) should formulate precise benchmark for textbook evaluation which ensured the existence of curriculum competence in textbook. There are some suggestions; key word “organism” and “kingdom” should be given at the start of the first chapter. The topic of invertebrates was started with the definition of invertebrates incorporating the key word “absence of backbone”. Reproductive mechanism of fishes and amphibian should be supplementary to the textbook. The textbook should also include information about the environments were insects and worms lives.

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