

## A STUDY ON THE INNOVATIVE TEACHING STRATEGIES OF PHYSICAL SCIENCE IN SECONDARY LEVEL SCHOOLS

**Allu Ashok Kumar\***

Research Scholar

Department of Education

Andhra University, Visakhapatnam.

**Dr. T. Sharon Raju\*\***

Assistant Professor

IASE

Andhra University, Visakhapatnam.

### ABSTRACT

This paper intended to discuss about Innovative Teaching Strategies of Physical Science in Secondary Level Schools. The innovative practices are those actions or activities engaged by man through which new inventions are introduced into the society. This present paper was developed to examine innovative strategies of Physical Science education which was identified as a panacea for improving students' academic achievement in physical science subjects in secondary schools in Vizianagaram District. There are general teaching factors that appear to be associated with learners positive learning outcomes, for example, teachers good subject knowledge; good questioning skills; an emphasis upon the lesson introduction; stating learning objectives clearly; good time management; effective planning of lessons and good classroom management. As per the curricular changes in the teaching of Physical Science. They are adopting innovative teaching methods, Integrating ICT applications, adopting evaluative practices for enhancement of quality in the teaching of Physical Science subject at Secondary Level. This study is undertaken by the researcher to know the factors causing for effective teaching of Physical Science subject at Secondary Level.

**Key Words:** Teaching Strategies, Innovative Practices, Curricular Changes, Quality.

### INTRODUCTION

Science Education has been recognized, the world over, as a prerequisite for scientific and technological development. It provides opportunities for students to acquire relevant functional knowledge and skills that are associated with scientific processes needed for advancement in science and technology. In science education, students are encouraged to acquire

and practice the scientific skills. Science education is concerned with finding answers to problems in a bid to understand and interpret natural phenomena (Eze and Akubue, 2007).

Science education should therefore, inculcate self-discipline, scientific literacy and commitment in the minds of students. To achieve these, science teachers have to convert science teaching into sport and learning process that has to generate interest in the students and motivate them to stay back in the science discipline than to run away from it. Science education should become fun and thrilling to the students rather than burden and boredom. Science education is an engine for the growth and progress of any society. It not only imparts knowledge, skills and inculcates values, but is also responsible for building human capital which breeds, drives and sets technological innovation and economic growth of any nation (Eze and Akubue, 2007). In today's era, information and knowledge stand out as very important and critical input for growth and survival. Rather than looking at science education simply as a means of achieving social uplifting, the society must view it also as an engine of advancement in an information era propelled by its wheels of knowledge and research leading to development. This change in focus of science teaching and learning is an aspect of innovative practices.

Khoboli and O'Toole (2011), however, propose that appropriate teaching and learning methods in teaching science, such as problem-based learning, practical work and group work, allow learners to interact and help each other to attain better subject understandings. The use of different teaching methods is likely to accommodate different individual learning styles among the learners. Khoboli and O'Toole (2011) argue that the teachers' commitment to learner-centred methods does not mean that all the designed activities are suitably covered with such methods, but that the choice of teaching methods should depend on the content of the lesson to be covered, the resources and time available.

Edowonyi-Otu and Abraham (2011) contend that the teaching of science is supposed to be result oriented and learner-centred, which can be only be achieved when learners are willing and when and when the teachers are using the appropriate methods and resources in teaching the learners. Since learners are curious by nature, they only need to be actively involved in the learning process in which they are continuously testing, speculating as well as building their own personal knowledge. When learners personalize the knowledge, it will become valid, meaningful and useful to them to apply in different contexts.

Garcia (2003) noted that science in many schools is still being taught primarily through the lecture method and textbooks, rather than through exploration and experimentation which will allow learners to construct their own knowledge. In other words, some teachers in secondary schools are still not aware of what impact some teaching methods have on the teaching and learning of science.

### **NEED AND SIGNIFICANCE OF THE STUDY**

There are general teaching factors that appear to be associated with learners positive learning out comes, for example, teachers good subject knowledge; good questioning skills; an emphasis upon the lesson introduction; stating learning objectives clearly; good time management; effective planning of lessons and good classroom management. Teachers who have many of the aforementioned qualities may lead their learners to achieve high performance in their subject. Muijs and Reynolds (2011) further state that if teachers have good management of learners behaviour, allow interactions in teaching, provide attention to individual learners and employ different teaching methods as well as create a conducive teaching-learning climate in their classroom there is improvement in the understanding of content by learners.

Conner and Gunstone (2004) noted that learning outcomes are maximised when content knowledge is promoted together with strategic learning approaches. All these have implications for ITE in that ITE programmes need to model how to identify and learn content knowledge for pre-service teachers so they will gain confidence to teach the fundamental aspects of physics. ITE providers are responsible for the training and development of effective teachers. Commenting on the role that science teachers can play in facilitating high school students' learning, Wellington and Osborne (2001) indicated that "as teachers of science ... our primary skills lie not in our ability to do science, but in our ability to interpret and convey a complex and fascinating subject" (p. 138). This statement indicates the importance of subject matter content knowledge (Fensham, 2001) and how beginning teachers might be enabled to interpret and connect ideas and make these explicit in their teaching.

As per the curricular changes in the teaching of Physical Science. They are adopting innovative teaching methods, Integrating ICT applications, adopting evaluative practices for enhancement of quality in the teaching of Physical Science subject at Secondary Level. This study is undertaken by the researcher to know the factors causing for effective teaching of Physical Science subject at Secondary Level.

### **OBJECTIVES OF THE STUDY**

1. To study the perceptions of physical science teachers towards Teaching Methods basing on their socio-economic variables.
2. To study the perceptions of physical science teachers towards Teachers content Knowledge basing on their socio-economic variables.
3. To study the perceptions of physical science teachers towards Curriculum Issues basing on their socio-economic variables.

### **HYPOTHESES OF THE STUDY**

1. There is no significant difference among the perceptions of physical science teachers towards Teaching Methods basing on their socio-economic variables viz., Gender, Age, Locality, School Management, General Qualifications, Professional Qualifications and Teaching Experience.
2. There is no significant difference among the perceptions of physical science teachers towards Teachers Content Knowledge basing on their socio-economic variables viz., Gender, Age, Locality, School Management, General Qualifications, Professional Qualifications and Teaching Experience.
3. There is no significant difference among the perceptions of physical science teachers towards Curriculum Issues basing on their socio-economic variables viz., Gender, Age, Locality, School Management, General Qualifications, Professional Qualifications and Teaching Experience.

### **SAMPLE DESIGN AND SAMPLING TECHNIQUES**

Subjects were selected from 120 schools covering ten rural mandals (86 schools), four urban localities (18 schools) and two tribal mandals (16 schools) situated in Vizianagaram district. The investigator personally approached and distributed the questionnaires to respondents. The purpose and procedures for filling out the questionnaires were personally explained to the Physical Science Teachers who acted as respondents. The investigator selected

Secondary Schools covering Government, Zilla Parishad, Municipal and Tribal Welfare in selecting the respondents. The investigator selected ten rural mandals viz., Vizianagaram (rural), Bobbili (rural), Parvathipuram (rural), Saluru (rural), Denkada, L.Kota, Pusapatirega, Garugubilli, Jiyyammavalasa, and Terlam and four from urban locality viz., Vizianagaram (urban), Bobbili (urban), Parvathipuram (urban), Saluru (urban), whereas for tribal locality, the researcher selected Kurupam and Pachipenta mandals for this study purpose.

### TOOL DESCRIPTION

The researcher selected 3 areas viz., a) Teaching Methods, b) Teachers content Knowledge, c) Curriculum Issues, in the preparation of a tool. It is an instrument designed for self-rating of the physical science teacher's opinion of the degree to which they feel on the perceptions towards Factors Affecting the Effective Teaching of Physical Science in Secondary Schools.

### ANALYSIS AND DATA INTERPRETATION

**Table - 1: Mean, SD, and 't'/F Values on the perceptions of Physical Science Teachers with respect to Teaching Methods.**

S.No.	Variable	Category	N	Mean	Std. Dev.	t/F-value	p-value
1	Gender	Male	115	41.65	3.94	1.01 <sup>NS</sup>	0.31
		Female	51	42.27	2.86		
2	Age	Below 35	18	41.22	4.70	0.85 <sup>NS</sup>	0.43
		35 to 45	84	41.64	3.94		
		Above 45	64	42.28	2.84		
3	Locality	Rural	111	41.68	3.96	2.94*	0.05
		Urban	43	42.58	2.65		
		Tribal	12	39.83	2.32		
4	Management	Government	22	42.05	2.15	2.99*	0.05
		ZPP	120	41.66	3.99		
		Municipal	19	42.84	2.85		

		Tribal Welfare	5	41.60	2.88		
5	General Qualification	B.Sc.	108	41.95	3.34	0.53 <sup>NS</sup>	0.60
		M.Sc.,	58	41.64	4.18		
6	Professional Qualification	B.Ed.,	162	41.93	3.64	2.01*	0.05
		M.Ed.,	4	38.25	1.71		
7	Teaching Experience	Below 10	17	39.76	4.63	3.17*	0.04
		10 to 20	76	42.12	3.49		
		Above 20	73	42.04	3.45		

\*\*Significant at 0.01, \*Significant at 0.05 and NS : Not Significant

From the table 1, it was observed that the mean opinion scores of physical science teachers with respect to Teaching Methods based on their gender. The mean opinion score of male category respondents was 41.65, whereas it is for the female category respondents was 42.27 and the S.D. values are 3.94 and 2.86 respectively. The obtained t – value was 1.01 and the p-value was 0.31 which was statistically not significant at any level. It shows that male and female category respondents did not differ significantly in their perceptions and they perceived similar opinion towards Teaching Methods.

With regard to Age group, the mean opinion scores of physical science teachers for below 35 years age group was 41.22, whereas it is for 35 to 45 years age group was 41.64 and it is for above 45 years age group was 42.28 and the S.D. Values were 4.70, 3.94 and 2.84 respectively. The 'F'- value was 0.85 and the p-value was 0.43, which was statistically not significant at any level. It shows that, there is no significant difference among the perceptions of physical science teachers based on their age group and they perceived similar opinion towards Teaching Methods.

With regard to Locality, the mean opinion scores of physical science teachers belong to rural area was 41.68 whereas it is for the urban area was 42.58 and it was for tribal area was 39.83 and the S.D. values were 3.96, 2.65 and 2.32 respectively. The 'F'-value was 2.94 and the p-value was 0.05 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their locality

and urban area category physical science teachers perceived high perceptions towards Teaching Methods than that of rural and tribal area category physical science teachers.

With regard to School Management, the mean opinion scores of physical science teachers working in Government Schools was 42.05 whereas it is for the physical science teachers working in ZPP schools was 41.66 and it was for the physical science teachers working Municipal schools was 42.84 and it was for the physical science teachers working Tribal Welfare schools was 41.60 and the S.D. values were 2.15, 3.99, 2.85 and 2.88 respectively. The 'F'-value was 2.99 and the p-value was 0.05 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their school management and Municipal school science teachers perceived high perceptions towards Teaching Methods than that of Government, ZPP and Tribal Welfare school physical science teachers.

With regard to General Qualification, the mean opinion score of B.Sc., qualified category respondents was 41.95, whereas M.Sc., qualified category respondents was 41.64 and the S.D. values were 3.34 and 4.18 respectively. The derived F – value was 0.53 and the p-value was 0.60, which was statistically not significant at any level. It shows that, there is no significant difference between the perceptions of B.Sc. and M.Sc. qualified category physical science teachers and they perceived similar opinion towards Teaching Methods.

With regard to Professional Qualification, the mean opinion score of B.Ed., qualified category physical science teachers was 41.93 whereas it was for M.Ed., qualified category physical science teachers was 38.25 and the S.D. Values were. 3.64 and 1.71 respectively. The derived F – value was 2.01 and the p-value was 0.05, which was statistically significant at 0.05 level. It shows that there is a significant difference in their perceptions between B.Ed., and M.Ed., qualified category physical science teachers and B.Ed., qualified category physical science teachers perceived high towards Teaching Methods than that of M.Ed., qualified category physical science teachers.

With regard to Teaching Experience, the mean opinion score of physical science teachers for below 10 years' experience category was 39.76 whereas it was for the 10 to 20 years teaching experience category physical science teachers was 42.12 and it was for above 20 years teaching experience category physical science teachers was 42.04 and the S.D. values were 4.63, 3.49 and 3.45 respectively. The derived F – value was 3.17 and the p-value was 0.04 which was

statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their teaching experience and 10 to 20 years teaching experience physical science teaches perceived high towards Teaching Methods than that of below 10 and above 20 teaching experience physical science teachers.

**Table - 2: Mean, SD, and 't'/F Values on the perceptions of Physical Science Teachers with respect to Teachers content Knowledge.**

S.No.	Variable	Category	N	Mean	Std. Dev.	t/F-value	p-value
1	Gender	Male	115	74.90	7.63	1.20 <sup>NS</sup>	0.23
		Female	51	73.25	9.30		
2	Age	Below 35	18	73.61	7.90	1.18 <sup>NS</sup>	0.31
		35 to 45	84	74.67	7.87		
		Above 45	64	74.83	6.81		
3	Locality	Rural	111	74.37	7.04	3.17*	0.04
		Urban	43	74.75	8.02		
		Tribal	12	67.67	15.62		
4	Management	Government	22	73.95	6.29	3.15*	0.03
		ZPP	120	74.29	9.03		
		Municipal	19	75.53	4.61		
		Tribal Welfare	5	74.60	5.37		
5	General Qualification	B.Sc.	108	75.34	5.16	2.05*	0.04
		M.Sc.,	58	72.64	11.80		
6	Professional Qualification	B.Ed.,	162	74.38	8.27	0.21 <sup>NS</sup>	0.83
		M.Ed.,	4	75.25	2.87		
7	Teaching Experience	Below 10	17	70.88	13.04	2.93*	0.05
		10 to 20	76	74.42	9.12		
		Above 20	73	75.19	5.05		

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

From the table 2, it was observed that the mean opinion scores of physical science teachers with respect to Teachers content Knowledge based on their gender. The mean opinion score of male category respondents was 74.90, whereas it is for the female category respondents was 73.25 and the S.D. values are 7.63 and 9.30 respectively. The obtained t – value was 1.20 and the p-value was 0.23 which was statistically not significant at any level. It shows that male and female category respondents did not differ significantly in their perceptions and they perceived similar opinion towards Teachers content Knowledge.

With regard to Age group, the mean opinion scores of physical science teachers for below 35 years age group was 73.61, whereas it is for 35 to 45 years age group was 74.67 and it is for above 45 years age group was 74.83 and the S.D. Values were 7.90, 7.87 and 6.81 respectively. The 'F'- value was 1.18 and the p-value was 0.31, which was statistically not significant at any level. It shows that, there is no significant difference among the perceptions of physical science teachers based on their age group and they perceived similar opinion towards Teachers content Knowledge.

With regard to Locality, the mean opinion scores of physical science teachers belong to rural area was 74.37 whereas it is for the urban area was 74.75 and it was for tribal area was 67.67 and the S.D. values were 7.04, 8.02 and 15.62 respectively. The 'F'-value was 3.17 and the p-value was 0.04 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their locality and urban area category physical science teachers perceived high perceptions towards Teachers content Knowledge than that of rural and tribal area category physical science teachers.

With regard to School Management, the mean opinion scores of physical science teachers working in Government Schools was 73.95 whereas it is for the physical science teachers working in ZPP schools was 74.29 and it was for the physical science teachers working Municipal schools was 75.53 and it was for the physical science teachers working Tribal Welfare schools was 74.60 and the S.D. values were 6.29, 9.03, 4.61 and 5.37 respectively. The 'F'-value was 3.15 and the p-value was 0.03 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their school management and Municipal school science teachers perceived high

perceptions towards Teachers content Knowledge than that of Government, ZPP and Tribal Welfare school physical science teachers.

With regard to General Qualification, the mean opinion score of B.Sc., qualified category respondents was 75.34, whereas M.Sc., qualified category respondents was 72.64 and the S.D. values were 5.16 and 11.80 respectively. The derived F – value was 2.05 and the p-value was 0.04, which was statistically significant at 0.05 level. It shows that, there is a significant difference between the perceptions of B.Sc. and M.Sc. qualified category physical science teachers and B.Sc., qualified category respondents perceived high towards Teachers content Knowledge than that of M.Sc. qualified category respondents.

With regard to Professional Qualification, the mean opinion score of B.Ed., qualified category physical science teachers was 74.38 whereas it was for M.Ed., qualified category physical science teachers was 75.25 and the S.D. Values were. 8.27 and 8.87 respectively. The derived F – value was 0.21 and the p-value was 0.83, which was statistically not significant at any level. It shows that there is no significant difference in their perceptions between B.Ed., and M.Ed., qualified category physical science teachers and they perceived similar opinion towards Teachers content Knowledge.

With regard to Teaching Experience, the mean opinion score of physical science teachers for below 10 years' experience category was 70.88 whereas it was for the 10 to 20 years teaching experience category physical science teachers was 74.42 and it was for above 20 years teaching experience category physical science teachers was 75.19 and the S.D. values were 13.04, 9.12 and 5.05 respectively. The derived F – value was 2.93 and the p-value was 0.05 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their teaching experience and above 20 years teaching experience physical science teaches perceived high towards Teachers content Knowledge than that of below 10 and 10 to 20 teaching experience physical science teachers.

**Table - 3: Mean, SD, and 't'/F Values on the perceptions of Physical Science Teachers with respect to Curriculum Issues.**

S.No.	Variable	Category	N	Mean	Std. Dev.	t/F-value	p-value
1	Gender	Male	115	54.50	7.07	0.40 <sup>NS</sup>	0.69
		Female	51	54.04	6.46		

2	Age	Below 35	18	52.94	8.96	0.48 <sup>NS</sup>	0.62
		35 to 45	84	54.37	6.97		
		Above 45	64	54.75	6.12		
3	Locality	Rural	111	54.30	5.76	4.13**	0.00
		Urban	43	54.78	6.60		
		Tribal	12	46.67	13.95		
4	Management	Government	22	54.32	4.81	3.34*	0.03
		ZPP	120	52.59	6.87		
		Municipal	19	54.63	4.32		
		Tribal Welfare	5	51.80	15.19		
5	General Qualification	B.Sc.	108	55.33	5.75	2.53*	0.01
		M.Sc.,	58	52.55	8.34		
6	Professional Qualification	B.Ed.,	162	54.32	6.93	0.48 <sup>NS</sup>	0.63
		M.Ed.,	4	56.00	4.32		
7	Teaching Experience	Below 10	17	52.00	8.94	2.06*	0.05
		10 to 20	76	54.92	6.64		
		Above 20	73	54.33	6.55		

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

From the table 3, it was observed that the mean opinion scores of physical science teachers with respect to Curriculum Issues based on their gender. The mean opinion score of male category respondents was 54.50, whereas it is for the female category respondents was 54.04 and the S.D. values are 7.07 and 6.46 respectively. The obtained t – value was 0.40 and the p-value was 0.69 which was statistically not significant at any level. It shows that male and female category respondents did not differ significantly in their perceptions and they perceived similar opinion towards Curriculum Issues.

With regard to Age group, the mean opinion scores of physical science teachers for below 35 years age group was 52.94, whereas it is for 35 to 45 years age group was 54.37 and it

is for above 45 years age group was 54.75 and the S.D. Values were 8.96, 6.97 and 6.12 respectively. The 'F'- value was 0.48 and the p-value was 0.62, which was statistically not significant at any level. It shows that, there is no significant difference among the perceptions of physical science teachers based on their age group and they perceived similar opinion towards Curriculum Issues.

With regard to Locality, the mean opinion scores of physical science teachers belong to rural area was 54.30 whereas it is for the urban area was 54.78 and it was for tribal area was 46.67 and the S.D. values were 5.76, 6.60 and 13.95 respectively. The 'F'-value was 4.13 and the p-value was 0.00 which was statistically significant at 0.01 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their locality and urban area category physical science teachers perceived high perceptions towards Curriculum Issues than that of rural and tribal area category physical science teachers.

With regard to School Management, the mean opinion scores of physical science teachers working in Government Schools was 54.32 whereas it is for the physical science teachers working in ZPP schools was 52.59 and it was for the physical science teachers working Municipal schools was 54.63 and it was for the physical science teachers working Tribal Welfare schools was 51.80 and the S.D. values were 4.81, 6.87, 4.32 and 15.19 respectively. The 'F'-value was 3.34 and the p-value was 0.03 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their school management and Municipal school science teachers perceived high perceptions towards Curriculum Issues than that of Government, ZPP and Tribal Welfare school physical science teachers.

With regard to General Qualification, the mean opinion score of B.Sc., qualified category respondents was 55.33, whereas M.Sc., qualified category respondents was 52.55 and the S.D. values were 5.75 and 8.34 respectively. The derived F – value was 2.53 and the p-value was 0.01, which was statistically significant at 0.05 level. It shows that, there is a significant difference between the perceptions of B.Sc. and M.Sc. qualified category physical science teachers and B.Sc. qualified category physical science teachers perceived high towards Curriculum Issues than that of M.Sc. qualified category physical science teachers.

With regard to Professional Qualification, the mean opinion score of B.Ed., qualified category physical science teachers was 54.32 whereas it was for M.Ed., qualified category

physical science teachers was 56.00 and the S.D. Values were. 6.93 and 4.32 respectively. The derived F – value was 0.48 and the p-value was 0.63, which was statistically not significant at any level. It shows that there is no significant difference in their perceptions between B.Ed., and M.Ed., qualified category physical science teachers and they perceived similar opinion towards Curriculum Issues.

With regard to Teaching Experience, the mean opinion score of physical science teachers for below 10 years' experience category was 52.00 whereas it was for the 10 to 20 years teaching experience category physical science teachers was 54.92 and it was for above 20 years teaching experience category physical science teachers was 54.33 and the S.D. values were 8.94, 6.64 and 6.55 respectively. The derived F – value was 2.06 and the p-value was 0.05 which was statistically significant at 0.05 level. It shows that, there is a significant difference among the perceptions of physical science teachers based on their teaching experience and 10 to 20 years teaching experience physical science teachers perceived high towards Curriculum Issues than that of below 10 and above 20 teaching experience physical science teachers.

## **FINDINGS AND CONCLUSIONS**

1. With regard to Teaching Methods, all the teacher category respondents with different localities differed significantly and urban area category physical science teachers perceived high perceptions than that of rural and tribal area category physical science teacher. The physical science teachers working in different category managements differed significantly and Municipal school category physical science teacher respondents expressed high perceptions than that of Government, ZPP and Tribal Welfare school teachers, B.Ed., qualified category physical science teachers expressed high perceptions than that of M.Ed., Qualified category physical science teachers. According to their teaching experience, 10 to 20 years teaching experience physical science teachers expressed high perceptions than that of below 10 and above 20 years teaching experience physical science teachers.

2. With regard to Teaching Method, there is no significant difference between perceptions of respondents with respect to Gender, age and General Qualifications. It shows that, they expressed one and the similar opinion towards Teaching Method.

3. With regard to Teachers content Knowledge, there is no significant difference between perceptions of respondents with respect to Gender, age and Professional Qualifications. It shows that, they expressed one and the similar opinion towards Teachers Content Knowledge.

4. With regard to Curriculum Issues, there is no significant difference between perceptions of respondents with respect to Gender, age and Professional Qualifications. It shows that, they expressed one and the similar opinion towards Curriculum Issues.

## REFERENCES

1. Ashiq Hussain, Muhammad Azeem & Azra Shakoor (2011). Physics Teaching Methods: Scientific Inquiry Vs Traditional Lecture. *International Journal of Humanities and Social Sciences*, Vol. 1 No. 19; December 2011.
2. Creswell, J. W., & Clark, V. L. P. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage Publications.
3. Guzey, S. S., & Roehrig, G. H. (2009). Teaching science with technology: Case studies of science teachers' development of technology, pedagogy, and content knowledge. *Contemporary Issues in Technology and Teacher Education (CITE Journal)*, 9(1). 25-45.
4. Izaak Hendrik Wenno, (2016). Analysis of Factors Affecting Teacher Competence Physics Science SMP in the District of West Seram Maluku Province. *International Journal of Science and Research (IJSR)*, Vol. 5 Issue 6.
5. Johannes M. Nakanyala (2015). Investigating Factors Affecting The Effective Teaching Of Grade 12 Physical Science In Selected Secondary Schools in the Oshana educational region in Namibia.
6. Khoboli, B. & O'Toole, J.M. (2011). Learner-centred science in Lesotho: Adapting the ideal in adjust classroom practice. *African Journal of Research in MST Education*, 15(1),80-91.
7. Ogegbo, Gaigher, Salagaram(2019). Benefits and challenges of lesson study: A case of teaching Physical Sciences in South Africa. *South African Journal of Education*, Vol. 39, Number 1.
8. Prakash, Brahma, (1990). Effectiveness of concrete materials to enhance learning in physical sciences. *Independent study. National Council of Educational Research and Training*.
9. Suman, G. (2015). Problems of Science Teachers in Teaching Physical Science for X Class Students in Secondary Schools of Visakhapatnam District. Andhra Pradesh, India.