



## A STUDY ON THE EFFECTIVENESS OF INSTRUCTIONAL PACKAGE ON CLIMATE CHANGE WITH REFERENCE TO ELECTRICITY CONSERVATION PRACTICES AMONG B.Ed. STUDENT-TEACHERS IN BANGALORE CITY

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### ABSTRACT

Climate change is affecting almost every aspect of human society. Among the human sectors coal based electricity remains the top contributor to climate change. Given the fast depletion of coal reserves, release of carbon dioxide and yet to be affordable renewable energy, everyone needs to take up electricity conservation practices (ECP) to address climate change. B.Ed. student-teachers being the future secondary school teachers, have the larger responsibility in developing ECP among the adolescent pupils who are future citizens. In the present study, an attempt was made to develop and find out the effectiveness of Instructional Package on Climate Change (IPCC) with reference to ECP among B.Ed. student-teachers in Bangalore. Pre-test, post-test parallel group design was used. Climate Change Practices Scale (CCPS) which includes ECP as one of its dimensions was used to collect data which was statistically analyzed and interpreted.

**KEY WORD:** B.Ed. Student-Teachers, ECP, IPCC and CCPS.

### INTRODUCTION

Climate change means the changes in the earth's weather, including changes in temperature, wind patterns and rainfall, especially the increase in the temperature of the earth's atmosphere that is caused by the increase of greenhouse gases like carbon dioxide, methane, nitrous oxide, ozone etc. due to anthropogenic activities. The wide range impacts of increasing temperature persist for decades to millions of years across the earth. The impacts of climate change like rise in global sea level, erratic rainfall, increasing frequency and intensity of heat waves, droughts and floods, spread of vector borne diseases etc. is affecting almost every aspect of human society including economic prosperity, health, and national security.

### NEED AND IMPORTANCE OF THE STUDY

Carbon dioxide contributes around 60% to [climate](#) change. Its concentration was 280 ppm (parts per million) in pre-industrial times and has risen to has risen to 404.16 ppm (February 2016) with the increase mainly attributed to the use of fossil fuels. 29.5% of carbon dioxide is produced by coal based electricity. Given the fast depletion of coal reserves, release of carbon dioxide and yet to be affordable renewable energy, everyone needs to take up ECP to significantly address climate change. B.Ed. student-teachers being the future secondary school teachers, have the big responsibility in developing ECP among adolescent pupils who are future citizens. In the present study an attempt was made to develop and find out the effectiveness of IPCC with reference to ECP among Bangalore University B.Ed. student-teachers.



### OBJECTIVES

- To develop and validate IPCC for B.Ed. student-teachers.
- To construct and validate the CCPS for B.Ed. student-teachers.

- To compare the effectiveness of IPCC and Conventional Method of Teaching Environmental Education in enhancing ECP among B.Ed. student-teachers.
- To investigate interaction between 'treatment' and locality, gender and subject with reference to ECP among B.Ed. student-teachers.
- To investigate whether the B.Ed. student-teachers sustain ECP fostered through IPCC.

### HYPOTHESES

1. There is no significant difference between pre-test scores of E and C Groups with reference to ECP.
2. There is no significant difference in the effectiveness of IPCC and Conventional Method of Teaching Environmental Education with reference to ECP among B.Ed. student-teachers.
3. There is interaction between treatment and gender-subject, locality-subject; and locality-gender with reference to ECP among E group.
4. Immediate and delayed post-test scores of E group differ significantly with reference to ECP.

### Design

Pre-test Post-test equivalent group experimental design was followed.

### Tools

1. Raven's Standard Progressive Matrices Test (RSPMT)
2. CCPS consists of 100 statements grouped under 10 dimensions. The reliability coefficient is 0.87 (split half) and 0.88 (test-retest) and 0.93 (intrinsic validity). The dimension 3 covers ECP with ten statements each with five level of responses viz. Always (A-5), Frequently (F-4), Sometimes (S-3), Rarely (R-2) and Very Rarely (VR-1). The omitted statement was given zero.

### Sampling Procedure

Multistage purposive sampling technique was employed to select student-teachers from two B.Ed. colleges in Bangalore city as Experimental (E) and Control (C) groups. RSPMT was used to obtain two matched groups (36+36) for the E and C groups.

### Treatments for E and C Groups

1. IPCC: This validated package was meant for E group with duration of 40 hours.
  1. Orientation Session (1 Hour)
  2. Printed User Guide
  3. Printed SIMsModule 1: The Background of the Climate Change (5 Hours)  
Module 2: Impacts of Climate Change (6 Hours)  
Module 3: Global Fight on Climate Change (5 Hours)  
Module 4: India's Fight on Climate Change (5 Hours)  
Module 5: Green Solutions for Climate Change (5 Hours)  
Module 6: Climate Change Education (4 Hours)
  4. Screening of Documentaries and Discussion (3 Hours)  
Glimpses of Climate Change - NASA (5.48 Minutes)  
Impacts of Climate Change on World (2.22 Minutes)  
Climate Change - Causes, Impacts and Solutions (3.55 Minutes)  
'An Inconvenient Truth' (1 Hour and 47 Minutes)
  5. Consolidating Sessions (6 Hours)
2. Conventional Method of Teaching Environmental Education: It was meant for C group with duration of 5 hours. It covers the topics like environment; environmental pollution; meaning, importance, objectives and strategies for teaching environmental education at secondary school.

### Conducting of the Experiment

- E and C groups were pre-tested on ECP.
- E and C groups were given treatment respectively through IPCC and Conventional Method of Teaching Environmental Education.
- After the treatment, E and C groups were immediately post-tested on ECP.
- After a gap of five weeks E group was administered delayed post-test.

### Data Analysis

**Hypothesis 1:** There is no significant difference between pre-test scores of E and C Groups with reference to ECP.

**Table 1: Comparison of Pre-test Scores of C and E Groups with reference to ECP**

Group	N	Mean	SD	t-value	Result
C Group	36	30.28	2.173	0.090	Not Significant
E Group	36	30.25	1.857		

From Table-1, the obtained t-value 0.090 is less than table value of 1.96 at 0.05 level of significance with df 35. This indicates that the E and C groups were alike with reference to ECP before treatment.

**Hypothesis 2:** There is no significant difference in the effectiveness of IPCC and Conventional Method of Teaching Environmental Education with reference to ECP among student-teachers.

**Table 2: Comparison of Post-test Scores of C and E Groups with reference to ECP**

Group	N	Mean	SD	t-value	Result
C Group	36	30.28	2.225	-27.271	Significant at 0.01 level
E Group	36	41.75	3.166		

From Table-2, the obtained t-value 27.271 is significant at 0.01 level with df 35. It means that E group performed better than C group with reference to ECP. Hence it may be concluded that IPCC proves to be more effective than Conventional Method of Teaching Environmental Education in increasing ECP among student-teachers.

**Hypothesis 3 (a):** There is interaction between treatment and gender-subject with reference to ECP among E group.

**Table 3a: A two-way ANOVA of ECP in regard to Interaction of Treatment and Gender-Subject**

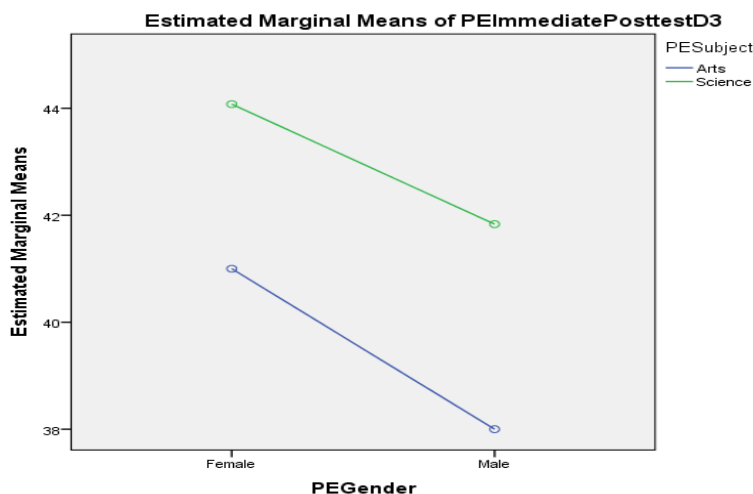
Source	df	Mean Square	'F' Value	'P' Value (0.05 los)
Corrected Model	3	53.665	9.050	0.000 **Significant
Intercept	1	54264.295	9150.982	0.000 **Significant
Gender	1	54.863	9.252	0.005 **Significant
Subject	1	95.281	16.068	0.000 **Significant
Gender*Subject	1	1.142	0.193	0.664 *Not Significant

From Table-3, the obtained 'F' value 0.193 is less than tabled 'F' value 4.00 with df 1 and 32. The obtained 'P' value 0.664 is not significant as this value is more than tabled 'P' value 0.05 level of significance. This implies that IPCC is equally effective in increasing ECP among B.Ed. student-teachers irrespective of their gender-subject.

**Table 3a (i): Gender-Subject wise Mean and Significance values of ECP**

E Group Gender	E Group Subject	Mean	df	F	p-value at 0.05 level
Female (24)	Arts (11)	41.000	1	9.513	0.004 **Significant
	Science (13)	44.077	32		
Male (12)	Arts (06)	38.000	1	7.434	0.010 **Significant
	Science (06)	41.833	32		

From Table-3a, the obtained ‘F’ value 9.513 is more than tabled ‘F’ value 4.00 and ‘P’ value 0.004 is less than tabled ‘P’ value 0.05 level of significance with df 1 and 32. It means IPCC has more interaction with female student-teachers belonging to Science than Arts with reference to ECP. The obtained ‘F’ value 7.434 is more than tabled ‘F’ value 4.00 and ‘P’ value 0.010 is less than the tabled ‘P’ value 0.05 level of significance with df 1 and 32. It means IPCC has more interaction with male student-teachers belonging to Science than Arts with reference to ECP.



**Graph 1: A two-way ANOVA of ECP among E group by the Gender-Subject and Treatment**

**Hypothesis 3 (b):** There is interaction between treatment and locality-subject with reference to ECP among E group.

**Table 3b: Two-Way ANOVA of ECP in regard to Interaction of Treatment and Locality-Subject**

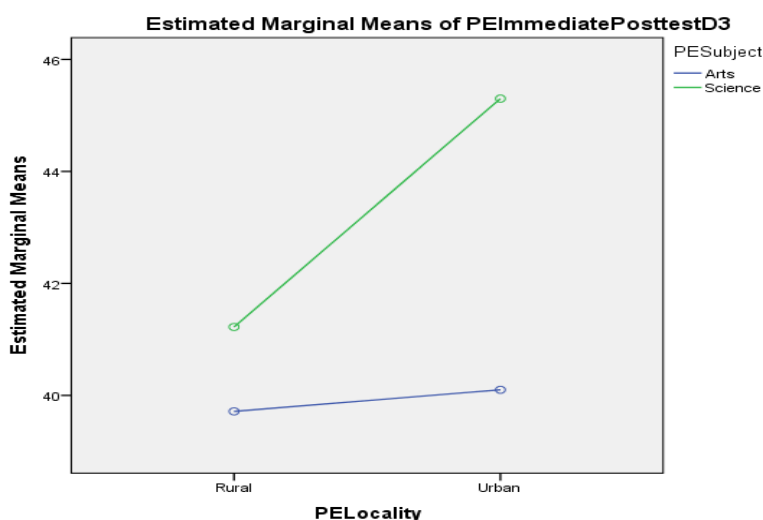
Source	df	Mean Square	F	p-value (0.05 los)
Corrected Model	3	61.589	11.874	0.000 **Significant
Intercept	1	60946.627	11749.871	0.000 **Significant
Locality	1	43.886	8.461	0.007 **Significant
Subject	1	99.118	19.109	0.000 **Significant
Locality*Subject	1	30.027	5.789	0.022 **Significant

From Table-3b, the obtained ‘F’ value 5.789 is more than tabled ‘F’ value 4.00 and ‘P’ value 0.022 is significant as this value is less than tabled ‘P’ value 0.05 level of significance with df 1 and 32. It implies that effect of IPCC on ECP among experimental group is not homogenous as there is significant interaction of IPCC and locality-subject.

**Table 3(b): Locality-Subject Wise Mean and Significance Values of ECP**

E Group Locality	E Group Subject	Mean	df	F	p-value (0.05 level)
Rural (16)	Arts (07)	39.714	1	1.726	0.198 *Not Significant
	Science (09)	41.222	32		
Urban (20)	Arts (10)	40.000	1	26.065	0.000 **Significant
	Science (10)	45.300	32		

From Table-3(b), the obtained ‘F’ value 1.726 is less than tabled ‘F’ value 4.00 and ‘P’ value 0.198 is more than tabled ‘P’ value 0.05 level of significance with df 1 and 32. That means IPCC is equally effective on both science and arts rural student-teachers with reference to ECP. In addition, IPCC has more interaction with urban student-teachers belonging to science than Arts with reference to ECP as the obtained ‘F’ value 26.065 is more than tabled ‘F’ value 4.00 and ‘P’ value 0.000 is less than tabled ‘P’ value 0.05 level of significance with df 1 and 32.



**Graph 2: A Two-Way ANOVA of ECP among E group by the Locality-Subject and Treatment**

**Hypothesis 3 (c):** There is interaction between treatment and locality-gender with reference to ECP among E group.

**Table 3(c): Summary table of a Two-way ANOVA of ECP by Locality-Gender and Treatment**

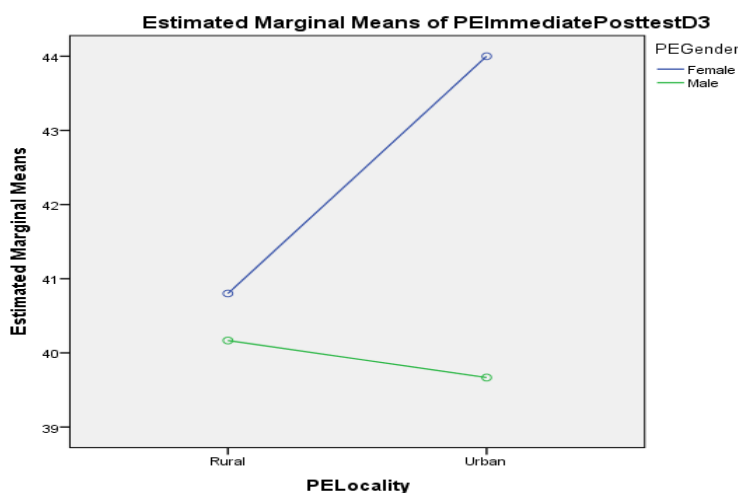
Source	df	Mean Square	F	p-value (0.05 los)
Corrected Model	3	40.328	5.617	0.003 **Significant
Intercept	1	53696.870	7478.456	0.000 **Significant
Locality	1	14.442	2.011	0.166 *Not Significant
Gender	1	48.870	6.806	0.014 **Significant
Locality * Gender	1	27.122	3.777	0.061 *Not Significant

From Table-3(c), the obtained ‘F’ value 3.777 is less than tabled ‘F’ value 4.00 and ‘P’ value 0.061 is not significant as it is more than the tabled ‘P’ value 0.05 level of significance with df 1 and 32. It implies that IPCC is equally effective in increasing ECP among student-teachers irrespective of their locality-gender.

**Table 3c (i): Locality-Gender wise Mean and Significance Values of ECP**

E Group Locality	E Group Gender	Mean	df	F	p-value (0.05 level)
Rural (16)	Female (10)	40.800	1	0.209	0.650 *Not Significant
	Male (06)	40.167	32		
Urban (20)	Female (14)	44.000	1	10.984	0.002 **Significant
	Male (06)	39.667	32		

Table-3c(i) shows that the obtained ‘F’ value 0.209 is less than tabled ‘F’ value 4.00 and ‘P’ value 0.650 is more than tabled ‘P’ value 0.05 level of significance with df 1 and 32. It means IPCC is equally effective on rural female and male student-teachers with reference to ECP. In addition, the obtained ‘F’ value 10.984 is more than tabled ‘F’ value 4.00 and ‘P’ value 0.002 is less than tabled ‘P’ value 0.05 level of significance with df 1 and 32. It means the IPCC has more interaction with female B.Ed. student-teachers than male belonging to urban with reference to ECP.



**Graph 3: A Two-Way ANOVA of ECP among E Group by the Locality-Gender and Treatment**

**Hypothesis 4:** Immediate and delayed post-test scores of experimental group differ significantly with reference to ECP.

**Table 4: Comparison of Immediate and Delayed Post-test of Scores of E Group with reference to ECP**

E Group	N	Mean	SD	t-value	p-value at 0.05 los
Immediate Post-test	36	41.75	3.166	1.784	0.083
Delayed Post-test	36	41.83	3.194		*Not Significant

From Table-4, the obtained t-value 1.784 is less than the tabled value 1.96 at 0.05 level of significance with df 35. It proves that the ECP fostered through IPCC is sustainable by the experimental group even after five weeks.

**MAJOR FINDINGS**

- The E and C groups were alike with reference to ECP before treatment.
- CCIP is more effective than conventional method of teaching environmental education in improving ECP among B.Ed. student-teachers.

- IPCC has more interaction with female student-teachers belonging to Science than Arts with reference to ECP. In addition IPCC has more interaction with male student-teachers belonging to Science than Arts with reference to ECP.
- IPCC is equally effective on rural student-teachers belonging to both Science and Arts with reference to ECP. In addition, IPCC has more interaction with urban student-teachers belonging to science than Arts with reference to ECP.
- IPCC is equally effective on both female and male B.Ed. student-teachers belonging to rural with reference to ECP. In addition IPCC has more interaction with female B.Ed. student-teachers than male belonging to urban with reference to ECP.
- E group has sustained ECP fostered by IPCC even after 5 weeks.

### EDUCATIONAL IMPLICATIONS

- There shall be a provision for teaching of environmental education by using a specific module and documentaries on electricity conservation.
- The Center for Environmental Education, (CEE) Bangalore can organize awareness programmes and workshops on electricity conservation for student-teachers.
- The Ministry of Environment, Forest and Climate Change, New Delhi can develop the learning materials like brochures, handbooks, posters, charts and documentaries to promote electricity conservation practices among student-teachers.
- Media can take up initiatives to promote electricity conservation practices among student-teachers through wide news coverage on pitfalls of coal based electricity and energy conservation.

### Limitations

- The study was confined to B.Ed. Student-teachers studying in Bangalore.
- The study was limited to two parallel groups from two of B.Ed. Colleges affiliated to Bangalore University.
- The study was confined to moderate variables like gender, locality and subject of student-teachers.
- Sample groups were selected from two separate Colleges of Education due to the non-availability of good number of them.

### SUGGESTIONS FOR FURTHER STUDY

- A study can be taken up to know the effectiveness of IPCC on attitude among student-teachers towards ECP.
- A study can be conducted with variables like marital status, qualification, religion, socio-economic status etc.
- A survey can be undertaken to know the ECP among student-teachers.
- The study can be extended to secondary school students.

### CONCLUSION

The study reveals that IPCC is more effective than conventional method of teaching environmental education in increasing ECP among student-teachers. This calls for the proper integration of IPCC in B.Ed. curriculum which helps the student-teachers not only to develop ECP among themselves but also to develop awareness and attitude to conserve electricity among secondary school students.

### BIBLIOGRAPHY

1. Down to Earth. Center for Science and Environment, New Delhi (Regular Reference).
2. Eugene Cordero, Anne Marie Todd & Diana Abellera. (2008). A Study on Climate Change Education and the Ecological Footprint. Bulletin of American Meteorological Society. 865-872.

3. Mark McCaffrey, Minda Berbeco & Eugenic Scott. (2012). Toward a Climate and Energy Literate Society. Berkeley, California, Recommendations from the Climate and Energy Literacy Summit.
4. Ravindranath, M.J. (2013). Climate Change and Education for Sustainable Development in Teacher Education - What Do Teacher Educators and Teacher Trainees think? Published in the abstracts of Indian Council for Social Science Research (ICSSR). 10-18.
5. Somavanshi, A.G. (2009). Energy Conservation and Environment Protection Initiatives in Universities, University News. 47(38), 25-26.
6. Srinivasacharlu A. & Talawar, M.S. (2014). Construction and Standardization of Climate Change Practices Scale (CCPS). Inigo Edu Research Journal. 1(2), 1-7.
7. Tse Ka Ho Alan. (2013). A Study on Students perceptions on Climate Change and Engagement in Low-Carbon Behaviours: Implications for Climate Change Education in Hong Kong, University of Hong Kong, Hong Kong.
8. The Hindu Newspaper. ISSN: 0971-751X, Chennai.
9. UNESCO (2009). International Seminar on Climate Change Education. Paris, Proceedings of Seminar.
10. [www.business-standard.com](http://www.business-standard.com) (Accessed on 14<sup>th</sup> June 2016).
11. [www.progress-energy.com](http://www.progress-energy.com) (Accessed on 14<sup>th</sup> June 2016).
12. [www.savingelectricity.org.za](http://www.savingelectricity.org.za) (Accessed on 15<sup>th</sup> June, 2016)
13. [www.unfccc.int/](http://www.unfccc.int/) (Accessed on 16<sup>th</sup> June 2016)
14. [www.ipcc.ch/](http://www.ipcc.ch/) (Accessed on 18<sup>th</sup> June 2016)
15. [en.wikipedia.org](http://en.wikipedia.org) (Accessed on 19<sup>th</sup> June, 2016)
16. [www.conserve-energy-future.com](http://www.conserve-energy-future.com) (Accessed on 19<sup>th</sup> June, 2016).