

# Effect of Refrigeration and Air Conditioning Faculty Development Training Programme on Technical Teachers



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**Abstract:** *Teacher Training is needed for teachers those teaching technical subjects. Pedagogical training programmes and subject knowledge enhancing training programmes are necessary for technical teachers. Nowadays, skill oriented training programmes are essential for polytechnic, engineering and other technical institute teachers. In teaching profession, faculty development training programmes are important for career development and content updating. In this paper, the content updating training programme in Refrigeration and Air conditioning was taken and discussed the knowledge enhancement of the teachers by conducted the evaluation tests before and after the training programme. The knowledge of the teachers in refrigeration and air conditioning areas were improved due to this faculty development programme.*

**Keywords:** *Faculty development programme, Participants, Refrigeration, Air conditioning, Evaluation*

## I. INTRODUCTION

Content updating faculty development programme is important for all the teachers involving technical teaching related to Refrigeration and Air conditioning subject in the institutions. To make the changes in the learners in desirable way is called teaching [1]. If the training involves only the theory part, the changes occurred in the domain of cognitive; if it involves the practical part, the changes also occurred in the domains of psychomotor and affective. The changes may be occurred in the above all the domains, the training programmes should have theory and also practical.

In this study, the evaluation tests were conducted before and after the faculty development training programme and discussed the knowledge enhancement of the teachers from technical institutions

## II. METHODOLOGY

This training is mainly to provide the knowledge and skills, focusing the objectives to enrich the knowledge in Refrigeration and Air conditioning subject. Training methodology have the training in different modes like class room lecture mode, demonstration mode, discussion mode, lab centered instruction mode and hands on training mode[2][3][9][10].

## III. TRAINING PROGRAMME

The training programme of “Refrigeration and Air-Conditioning” is the content updating faculty

development programme. This faculty development programme was organised by Mechanical Engineering Department at NITTTR (National Institute of Technical Teachers Training & Research), Chennai from 1<sup>st</sup> July 2019 to 5<sup>th</sup> July 2019. During the training period, the theory, practical and hands on training were given to the participants by the internal faculty members and external resource persons including field visits. The participants are the teachers from polytechnic and engineering colleges from the southern states of India particularly from Karnataka, Andhra Pradesh and Telangana states. Totally fifteen participants participated in this programme and the details are illustrated in the following tables 1 & 2.

**Table: 1. Total Participants**

Institution	States			Total
	Andhra Pradesh	Karnataka	Telangana	
Polytechnics	----	09	04	13
Engineering Colleges	02	----	----	02
Grand Total				15

**Table: 2. Male and Female participants**

Institution	Male	Female	Total
Polytechnics	12	1	13
Engineering Colleges	02	----	02
Grand Total			15

## IV. CONTENTS OF THE TRAINING PROGRAMME

The following contents of the Refrigeration & Air-conditioning areas were covered during the training period [4][5]

- **Basic Thermodynamics for Refrigeration :** Heat, Temperature, specific heat, open system, closed system, basic laws, first law of thermodynamics , second law of thermodynamics involving Clausius and Kelvin Planck statements, Boyle’s law, Charle’s law, Third law of thermodynamics, enthalpy , entropy, Vapour power cycles, reversed Carnot cycle and Bell Coleman cycle[6].

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- **Refrigeration:** Refrigeration concepts, unit of refrigeration, refrigeration and heat pump, air refrigeration, vapour compression refrigeration system, vapour absorption refrigeration system, working principle, refrigerator components, evaporator, compressor, condenser, capillary tube, expansion valve, C.O.P, Electrolux refrigerator, solar refrigerators, commonly used refrigerants and applications of refrigeration [7].
- **Air Conditioning:** Psychrometry and processes, humidity, specific humidity, relative humidity, sensible heating, sensible cooling, cooling with dehumidification, Psychrometric chart, summer air conditioning system, winter air conditioning system, year round air conditioning system, window air conditioning , split air conditioning, centralized air conditioning system, solar air conditioners. Refrigerants used for air conditioning systems. Eco friendly refrigerants for air conditioners and Heating, ventilation & Air conditioning (HVAC) systems [8].
- **Automobile Air conditioning:** Automobile air conditioning working principle, components, evaporator, compressor, mechanical power supply for compressor, condenser, receiver tank, capillary tube, blower arrangement, control units at vehicle dashboard, air conditioning system for electric vehicles refrigerants for automobile air conditioning systems.
- **Cryogenics:** Introduction to liquefaction of gases, Theoretical study on very low temperature applications, liquid nitrogen, liquid helium, fuels and applications.
- **Hands on Practical Training & Field visit:** The hands on practical training was given in home refrigerator, window air conditioning system, split air conditioning system, charging of refrigerants, trouble shooting, field visit exposure on centralized air conditioning systems.

The class room teaching, hands on practical training and field visit exposure are illustrated in the figures 1, 2 & 3.



Fig.1.Class Room Training in Refrigeration & Air conditioning



Fig.2.Practical Training in Air conditioning



Fig.3.Field Visit Exposure on Centralized Air conditioning system

## V. ASSESSMENT PROCESS

The assessment was done by conducting the evaluation examination in the form of pre test and post test before and after the faculty development training programme. For pretest, prepared the objective type question paper having 20 questions related to refrigeration and air conditioning subject contents, it was given to all the participants and conducted the pretest at the starting date of the programme and grading was converted into percentage. For post test, the same question paper was given to the participants and conducted the post test at the end date of the programme and grading was converted into percentage.

## VI. RESULTS & DISCUSSION

The analysis was done based on the marks secured by the participants before and after the training programme and illustrated in the graphs. Totally 15 participants attended the training programme. The marks of the total participants before the training programme varied from 35% to 80%; after the training programme, the marks of the participants were improved and varied from 85% to 100% and indicated in figure 4. Similarly the marks of the 13 polytechnic participants before the training programme varied from 35% to 80%.; after the training programme the marks of the polytechnic participants were improved and varied 90% to 100% and illustrated in figure 5. The marks of the 2 engineering college participants before the training programme were 70% and 75%; after the training programme marks were improved 85% and 90% and indicated in the figure 6.

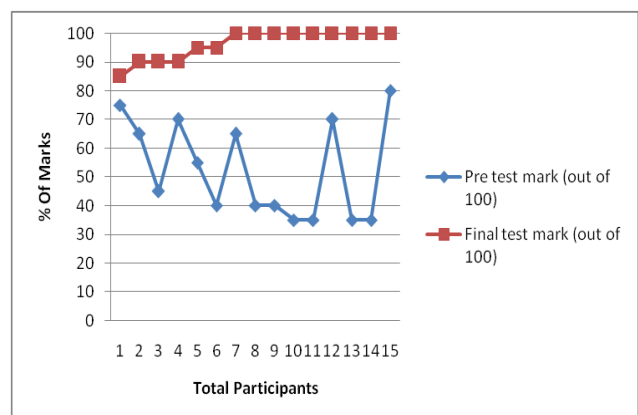


Fig.4. Evaluation Results of the Total Participants

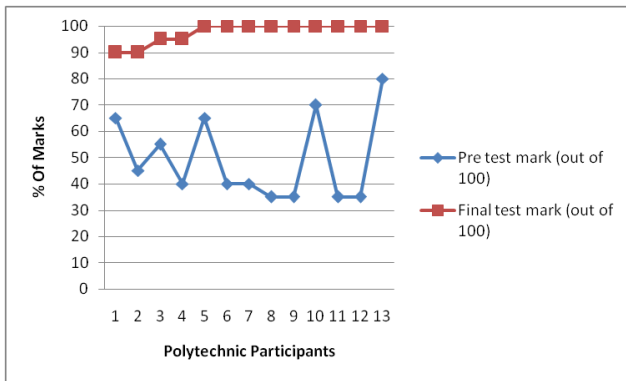


Fig.5. Evaluation Results of Polytechnic Participants

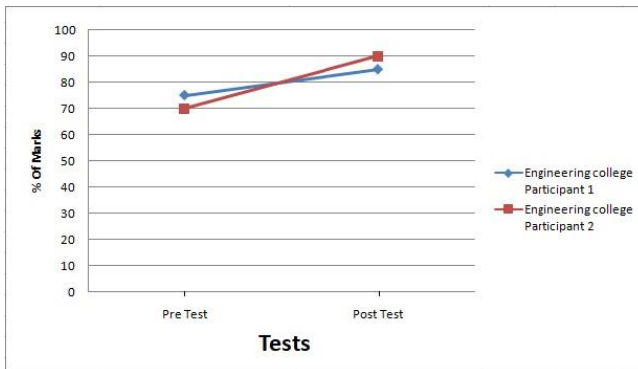


Fig.6. Evaluation Results of Engineering College Participants

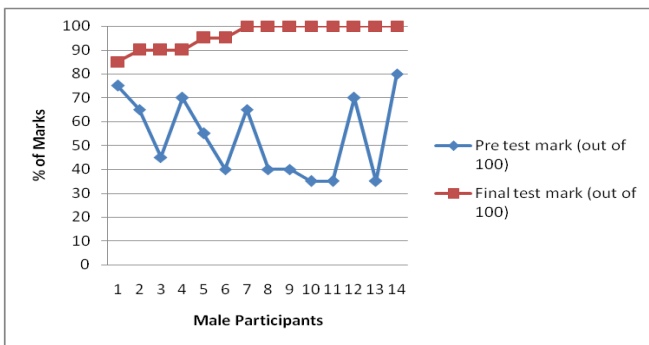


Fig.7. Evaluation Results of Male Participants

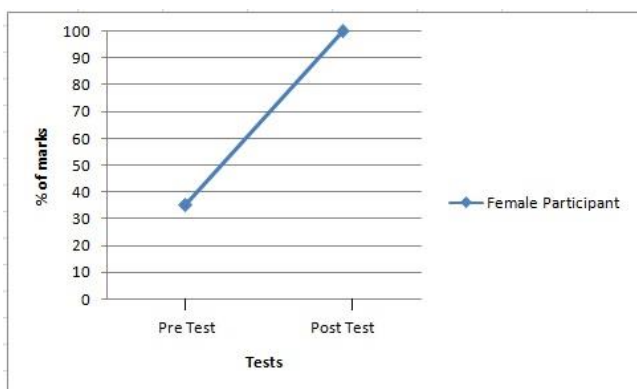


Fig.8. Evaluation Result of Female Participant

The marks of the 14 male participants before the training programme were varied from 35% to 80%; after the training programme, the marks of male participants were improved and varied from 85% to 100% and indicated in figure 7. The mark of one female participant was 35% before the training programme and it was improved to 100% after receiving the inputs from the training programme and indicated in figure 8.

## VII. CONCLUSION

From the above analysis, the evaluation marks obtained by the participants before and after the faculty development training programme were illustrated in the graphical form. The theory and practical parts including hands on training of the refrigeration air-conditioning contents were input to the participants. Based on that, the knowledge level increased and indicated in the form of increased percentage of marks. Using this enhanced knowledge, the teachers will give good input to students and their development.

## REFERENCES

1. M.Senthil Kumar, "Professional Ethics for Technical Teachers", International Journal of Science and Research, June 2019, Volume 8, Issue 6, ,1048-1049
2. S.Krishnanan, "Training Methodology(Book)", Asian Publishers, New Delhi, 1987
3. D.N.Dash, "Principal of Education(Book)", Neelkamal publications Pvt.Ltd., Hyderabad, 2003, Second edition
4. C.P.Kothandaraman and Domkundar, "A Course in Thermal Engineering (Book)", Dhanpat Rai & Co.(P) Limited, New Delhi, 2010, 6<sup>th</sup> Revised and Enlarged edition, Reprint.
5. R.S. Khurmi and J.K.Gupta, "A Text book of Thermal Engineering (Book)", Chand (S) and Co Limited, New Delhi, 2006.
6. P.K.Nag, "Engineering Thermodynamics" (Book)" Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008, Fourth edition, Reprint.
7. Manohar Prasad, "Refrigeration and Air Conditioning (Book)", New Age International (P) Ltd., Publishers,, New Delhi, 2006, second edition, Reprint.
8. C.P.Arora, Refrigeration and Air Conditioning (Book)", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006, Second edition, seventeenth reprint.
9. M.Senthil Kumar, "Role of Education for Environmental Sustainability", International Journal of Science and Research, June 2019, Volume 8, Issue 6, ,880-883.
10. M.Senthil Kumar, "Impact of Energy and Environmental Management Training Programme on Technical Teachers", International Journal of Innovative Technology and Exploring Engineering, Vol-08, Issue-11, September, 2019, 161-164.