Content Knowledge of Science Teachers in relation to their Sex, Age, Qualification and Teaching Experience

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Abstract

Possession of satisfactory level of content knowledge on the part of the science teacher is the one of the effective strategies to achieve the goals of education system. It is beyond doubt that teachers with inappropriate content knowledge cannot construct the efficient manpower for the society in terms of imparting true scientific knowledge, facts and inculcating scientific attitude as well as temper among the students. The main purpose of this paper is to find out the level of content knowledge within secondary school science teachers and to investigate how it is related to their sex, age and qualification and teaching experience. It is found that very little percentages (30.5%) of science teachers have high content knowledge. It is also found that there lies significant relation between content knowledge of science teachers and their sex, age, qualification and teaching experience. It is suggested that more numbers of in-service training programs related to improvisation of science content knowledge should be organized to enrich the future of science education.

KEYWORDS: Content Knowledge, Science Teachers, Sex, Age, Qualification, Teaching Experience

Introduction

The absolute role of the science teacher is incontrovertible. Because, in recent times the subject Science is considered as an active, energetic, broad field of knowledge and experience. In secondary school education, it has attained an imperative and compulsory place because of its wide application in daily life as well as for providing vast scope to follow livelihood. Science has made people to acquire suitable skills and competencies to adapt the vast changing world. To make students obtain worth knowledge, understanding, and skill in such a noteworthy subject field the role of the science teacher is very essential as well as significant. Science teachers provide a framework to help children to think in scientific ways. Science teacher also creates an environment in which learners learn scientifically and develops understanding over content, acquire reasoning power, nurture problem solving capacity plus critical thinking as well as widen students’ mental horizon in propagating scientific attitude and scientific temperament. A recent review of the research on teacher quality conducted over the last 20 years revealed that, among those who teach math and science, having a major in the subject taught has a significant positive impact on student achievement. (Jeffrey J. Kuenzi 2008). Teacher’s understanding in their teaching matter also affects student’s opportunity to learn. (Grossman 1988; Limpert, 1986) Therefore science teachers need to develop good content knowledge to carry out such an important task of teaching science effectively to students. In this concern, it is a great task to explore what factors play critical role in influencing content knowledge of science teacher. Factors such as sex, age, qualification, teaching
experience are suspected as affecting the content knowledge of science teacher as suggested by several researchers. The purpose of the paper is to find out the level of science content knowledge among the secondary school teachers as well as effect of sex, age, qualification, teaching experience on the content knowledge of science teacher.

**Conceptualization of Content Knowledge of Science Teacher**

Teacher’s content knowledge is one of the important factors for student achievement at secondary level. Several countries and teacher organization have given importance to content knowledge of science teacher. To teach science at secondary level, science teacher must know about content knowledge because it is one of the factors, which provides a basis of conceptual teaching in the classroom. Content knowledge means conceptual knowledge of the subject or in depth knowledge of subject. In other words content knowledge is the base of teaching learning process through which teacher achieves aim, objective and goal of teaching. Thus one of the significant determinants of effective science teaching is science teacher’s content knowledge in science subject. Content knowledge helps and encourages science teacher to reflect on their own teaching and also to develop deeper insight into their understanding of science subject. It provides means to help students in a scientific way with reference to clearing doubts and queries raised by the learners. Hence content knowledge of science teacher refers to the science knowledge a teacher should possess. It is the knowledge about scientific concepts, principles, facts and their relationship. Teachers’ subject matter knowledge has been considered as an important component of teaching expertise. As Shulman (1986) introduced three components of content knowledge: subject matter content knowledge, pedagogical content knowledge, and curricular content knowledge. Kennedy (1990) addressed three aspects of subjects: the content of the subject, the organization of the content, and the methods of inquiry used in the subject. Wayne and Youngs (2003) also considered teacher content knowledge has significant role. In 2002 the report of the Secretary of the U.S. of Education asserted “Rigorous research indicates that verbal ability and content knowledge are the most important attributes of highly qualified teachers’” (2002, p. 19, emphasis added). Hess, (2001) believe that individuals with little more than a clear understanding of their topic can be good teachers. Still others have argued that a strong base of content knowledge is necessary but not sufficient – and serves as a basis for teachers to develop further pedagogical skills. Grossman (1990), for example, conceives of subject-matter knowledge as having three components (content, and syntactic and substantive structures) which feed into the teacher’s development of Pedagogical Content Knowledge. Thus content knowledge is very necessary. Disciplinary content knowledge can be thought of as an individual's understanding of subject matter concepts and how these concepts relate to form the larger body of knowledge. Hill & Ball (2004) refer to this kind of knowledge as "common knowledge of content;" Ferrini-Mundy and colleagues (Ferrini-Mundy, Floden, McCrory, Burrill, & Sandow, 2005) call it "core content knowledge." Another way to think about common or core knowledge of disciplinary content is as the knowledge held by all professionals who use science or mathematics in their work. This kind of knowledge is not unique to teachers, but it definitely has important connections to teaching. There is general agreement that teachers need to know the disciplinary content they teach, but there are multiple points of view on what it means to know that content, or what is the appropriate way for teachers to know it. Proper
content knowledge in science subject enables one teacher to teach conceptually and confidently in class. If the teacher has no depth and conceptual knowledge, then teacher would simply teach but learner could not understand the concept of science. Such teacher cannot create scientific attitude in learner.

Rationale of the Study

Several researchers have tried to explore level of content knowledge of science teacher and factors affecting it. Johnston, Morrison and Sharp (1971) found out that science teachers teach Chemistry majority have lack of conceptual knowledge. Kaulaidis and Ogburn (1989) reported that pre-service and experienced teacher generally lack sufficient knowledge of strategies for teaching science. Grossman (1990) reported that depth content knowledge is necessary for science teaching. Sanders (1993) explored that view of South African Biology teacher about respiration, finding out that many seems to have misconception about basic principles within this topic. Newsome (1999) reported that science teacher often lack a deep conceptual understanding of the subject matter knowledge of teacher having fragmented conceptualized poorly organized knowledge. Margnusson et.al. (1999) reported that for effective teaching, teacher needs to develop knowledge with respect to all of the aspects of teaching content knowledge and with respect to all of the topic they teach. Munby, Russell and Martin (2001) reported that school learners did not have access to their teachers’ thinking and decision making as they taught in addition to that, teachers having less conceptual knowledge. U.K.Gov.(2006) reported that 47% teachers hold pass course and have less content knowledge about subject. Markik, Valanides and Eilks (2006) reported that subject matter knowledge provides confidence to teachers in teaching science. Kamtet, Ngamman, Liewkongsthaporn, Pativisan, Dechsri (2009) studied Assessing Subject Matter Knowledge of Science Teachers and results indicated that most of participants had bachelor degrees in science or science education. The average score of those teachers was higher than teachers who had bachelor degrees in other majors. Findings also showed a positive significant relationship between their teaching experience, qualification, sex and teachers’ SMK (Subject Matter Knowledge). It is concluded in the report that teaching experience and major in science or science education influenced teachers’ SMK.

The above studies made researchers suspect role of sex, age, qualification, teaching experience of science teacher in influencing their content knowledge.

Therefore, the investigator raised following research question:

- Is there any significant difference between content knowledge of secondary school science teacher in relation to their sex, age, qualification and teaching experience?
Objectives of the Study

1. To ascertain the content knowledge of science teachers.
2. To compare the content knowledge of male and female teachers teaching science.
3. To compare the content knowledge of science teachers with different age groups.
4. To compare the content knowledge of science teachers having different qualification.
5. To compare the content knowledge of science teachers having different duration of teaching experience.

Hypotheses of the Study

1. There is no significant difference between male and female science teachers with regard to their content knowledge.
2. There is no significant difference in content knowledge of science teachers with respect to their age group.
3. There is no significant difference in content knowledge of science teachers with respect to their qualification.
4. There is no significant difference in content knowledge of science teachers with respect to their duration of teaching experience.

Assessing Content Knowledge

Researchers have used a variety of ways to measure science teachers’ content knowledge. Typical in large scale studies such as the National Education Longitudinal Study (NELS; Chaney, 1995; Ye, 2000) and the Longitudinal Survey of American Youth (LSAY; Monk, 1994; Monk & King, 1994; Spychala, 1995) are self-reports of such things as course counts in science and reports of the type of certification held by the teacher. Numbers of courses or credits in science content areas are probably the most commonly measured outcome, though Monk (1994) has described the challenges involved in ensuring commensurability when data involve counts of both courses and credit hours, from both semester- and quarter-based systems. Education-production-function analyses tend to use simple dichotomies, such as whether the teacher held an advanced degree in a science area or majored in science in college (e.g., Goldhaber & Brewer, 1999). Self-reported grade point averages (GPAs) in science courses (Chaney, 1995) and particular areas of science such as biology or chemistry (Harpole et al., 1986) are much more unusual. It is even more unusual to find that teachers have been given a test of science knowledge. In the studies it is found that, only three (Perkes, 1967; Rothman, 1969; Thomas, 1978) used tests of teacher science knowledge. So achievement test is found to be an accurate, simple tool to assess content knowledge of science teacher. After reviewing
the previous researches for constructing a tool to assess content knowledge of science teacher researcher has chosen and adopted the achievement test as a tool for this study.

**Description of Self developed achievement test:**

The Achievement test was prepared by the researcher for assessing content knowledge of science teachers teaching science at class IX and X in secondary schools. The questions are prepared referring the class IX and X science curriculum implemented by Govt. of Odisha in lower secondary odiya medium schools.

The test consist of 50 questions having physical science and biological science of class IX and X that satisfy the knowledge, understanding, application, skill objectives. For getting validity the tool was distributed to ten Science teacher educators who have validated it through their significant suggestions and recommendations. Thus the face and content validity is ensured. The achievement test was tried out on 20 teachers teaching science. The reliability of the achievement test was estimated by using test-retest method by giving seven days gap. It was found to be 0.99.

**Administration and Scoring of Achievement**

The achievement test contains 50 questions having total mark 50. In other words each question contains one mark .All questions are multiple choice type having four options. Out of which three are wrong and one is correct. For each correct response the teacher is awarded one mark. There is no provision of negative marking in this test. By assigning the scores for each correct response the total score is determined by the researcher.

<table>
<thead>
<tr>
<th>% of score</th>
<th>Score range</th>
<th>Category of Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 44</td>
<td>Less than 22</td>
<td>Poor Content Knowledge</td>
</tr>
<tr>
<td>44-68</td>
<td>23-34</td>
<td>Average Content Knowledge</td>
</tr>
<tr>
<td>Above 68</td>
<td>Above 34</td>
<td>High Content Knowledge</td>
</tr>
</tbody>
</table>

**Sample, Data Collection and Analysis**

The study involved 200 secondary school science teachers. Out of these 200 teachers, 100 are male and 100 are female. This sample selected by using stratified random sampling method taking sex as strata. This sample is selected from coastal region of Odisha (Undivided Balasore, Cuttuck and Puri District). The sample for study consists of 200 secondary school science teachers. Out of 200 teachers, 100 are male and 100 are female. Again 115 science teachers have B.Sc. B.Ed. qualification whereas 85 teachers have M.sc. B. Ed qualification. Again 53 teachers are below the age of 35, 65 are between the age of 36 – 45 and 82 have above the age of 45. Also, 44 are having less than 10, 70 are having 10 to 20 and 86 are having more than 20 years of teaching experience.
The collected data were scrutinized under each category of variable such as sex, age, qualification and teaching experience. Sex variable is categorized in two category such as (i) male and (ii) female. Age variable is classified as (i) below 35 year (ii) Between 35 to 45 year and teachers having (iii) above 45 year of age. Similarly qualification variables is grouped under two category such as teachers having (i)B.Sc., B.Ed, qualification and those having (ii)M.Sc. B.Ed, qualification. The last variable teaching experience is categorized in three category such as teachers having (i) less than 10 years, (ii) 10 to 20 years and (iii) above 20 years of teaching experience. Then t test is administered to find out whether there exists significant difference between different groups of each variable with respect to the content knowledge of science teacher. Further the hypotheses were tested. The table 1 indicates the calculated ‘t’ value for each category of variables and shows the Significance of Difference among different category of science teachers with respect to their Content Knowledge.

**Table 2 : Showing the Significance of Difference among different Category of Science Teachers with respect to their Content Knowledge**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>N</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>SEM</th>
<th>SED</th>
<th>df</th>
<th>'t' Value</th>
<th>Table 't' Value at 0.05</th>
<th>Table 't' Value at 0.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>100</td>
<td>29.60</td>
<td>9.01</td>
<td>0.90</td>
<td>1.204</td>
<td>198</td>
<td>2.9570**</td>
<td>1.9720</td>
<td>2.6089</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>100</td>
<td>26.04</td>
<td>7.98</td>
<td>0.80</td>
<td>1.204</td>
<td>198</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Below 35</td>
<td>53</td>
<td>32.77</td>
<td>7.65</td>
<td>1.05</td>
<td>1.05</td>
<td>116</td>
<td>3.5809**</td>
<td>1.9806</td>
<td>2.6189</td>
</tr>
<tr>
<td></td>
<td>Between 35 to 45</td>
<td>65</td>
<td>27.83</td>
<td>7.30</td>
<td>0.91</td>
<td>1.365</td>
<td>145</td>
<td>2.3599*</td>
<td>1.9765</td>
<td>2.6102</td>
</tr>
<tr>
<td></td>
<td>Above 45</td>
<td>82</td>
<td>24.61</td>
<td>8.88</td>
<td>0.98</td>
<td>1.484</td>
<td>133</td>
<td>5.4983**</td>
<td>1.9779</td>
<td>2.8546</td>
</tr>
<tr>
<td>Qualification</td>
<td>B.Sc, B.Ed.</td>
<td>115</td>
<td>25.54</td>
<td>9.00</td>
<td>0.84</td>
<td>1.184</td>
<td>198</td>
<td>4.5311**</td>
<td>1.9720</td>
<td>2.6089</td>
</tr>
<tr>
<td></td>
<td>M.Sc., B.Ed.</td>
<td>85</td>
<td>30.91</td>
<td>7.20</td>
<td>0.78</td>
<td>1.582</td>
<td>107</td>
<td>1.4344NS</td>
<td>1.9824</td>
<td>2.6225</td>
</tr>
<tr>
<td>Teaching Experience</td>
<td>≤10 year</td>
<td>39</td>
<td>31.64</td>
<td>7.44</td>
<td>1.19</td>
<td>1.582</td>
<td>107</td>
<td>1.4344NS</td>
<td>1.9824</td>
<td>2.6225</td>
</tr>
<tr>
<td></td>
<td>10 to 20 year</td>
<td>70</td>
<td>29.37</td>
<td>8.17</td>
<td>0.98</td>
<td>1.347</td>
<td>159</td>
<td>3.2533**</td>
<td>1.9750</td>
<td>2.6071</td>
</tr>
<tr>
<td></td>
<td>≥20 year</td>
<td>91</td>
<td>24.99</td>
<td>8.70</td>
<td>0.91</td>
<td>1.597</td>
<td>128</td>
<td>4.1633**</td>
<td>1.9787</td>
<td>2.6148</td>
</tr>
<tr>
<td></td>
<td>≤10 year</td>
<td>39</td>
<td>31.64</td>
<td>7.44</td>
<td>1.19</td>
<td>1.597</td>
<td>128</td>
<td>4.1633**</td>
<td>1.9787</td>
<td>2.6148</td>
</tr>
<tr>
<td></td>
<td>≥20 year</td>
<td>91</td>
<td>24.99</td>
<td>8.70</td>
<td>0.91</td>
<td>1.982</td>
<td>128</td>
<td>4.1633**</td>
<td>1.9787</td>
<td>2.6148</td>
</tr>
</tbody>
</table>

**Significant at 0.01level, *Significant at 0.05 level and NS: Not Significant.**

df: degree of freedom
SEM: Standard Error of Mean
SED: Standard Error of Difference

**Analysis and Interpretation**

1. **Content knowledge of Science Teachers:**

By analyzing the data it is found that from the whole sample only 25% teachers have low content knowledge, 44.5% science teachers have average content knowledge and only 30.5 % of teachers have high content knowledge. Among the total science teachers having low content knowledge 9.5% are male and 15.5% are female whereas 3 % have age below 35 year, 7% have age between 35 to 45 and 17. 5 % have above 45year age. In addition to this 23 % teachers are with B.Sc, B.Ed degree and 5.5 % are with M.Sc B.Ed, degree have shown low content knowledge in science. Also 2.5%
teachers having teaching experience below 10 years, 5.5% teachers having 10 to 20 years of teaching experience and 18% of teachers having teaching experience above 20 years have shown low science content knowledge. Similarly 20% male and 22.5% of female have average content knowledge in science. Also among all average content knowledge showing teachers 10% of teachers have below 35 years of age, 17.5% have between 35 to 45 year of age and 16.5% teachers have above 45 year of age whereas 24.5% of teachers have B.Sc. B.Ed. qualification and 18% have M.Sc. B.Ed. degree. In addition to this 8% teachers having teaching experience below 10 years, 16.6% teachers having 10 to 20 years of teaching experience and 19.5% of teachers having teaching experience above 20 years also contribute average science content knowledge. Further 20.5% male and 10% of female have high content knowledge in science. Also among all high content knowledge performing teachers 13.5% of teachers have below 35 years of age, 8% have between 35 to 45 year of age and 7% teachers have above 45 year of age whereas 10% of teachers have B.Sc. B.Ed. qualification and 19% have M.Sc. B.Ed. degree. In addition to this 9% teachers having teaching experience below 10 years, 12% teachers having 10 to 20 years of teaching experience and 8% of teachers having teaching experience above 20 years also put in high science content knowledge.

Fig.1: Level of Content Knowledge of Secondary School Science Teachers

2. Content knowledge of Male and Female Teachers Teaching Science:

Hypothesis 1

There is no significant difference between male and female science teachers with regard to their content knowledge.

The mean value of male teacher (29.60) is higher than female science teacher. It is found that there exists significant difference between male and female teachers with respect to their content knowledge. The calculated ‘t’ value (2.95) is higher than that
of the tabulated ‘t’ value both at 0.01 and 0.05 level which is significant. Hence null hypothesis is rejected.

3. Content knowledge of Science Teachers with different Age Groups:

Hypothesis 2

There is no significant difference in content knowledge of science teachers with respect to their age group.

This hypothesis is further divided into three sub hypothesis such as:

H2.1. There is no significant difference in content knowledge of group of science teachers having age below 35 year and that of having 35 to 45 year.

It is found from the table that the mean of group of science teachers having age below 35 year (32.77) is higher than the mean (27.83) of teachers having age in between 35 to 45 year. The calculated ‘t’ value (3.58) is higher than that of the tabulated ‘t’ value both at 0.01 and 0.05 level which is significant. Hence null hypothesis is rejected.

H2.2 There is no significant difference in content knowledge of group of science teachers having age 35 to 45 year and that of having above 45 year:

It is found from the table that the mean of group of science teachers having age between 35 to 45 year (27.83) is higher than the mean (24.61) of teachers having age above 45 year. The calculated ‘t’ value (2.35) is higher than that of the tabulated ‘t’ value at 0.05 level which is significant. However it is not significant at 0.01 level as here calculated ‘t’ value is lower than the table value. Hence null hypothesis is rejected at 0.05 level and accepted at 0.01 level.

H2.3 There is no significant difference in content knowledge of group of science teachers having age below 35 year and that of having above 45 year:

It is found from the table that the mean of group of science teachers having age below 35 year (32.77) is more higher than the mean (24.61) of teachers having age above 45 year. The calculated ‘t’ value (2.35) is higher than that of the tabulated ‘t’ value both at 0.01 and 0.05 level which is significant. Hence null hypothesis is rejected.

4. Content knowledge of Science Teachers having different Qualification:

Hypothesis 3

There is no significant difference in content knowledge of science teachers with respect to their qualification: The mean value of teachers having M.Sc. B.Ed. (30.91) is higher than that of the teachers having qualification B.Sc. B.Ed. (25.54). The calculated ‘t’ (1.43) value is higher than table value of ‘t’ at 0.05 and 0.01 level of significance. Hence null hypothesis is rejected.
5. Content knowledge of Science Teachers having Different Duration of Teaching Experience:

Hypothesis 4

There is no significant difference in content knowledge of science teachers with respect to their duration of teaching experience. This hypothesis is divided into three sub hypotheses such as

**H4.1. There is no significant difference in content knowledge of group of science teachers having teaching experience below 10 years and that of having between 10 to 20 years:** It is found from the table that the mean of group of science teachers having teaching experience below 10 year (31.64) is slightly higher than the mean (29.37) of teachers having teaching experience between 10 to 20 year. The calculated ‘t’ value (1.4344) is lower than that of the table ‘t’ value at 0.01 level as well as at 0.05 level. Hence null hypothesis is accepted.

**H4.2 There is no significant difference in content knowledge of group of science teachers having teaching experience 10 to 20 years and that of having above 20 years:** From the table it is clear that teachers having teaching experience between 10 to 20 year have higher mean (29.37) than that of having more than 20 year (24.99). In addition to this the calculated ‘t’ value is found to be 3.2533 which is higher than table value at both 0.01 and 0.05 level. Therefore null hypothesis is rejected.

**H4.3 There is no significant difference in content knowledge of group of science teachers having teaching experience below 10 years and that of having above 20 years:** It is found that teacher having teaching experience below 10 year have higher mean value (31.64) as comparison to those of having teaching experience more than 20 year (24.99). The calculated ‘t’ value is found to be 4.1633 which is higher than both table value of ‘t’ at 0.01 and 0.05 level of significance. Therefore null hypothesis is rejected.

Findings

Findings of the study objective wise are as follows:

1. Maximum percentage of science teachers have average content knowledge (44.5) whereas a minimum percentage of teachers have low content knowledge (25). Acreage percentage of teachers have high content knowledge in science (30.5)

2. There exists significant difference in content knowledge of science teachers with respect to their sex.

(i) Male secondary school science teachers have high content knowledge than female science teacher.
3. There exists significant difference in content knowledge of science teachers with respect to their age.

(i) Teachers having age below 35 have more content knowledge than teachers having age in between 35 to 45.

(ii) Teachers having age in between 35 to 45 have more content knowledge than teachers having age above 45.

(iii) Teachers having age below 35 have more content knowledge than teachers having age above 45.

4. There exists significant difference in content knowledge of science teachers with respect to their qualification.

(i) Teachers having qualification M.Sc., M.Ed. have higher content knowledge than those having qualification B.Sc., B.Ed.

5. There exists significant difference in content knowledge of science teachers with respect to their teaching experience in two groups.

(i) Teachers having teaching experience below 10 year have slightly more content knowledge than teachers having teaching experience in between 10 to 20 year though difference is not significant.

(ii) Teachers having teaching experience in between 10 to 20 have more content knowledge than teachers having teaching experience above 20 year.

(iii) Teachers having age below 10 year have more content knowledge than teachers having age above 20 years.

Educational Implication and Suggestion for Further Study

The study has following educational implications

The findings of present study can be used to identify the content of secondary school science teachers in relation to their sex, age, qualification and teaching experience to set guidelines for professional development. The educational administrators can organize some in-service programs to boost science subject specific content knowledge among secondary school teachers. The educational authority can consider content knowledge and as criteria for requirement of secondary school science teachers. In addition to this, its findings would be helpful for improving the quality of secondary education in terms of teachers’ content knowledge. Teacher education system would give special attention to plan and implement pre-service and in service training programs for enriching the content knowledge of science teachers. As it is found that female teachers, teachers having more age and teaching experience as well as teachers having less qualification have low content knowledge in science, special in-service program can be organize to nurture their content knowledge. Several seminar, orientation course, refresher course, practical classes can be included in in-service teacher education program. One need
assessment program can be conducted at secondary school level to find out science teachers’ difficulty in understanding science content appropriately and according to their need in-service program can be designed. Further other researches can be conducted to find out the content knowledge level at primary, higher secondary as well as university level. Researches can also be done to find out teachers’ content knowledge in other subjects such as mathematics, social science, language etc.

Conclusion

Secondary school teacher should act as a competent architect of building effective human personalities for the country. Good content knowledge of science teacher at secondary level is a compulsory criterion for appropriate teaching learning in secondary school science class. But it is found from the present study that percentage of science teachers having high content knowledge is very less. It is also explored that sex, age, qualification, teaching experience are affecting the content knowledge of science teacher. Therefore while providing in-service as well as preserves teacher training teachers’ sex, age, qualification, teaching experience should be given due importance and according to that teacher training program should be organized

References


