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Dr. Khalida Akhtar
Department of Education,
Karamat Husain Muslim Girls' Post Graduate College,
Lucknow, Uttar Pradesh,
India

Correspondence
Dr. Khalida Akhtar
Department of Education,
Karamat Husain Muslim Girls' Post Graduate College,
Lucknow, Uttar Pradesh,
India

Content analysis of science text books by senior secondary school teachers in Uttar Pradesh

Dr. Khalida Akhtar

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Abstract
Teachers occupy an important role in executing or implementing the curriculum. Text books are the major sources of obtaining knowledge and information regarding any subject. Teaching of science at secondary school level includes subjects like Physics, Chemistry and Biology. The present study is an attempt in doing content analysis of science text books on the basis of opinion of senior secondary school teachers. Findings of the study are based on the basis of the questionnaires given to them containing items related to science text books. In the end conclusions and suggestions are given.

Keywords: Science curriculum, senior secondary schools, content analysis, text books

1. Introduction
Science text books occupy an important place in the secondary school curriculum. A country's development depends much upon scientific developments. At senior secondary school level, science includes subjects like Physics, Chemistry and Biology. The content of science text books should be such that it helps students understand all the concepts easily and clearly and develop in them scientific outlook and help them in qualifying various competitions.

2. Objectives of the study
a) Content analysis of textbooks of physics, chemistry and biology for classes XI and XII (CBSE Curriculum) in Uttar Pradesh
b) To suggest measures for improvement based on the findings of the study.

3. Methodology of the study
The study is based on the data collected from the senior secondary schools located in Agra, Aligarh, Allahabad, Bareilly and Lucknow. All these schools followed CBSE (Central Board of Secondary Education) curriculum. The total respondents were 150 Teachers each from physics, chemistry and biology. They were given questionnaires which contained items related to science text books. The items covered different aspects of syllabus in the text books of Physics, Chemistry and Biology. Analysis of data was done based on the percentage of responses. Then finally the findings regarding the science text books are given.

4. The responses of Science (Physics, Chemistry and Biology) teachers of classes XI, XII towards the statements given in questionnaire about the text books

Q1) The content of the textbook is

Table 1: Content of the textbook

Teachers' response towards	Easy		Difficult		Apt (understandable)	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	21	14.000	93	62.000	36	24.000
Chemistry	25	16.667	53	35.333	72	48.000
Biology	65	43.333	43	28.667	42	28.000
Total	111	24.666	189	41.958	150	33.300

Q2) Subject matter in the textbook is

Table 2: Subject matter in the textbook

Teachers' response towards	Interesting		Not very interesting		Boring	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	104	69.333	41	27.333	05	03.333
Chemistry	113	75.333	34	22.667	03	02.000
Biology	113	75.333	33	22.000	04	02.667
Total	330	73.26	108	23.976	12	02.664

Q3) New course when compared with old course is

Table 3: Comparison of new course with the old course

Teachers' response towards	Entirely different		Not much different		Not at all different	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	45	30.000	92	61.333	13	8.667
Chemistry	23	15.333	106	70.667	21	14.000
Biology	89	59.333	47	31.333	14	9.333
Total	157	34.854	245	54.39	48	10.656

Q4) Textbooks are

Table 4: Length of the text book

Teachers' response towards	Lengthy		Short		Appropriate	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	84	56.000	05	03.333	61	40.667
Chemistry	93	62.000	03	02.000	54	36.000
Biology	94	62.667	05	03.333	51	34.000
Total	271	60.162	13	02.886	166	36.852

Q5) Curriculum is

Table 5: Curriculum

Teachers' response towards	Wide and comprehensive		Narrow and limited		Heavy and burdensome	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	85	56.667	07	4.667	58	38.667
Chemistry	106	70.667	02	1.333	42	28.000
Biology	110	73.333	04	2.667	36	24.000
Total	301	66.822	13	2.886	136	30.192

Q6) The curriculum is

Table 6: Nature of the curriculum

Teachers' response towards	Flexible		Rigid		Dynamic	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	112	74.667	10	6.667	28	18.667
Chemistry	130	86.667	12	8.000	08	5.333
Biology	134	89.333	03	2.000	13	8.667
Total	376	83.472	25	05.550	49	10.878

Q7) New course when compared with old course is

Table 7: Comparison of new course with the old course

Teachers' response towards	More difficult		Less difficult		Of the same difficulty level	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	83	55.333	05	3.333	62	41.333
Chemistry	96	64.000	01	0.667	53	35.333
Biology	96	64.000	04	2.667	50	33.333
Total	275	61.05	10	02.220	165	36.630

Q8) Your syllabus is integrated with Information Technology

Table 8: Integration of syllabus with the text book

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	105	70.000	34	22.667	11	07.333
Chemistry	48	32.000	85	56.667	17	11.333
Biology	85	56.667	54	36.000	11	07.333
Total	238	52.836	173	38.406	39	08.658

Q9) Physics, Chemistry and Biology curricula are mutually correlated

Table 9: Correlation of the syllabi

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	62	41.333	56	37.333	32	21.333
Chemistry	65	43.333	63	42.000	22	14.667
Biology	102	68.000	35	23.333	13	8.667
Total	229	50.838	154	34.188	67	14.874

Q10) Textbooks provide students with sufficient material on the subject

Table 10: Sufficient course content in the text book

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	78	52.000	61	40.667	11	7.333
Chemistry	103	68.667	41	27.333	06	4.000
Biology	74	49.333	43	28.667	33	22.000
Total	165	36.63	145	32.19	50	11.100

Q11) Time frame of the school is sufficient enough to cover the course content in the textbooks

Table 11: Allotted teaching time for completion of the course

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	64	42.667	63	42.000	23	15.333
Chemistry	27	18.000	95	63.333	28	18.667
Biology	54	36.000	78	52.000	18	12.000
Total	145	32.190	236	52.392	69	15.318

Q12) New course is better than the old course in providing social competence in students

Table 12: Competency of the new course

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	78	52.000	57	38.000	15	10.000
Chemistry	78	52.000	38	25.333	34	22.667
Biology	103	68.667	23	15.333	24	16.000
Total	259	57.498	118	26.196	73	16.206

Q13) It is related to community living

Table 13: Relation of the curriculum to the community living

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	65	43.333	56	37.333	29	19.333
Chemistry	75	50.000	57	38.000	18	12.000
Biology	79	52.667	34	22.667	37	24.667
Total	219	48.618	147	32.634	84	18.648

Q14) Curriculum is sufficient enough to develop scientific attitude and skills in pupils required at senior secondary school level

Table 14: Role of the curriculum in developing scientific attitude and skills

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	108	72.000	30	20.000	12	8.000
Chemistry	134	89.333	05	3.333	11	7.333
Biology	122	81.333	16	10.667	12	8.000
Total	364	80.000	51	11.322	35	07.770

Q15) Curriculum is complete in itself

Table 15: Completeness of the curriculum

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	126	84.000	06	4.000	18	12.000
Chemistry	137	91.333	06	4.000	07	4.667
Biology	113	75.333	19	12.667	18	12.000
Total	376	83.472	31	06.882	43	09.546

Q16) The language of textbook is lucid, simple and precise

Table 16: Language of the text book

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	108	72.000	37	24.667	05	3.333
Chemistry	68	45.333	64	42.667	18	12.000
Biology	77	51.333	64	42.667	09	6.000
Total	253	56.166	165	36.63	32	07.104

Q17) The textbooks contain necessary examples, figures, graphs etc.

Table 17: Figures and graphs in the text books

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	48	32.000	61	40.667	41	27.333
Chemistry	94	62.667	41	27.333	15	10.000
Biology	113	75.333	16	10.667	21	14.000
Total	255	56.610	118	26.196	77	17.094

Q18) It develops in pupils the desired skills for solving problems in their day-to-day life

Table 18: How efficient is curriculum in developing desired skills and solving daily life problems

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	76	50.667	48	32.000	26	17.333
Chemistry	76	50.667	71	47.333	03	2.000
Biology	98	65.333	34	22.667	18	12.000
Total	250	55.500	153	33.966	47	10.434

Q19) The curriculum of classes XI and XII provide the students with sufficient knowledge and understanding required at senior secondary school level

Table 19: Efficiency of curriculum to provide knowledge and understanding for senior secondary school students

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	103	68.667	32	21.333	15	10.000
Chemistry	113	75.333	14	9.333	23	15.333
Biology	112	74.667	34	22.667	04	2.667
Total	328	72.816	80	17.76	42	09.324

Q20) It develops in students, economic efficiency and capacity to earn livelihood

Table 20: Curriculum and economic efficiency

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	78	52.000	45	30.000	27	18.000
Chemistry	95	63.333	34	22.667	21	14.000
Biology	51	34.000	65	43.333	34	22.667
Total	224	49.728	144	31.968	82	18.204

Q21) It develops curiosity and power of reasoning and observation in students

Table 21: Curriculum and curiosity, power of reasoning and observation in students

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	134	89.333	04	2.667	12	08.000
Chemistry	141	94.000	03	2.000	06	04.000
Biology	128	85.333	09	6.000	13	08.667
Total	403	89.466	16	03.552	31	06.882

Q22) It provides the scientific outlook (free from prejudices and based on tolerance)

Table 22: Curriculum and scientific outlook

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	116	77.333	04	2.667	30	20.000
Chemistry	139	92.667	03	2.000	08	05.333
Biology	134	89.333	03	2.000	13	8.667
Total	389	86.358	10	2.220	51	11.322

Q23) It trains pupils for efficient application of the knowledge of principles and theories of science

Table 23: Curriculum and training in application of principles and theories of science

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	119	79.333	07	04.667	24	16.000
Chemistry	143	92.667	02	02.000	05	5.333
Biology	129	86.000	03	02.000	18	12.000
Total	391	86.802	12	02.664	47	10.434

Q24) It has utility in the practical life of students

Table 24: Curriculum and utility in practical life of students

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	29	19.333	101	67.333	20	13.333
Chemistry	94	62.667	37	24.667	19	12.667
Biology	78	52.000	63	42.000	09	6.000
Total	201	44.622	201	44.622	48	10.656

Q25) Course content of new syllabus when compared with the old syllabus is

Table 25: Comparison of course content of old and new syllabi

Teachers' response towards	More		Less		The same	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	87	58.000	12	08.000	51	34.000
Chemistry	110	73.333	25	16.667	15	10.000
Biology	85	56.667	04	02.667	61	40.667
Total	282	62.604	41	09.102	127	28.194

Q26) Division of course into semesters for classes XI and XII is

Table 26: Division of course in semesters

Teachers' response towards	Beneficial		Not very beneficial		Semester pattern	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	74	49.333	42	28.000	34	22.667
Chemistry	78	52.000	38	25.333	34	22.667
Biology	96	64.000	13	8.667	41	27.333
Total	248	55.056	93	20.646	109	24.198

Q27) It is based on the psychological principles of learning

Table 27: Curriculum and psychological principles of learning

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	107	71.333	15	10.000	28	18.667
Chemistry	117	78.000	09	6.000	24	16.000
Biology	132	88.00	10	6.667	08	5.333
Total	356	79.032	34	07.548	60	13.32

Q28) It is feasible to perform all experiments in your school laboratory

Table 28: Performing experiments in school laboratory

Teachers' response towards	Yes		No		Can't say	
	Frequency of response	% Age of response	Frequency of response	% Age of response	Frequency of response	% Age of response
Physics	52	34.667	85	56.667	13	8.667
Chemistry	98	65.333	19	12.667	33	22.000
Biology	101	67.333	34	22.667	15	10.000
Total	251	55.722	138	30.636	61	13.542

5. Findings of the majority of teachers of Science (Physics, Chemistry and Biology) teaching classes XI and XII about the Science textbooks

From the analysis of data from Table 1 to Table 28, major findings of the study are as follows.

1. According to the teachers, content of Physics textbook is difficult whereas the content of chemistry textbook is apt or understandable to students and that of biology textbook is easy for the students.
2. Subject matter in the Physics, Chemistry and Biology textbook is interesting.
3. The new course in Physics and Chemistry is not much different from the old course but the old course of Biology is entirely different from the new course.
4. Textbooks of Physics, Chemistry and Biology are lengthy.
5. Curriculum in Physics, Chemistry and Biology is wide and comprehensive.
6. The curriculum in Physics, Chemistry and Biology is flexible.
7. New course in Physics, Chemistry and Biology is more difficult when compared to the old one.
8. Syllabus in Physics and Biology is integrated with Information Technology i.e, use of IT is made in teaching-learning process of Physics and Biology but Chemistry syllabus is not integrated with IT.
9. Physics, Chemistry and Biology curricula are mutually correlated.
10. Physics, Chemistry and Biology textbooks provide students sufficient material on the subject.
11. Majority of Physics teachers believed that course content in Physics was sufficient to be covered within the timeframe of the school. But Chemistry and Biology teachers said that school hours were not sufficient to cover their course.
12. New course in Physics, Chemistry and Biology was better than the old course in providing social competence in students.
13. Curriculum in Physics, Chemistry and Biology is related to community living.
14. Curriculum in Physics, Chemistry and Biology is sufficient enough to develop scientific attitudes and skills required at senior secondary school level.
15. Curriculum in Physics, Chemistry and Biology is complete in itself.
16. The language of Physics, Chemistry and Biology textbooks is lucid, simple and precise.
17. The Physics textbooks do not contain necessary examples, figures, graphs etc., but Chemistry and Biology textbooks contain the same.
18. The Physics, Chemistry and Biology curriculum develop in pupils the desired skills for solving problems in their day-to-day life.
19. The curriculum in Physics, Chemistry and Biology provide the students sufficient knowledge and understanding required at senior secondary school level.
20. The curriculum develops in students, economic efficiency and capacity to earn livelihood.
21. This curriculum also develops in students, curiosity and power of reasoning and observation in students.

22. The Physics, Chemistry and Biology curriculum provides scientific outlook, i.e, free from prejudices and based on tolerance.
23. This curriculum also trains pupils for efficient application of the knowledge of principles and theories of science.
24. Physics curriculum does not have utility in the practical life of students, whereas Chemistry and Biology curriculum has utility in the practical life of students.
25. Course content in the new course of Physics, Chemistry and Biology is more than the old course.
26. Division of Physics, Chemistry and Biology course in semesters for classes XI and XII is more beneficial for the students.
27. Curriculum in Physics, Chemistry and Biology is based on the psychological principles of learning.
28. Majority of Physics teachers said that it is not feasible to perform all experiments in the textbook in school laboratory. But Chemistry and Biology teachers said that it is possible in their school laboratory.

6. Suggestions

In the light of the above findings, improvements can be made in the science text books prescribed for classes XI and XII in Uttar Pradesh.

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