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A Study on Issues Relating to Training of Construction Workers in India

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***Abstract* – We trained twelve rural female coolie workers as assistant masons through S-React model training program. We want to find out the effectiveness of such programs whether it would be useful to other construction workers, particularly women coolie workers. With these objectives, we prepared and administered a questionnaire to construction workers, supervisors and others. The questionnaire use items with five point Likert scale, covering barriers of skill development of general and construction workers, training environment of female construction workers, cost of training and training methodology adopted in the model training program. Consolidation and comparison of feedback based on gender show that perceptions of female and male are very similar in many cases. There are few items where the differences in their perceptions are significant. The findings are that female construction workers can be given proper motivation, improve their literacy and numeracy, train them in trades of their liking, and provide practical training near or at their work places with the help of supervisors and engineers. Cost of training and sharing of the cost are important issues. We recommend 15-days compulsory training every year to every female worker of construction industry. The S-REACT training program is a baby step solution addressing some of the concerns of skill development of female workers and coolie workers.**

***Keywords :* Skill Development; Construction Workers; Female coolie; Likert Scale**

I. Introduction

Majority of workforce in India are unskilled or doing manual work. Their income or productivity as compared to developed nations is very low. The poverty is also high. There are heavy pressures due to large population in India. The workers are required to be skilled, productive and competitive to command high income as compared to other developed countries. This requires training and skill development of workers in the country. There are several barriers to train the workers. They practically remain unskilled in their entire productive life or employment. Lack of funds, large population size, high cost of training, scattered distribution of rural population, shortage of formal training institutions, shortage of trainers, illiteracy, early school drop-outs, lack of numeracy, lack of motivation and lack of opportunities are some of the reasons, why large workforce is unskilled. There are unbalanced growth and gender bias which require to be addressed such that female workers and population from most backward areas and communities do get skill development and earn better wages. Governments and other agencies are keen of inclusive growth and they are already carrying out lots of training and skill development programs through formal and non-formal formats. Individuals and groups do get training on their own through informal means. However, majority of the workforce remain unskilled and this requires study of existing systems of training and new attempts in training them, so that the workforce is as competitive and productive at least satisfying national interests of equitable and inclusive growth to all.

We designed and developed a pilot training program; implemented it, training twelve female coolie workers (who are daily wage casual workers in the lower rungs) as assistant masons. This training program appears to be a successful one, which can be replicated to other groups and trades. Hence, with these objectives of finding the training needs of a larger group of workers from construction industry and to evaluate suitability of the model training program, a questionnaire was prepared and administered. The same questionnaire was used as interview schedule for recording of feedback from illiterate and other workers

from rural areas. This paper outlines our study findings of the feedback from male and female respondents.

II. The Questionnaire

Online survey questionnaire was prepared and made available through SurveyMonkey [20] for pilot test. The response from online users were very few and many did not complete the full questionnaire. Subsequently, the form was modified for directly obtaining the feedback through interviewing technique. This form is also made available online through Google Form [5]. The printed copies were used to get the feedback from female and male workers, part time BE and diploma students who are employed in various positions, including worker level positions.

The questionnaire is a lengthy one and requires appreciable time to complete. Answering certain questions require particular knowledge about workers and their skill development. The questionnaire was prepared in local language, Tamil and the online version (Google Form [5]) is a translation of the same in English. The feed backs from workers were obtained through direct interviewing and clarifying samples doubts then and there, where they were not able to decide, those items were left blank, only items answered were taken for consolidation and analysis.

The questionnaire section-A contains fourteen items on demography details, descriptive feedback on skill development of workers, their learning inventories, preferences, likes and dislikes. The section-B contains five items on demography data in a structured form easy for data analysis, which is also used to validate or check consistency of feedback as between section-A and section-B and for classifying the samples for analysis. The section-C contains seven items on Likert scale and eighth item a open question, all the eight items pertain to barriers of skill development in general. The section-D contains eight items on Likert scale and ninth item an open question, all the items pertain to barriers of skill development in construction industry. The first item in section-D can be used to compare and check consistency of the samples as between section-C for general workers and section-D construction workers. The section-E contains seventeen items on Likert scale and eighteenth item an open question, all the items pertain to various issues relating to skill development such as their preference on place of training, industry, trade and trainers. The section-F contains two multiple choice item on cost of training and who has to bear the cost. The section-G contains nine items on Likert scale on the model training program where female workers were trained as assistant masons. The last section-H contains one open question for any feedback from samples. Total items contained in the questionnaire are sixty six.

III. Research Methodology

The study is conducted as a formative and summative research to find out from samples on their opinions, preferences and ratings on important issues relating to skill development of construction workers in India. The study is formative as it attempts and explores as a pilot study to find out the profiles and choices of the samples. The study is also summative as it uses Likert scales to ascertain group of samples, their likes and dislikes and further attempts to evaluate the effectiveness of such training as S-REACT model training [16, 18]. Sampling was done by a combination of random, convenience and clustering methods, as we attempted to gather as much direct feedback from female and male construction workers both unskilled coolie workers and skilled mason, in addition feedback were obtained from diploma and BE part time students. Comparative study is feasible as between male and female workers and part time students, who are employed at various levels. This paper confines to the comparative study to all samples as between male and female. Simple descriptive statistics, summative scores, standard scores are used for comparative study.

IV. Results

Table I gives total samples in term of gender; 41% of samples are female and 59% are male. Table II gives average age of samples under gender classification. Average age of male is 36.1, whereas that of female is 33.3. Table III gives average years of education of samples under gender classification. Average years of education of male is 8.5, whereas that of female is 6.1. Table IV gives average years of experience of samples under gender classification. Average years of experience of male is 11.0, whereas that of female is 6.5.

Table V gives details of the industry which samples represent. Majority of samples both male and female come from construction industry.

Table I Total Samples Based on Gender Classification

Description	Nos.	percentage
female	126	41
male	184	59
Grand Total	310	100

Table II Average Age of Samples Under Gender Classification

Description	Nos.	Averag e of age	StdDev of age
female	126	33.3	6.9
male	180	36.1	9.8
Grand Total	306	34.9	8.8

Table III Average Years of Education of Samples Under Gender Classification

Description	Nos.	Average years of education	Standard deviation
female	124	6.1	4.4
male	183	8.5	4.5
Grand Total	307	7.6	4.6

Table IV Average Experience of Samples Under Gender Classification

Description	Nos.	Average experienc e in years	Standard deviation
female	87	6.5	6.2
male	154	11.0	9.1
Grand Total	241	9.4	8.4

Table V The Industry Samples Represent

Description	female	male	Grand Total
agriculture	1	2	3
construction	119	174	293
education & research	2	3	5
service & others	1	3	4
Grand Total	123	182	305

Table VI gives designation of samples. Majority of female samples are manual coolie workers (about 1/3rd of the total samples). About 1/3rd of the total samples are male of mason and head mason designation, who had opportunity to skill upgrade. About 1/6th of the total sample are male at higher positions as supervisors, engineers and owners. A shade below 1/6th of the total sample are male as manual coolie workers without skill development. There is very small and negligible number of samples from female from skilled groups.

Table VI Classification Based on Sample's Designation

Description	female Nos.	male Nos.	Grand Total Nos.
coolie	106	25	131
head mason	2	27	29
mason	1	69	70
owner or top management	1	10	11
supervisor, engineer, manager, middle level	12	45	57
others	3	6	9
Grand Total	125	182	307

Table VII shows areas of inetrest what the samples would like to know or learn more. All most all samples have indicated their inetrest in one thing or other except 1% of the total samples who have indicated others or left blank.

Table VIII gives details of samples work place, the city or district where they work. Majority of samples both male and female come from Thanjavur and Dindugul districts. Table IX shows details about migration and non-migrant workers. More than fifty percent of workers both male and female have indicated that they are migrant workers because of their own employment.

Table X-A shows self-rating of samples in Likert five point scales on their knowledge about workers. Maximum frequency occurs in high and very high scales. We used values of 1 to 5 respectively for scales starting from very low to very high, where value of 3.0 can be taken as medium or median or neutral or average, where situation demands. Table-10B gives the scale score converted into percentage multiplied by 100. More than eighty percent samples, both male and female have rated themselves as very familiar about workers. Table-10C shows the above data on international standard score with mean of 50 and standard deviation of 10 [4]. The scales 'very high' and 'high' are located on either side of the population mean of 50. The 'medium' scale standard score is higher than 33.55 hence the difference is not significant from population mean of 50 at 5% confidence level.

Table XI A and Table XI B show female and male responses respectively, on barriers of skill development of general workers on international standard score with mean of 50 and standard deviation of 10 [4]. In both male and

female cases, the scales 'very high' and 'high' fall on either side of population mean. However, considering the cut-off value of 33.55 for significance of mean difference at 5% confidence level, we find illiteracy and lack numeracy are significantly different from population mean in both male and female cases. Low wages and full of barriers are significantly different from population mean only in the female case.

Table VII Responses on Areas of Learning Interests, in Nos, Percent Multiplied by 100

Description	Female,	Male,	Grand Total, nos
children	32.5	22.9	26.8
health	25.2	17.3	20.5
money	32.5	33.5	33.1
work	9.8	24.6	18.5
others	0.0	1.7	1.0
Grand Total	100	100	100

Table VIII Districts Where Samples Work

Description	female nos.	male nos.	Grand Total nos.
Thanjavur	77	110	187
Dindugul	17	21	38
Pudukottai	9	15	24
Ariyalur	5	6	11
Thiruvarur	1	4	5
Trichy		4	4
Others	5	3	8
Grand Total	114	163	277

Table IX Migrant and Non-Migrant Workers

Description	female nos.	male nos.	Grand Total nos.
father employment	7	12	19
my employment	63	84	147
other reasons	5	4	9
not migrated	28	41	69
Grand Total	103	141	244

Table X-A Samples Self Rating of Their Knowledge About Workers

Five point rating	female nos	male nos.	Grand Total nos.
5, Very high	58	95	153
4, high	39	51	90
3, medium	9	19	28
2, low	9	6	15
1, very low	2		2
Grand Total	117	171	288

Table X-B, Samples Self Rating of Their Knowledge About Workers, In Percent Multiplied by 100

Five point rating	female nos.	male nos.	Grand Total nos.
5, Very high	49.6	55.6	53.1
4, high	33.3	29.8	31.3
3, medium	7.7	11.1	9.7
2, low	7.7	3.5	5.2
1, very low	1.7	0.0	0.7
Grand Total	100	100	100

Table X-C, Samples Self Rating of Their Knowledge About Workers, Standard Score With Mean=50, and Standard Deviation=10

Five point rating	female	male	Grand Total
5, Very high	56.8	55.9	56.3
4, high	45.8	44.6	45.1
3, medium	38.9	36.6	37.6
2, low	34.1	28.9	31.6
1, very low	0.0	0.0	0

Table XI-A, Female Response to Barriers of Skill Development of General Workers, Standardized Scale Score With Mean=50, Std. Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
C1	0.00	0.00	30.23	40.85	54.02	S
C2	23.48	27.43	31.48	43.81	56.56	S
C3	25.91	28.56	35.95	45.88	57.32	
C4	0.00	0.00	31.48	44.41	56.93	S
C5	23.56	27.52	32.61	40.54	53.57	S
C6	25.97	28.62	34.19	45.58	57.74	
C7	23.56	31.59	40.05	45.88	55.51	

Note: C1_illiteracy, C2_lack_numeracy, C3_poverty, C4_low_wages C5_barriers, C6_lack_motivation, C7_fear, S-Significant, NS-Not Signiifcant

Table XI- B, Male Response to Barriers of Skill Development of General Workers, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
C1	0	24.61	29.90	41.38	54.61	S
C2	22.29	27.16	31.30	43.56	56.35	S
C3	28.04	32.41	37.09	46.63	58.24	
C4	24.61	29.90	34.77	44.11	56.14	
C5	26.12	32.44	36.08	42.00	54.15	
C6	24.63	28.74	33.84	44.23	56.44	
C7	27.20	34.40	41.90	47.50	56.44	

Table XII A shows female responses and Table XII B shows responses of male on barriers of skill development of construction workers on international standard score. In both male and female cases, the scales 'very high' and 'high' fall on either side of mean. However, considering the cut-off value of 33.55 for significance of mean difference at 5% confidence level, we find lack of motivation is significantly different from population mean in both male and female cases. Illiteracy, lack numeracy, low wages and full of barriers are significantly different from population mean only in the female case. As compared with general workers and construction workers, lack of motivation is distinct in the case of construction workers as one major item to reckon with in skill development.

Table XIII A shows female responses and Table XIII B shows responses of male on training environments or factors of skill development of female construction workers on international standard score. The factors considered are suitability of industry, major areas or content for skill development, trainers, training place and training methods. In both male and female cases, the scales 'very high' and 'high' fall on either side of poppulation mean in all cases, except in the case of males on the suitability of female workers working in construction industry, where the mean is bound by "medium" and "high" scales, a grade lower than rest. That is men see female are not suitable for construction industry by a shade of difference. However, considering the cut-off value of 33.55 for significance of mean difference at 5% confidence level, we find training at work place and practicals based training are significantly different from population mean in both male and female cases. Training by supervisors is significantly different from population mean in the female case and training female workers in other industry is significantly different from population mean in the case of male responses. For item training in construction industry itself, highest score of 35 is seen in the case of female responses under the scale "very low" of all items considered in training environment, this is on account of highest percentage (13.5%) of female samples scoring for this item.

Table XIVA shows female responses and Table XIV B shows responses of male on S-React model training program on international standard score. In both male and female cases, the scales 'very high' and 'high' fall on either side of mean in all cases, except in the case of females on the peer support, where the mean is bound by "medium" and "high" scales, a grade lower than rest. That is women see on peer support a shade low on their capability. However, considering the cut-off value of 33.55 for significance of mean difference at 5% confidence level, we find rating on national importance; training in parts and whole; and, allowing reflection during training are significantly different from population mean in both male and female cases. Obtaining government certificate is significantly different from population mean in the female case.

Chi square test was done at 5% confidence level, taking an expected international standard score of 37.2, 44.8, 50.0, 55.2 and 62.8 respectively for bipolar Likert scale of very low, low, medium, high and very high, at respective cumulative mid point probabilities of 0.1, 0.3, 0.5, 0.7 and 0.9. This is derived from the fact that each scale has an equal chance of scoring at 1/5th of the possibilities. This Chi square test shows no significant difference between actual standard scores (Tables-11A, 11B, 12A, 12B, 13A, 13B, 14A, 14B) and expected standard scores for both female and male categories for items 'E3-female workers are not suitable for construction industry', 'E11-workers can be trained at their residence', 'E15-class room instructions can be imparted' and 'G-6, awarding of tools to workers'. Similarly, there are no significant differences between actual standard scores and expected standard scores for the cases of 'E1-workers can be trained in construction industry' for female category and 'C7-there is fear', 'E4-can be trained in using tools etc.', 'E7- construction trades' and 'E8- inquire from ladies themselves' for male category. In all other cases, there are significant differences between the actual and expected standard scores.

Table XII A, Female Response To Barriers of Skill Development of Construction Workers, Standardized Scale Score With Mean=50, TD.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
D1	26.18	30.55	36.62	42.56	53.99	
D2	0.00	23.53	31.55	43.19	55.81	S
D3	23.56	26.00	31.00	43.26	55.99	S
D4	23.48	25.91	34.45	45.77	57.72	
D5	0.00	0.00	29.46	43.93	56.81	S
D6	25.91	30.23	33.35	41.15	54.02	S
D7	0.00	23.53	30.96	44.90	57.74	S
D8	0.00	29.46	40.22	46.52	55.83	

Note: D1_applicability, D2_illiteracy, D3_lack_numeracy, D4_poverty, D5_ ow_wages, D6_full_barriers, D7_lack_motivation, D8_fear, S-Significant, NS-Not Signiifcant

Table XII B, Male Response to Barriers of Skill Development of Construction Workers, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
D1	26.23	32.23	38.50	43.44	54.12	
D2	26.14	33.09	36.65	44.21	56.05	
D3	22.38	30.04	34.94	44.72	56.84	
D4	24.75	30.57	37.09	46.06	57.35	
D5	24.69	30.00	34.42	44.21	56.39	
D6	26.16	31.40	34.69	42.08	54.52	
D7	22.40	27.29	33.18	44.27	56.61	S
D8	22.36	33.12	40.85	46.72	56.26	

Table XIII A, Female Response On Training Environment, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
E1	35.05	39.15	39.84	44.69	55.66	
E2	23.48	30.23	35.67	43.81	55.59	
E3	28.59	37.00	43.13	49.09	58.36	
E4	23.48	30.89	38.05	46.31	57.19	
E5	25.88	30.85	36.67	43.63	54.97	
E6	27.40	33.32	37.14	45.47	57.12	
E7	25.91	32.94	40.54	47.88	57.72	
E8	0.00	33.78	39.25	43.38	54.27	
E9	28.59	32.98	35.43	43.51	55.64	
E10	27.49	30.96	33.02	38.35	52.37	S
E11	30.44	36.22	39.51	48.31	60.13	
E12	29.56	33.47	37.09	46.21	57.82	
E13	0.00	27.52	33.05	41.61	54.34	S
E15	25.94	33.39	39.77	47.45	57.94	
E15	28.59	33.39	38.50	47.24	58.36	
E16	25.94	28.59	32.53	42.74	55.29	S
E17	0.00	31.55	40.65	47.63	57.20	

Note: E1_construction, E2_other_industries, E3_not_suitable, E4_tools, E5_supervision, E6_management, E7_construction_trades, E8_inquire_ladies, E9_institutions, E10_work_place, E11_residence, E12_maistry, E13_supervisor, E14_maistry_combined, E15_classroom, E16_practicals, E17_media_combined, S-Significant, NS-Not Signiifcant

Table XIII B Male Response on Training Environment, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
E1	29.42	34.40	37.59	43.82	55.26	
E2	22.34	28.08	33.38	43.34	55.71	S
E3	30.60	39.43	46.43	51.39	58.93	
E4	27.22	33.93	39.78	47.77	58.46	
E5	26.16	32.49	38.39	44.17	54.92	
E6	26.16	33.69	38.39	45.48	56.61	
E7	28.81	36.47	41.94	47.55	57.20	
E8	28.83	37.02	41.48	45.64	55.66	
E9	27.24	32.82	36.14	44.17	56.08	
E10	0.00	28.20	32.92	39.34	52.90	S
E11	30.09	35.85	39.31	48.90	61.23	
E12	27.29	34.01	38.60	46.37	57.54	
E13	26.21	30.57	35.61	42.56	54.41	
E15	27.33	32.60	38.10	46.56	57.65	
E15	30.09	35.44	41.29	49.05	59.14	
E16	0.00	0.00	31.45	42.75	55.31	S
E17	0.00	31.50	38.10	44.19	55.13	

Table XIV-A Female Response on S-React Model Training Program, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
G1	23.48	27.43	32.01	40.06	53.37	S
G2	0.00	0.00	32.01	44.87	57.32	S
G3	0.00	25.94	39.94	50.51	61.31	
G4	0.00	27.46	38.30	48.48	59.57	
G5	0.00	0.00	23.53	41.70	55.22	S
G6	33.35	37.41	39.55	46.95	58.00	
G7	23.51	29.50	32.98	40.75	53.83	S
G8	0.00	27.46	37.89	46.49	57.13	
G9	29.46	33.35	34.78	38.64	52.33	

Note: G1_national_importance, G2_parts_whole, G3_peer_support, G4_full_job, G5_reflection, G6_tools_awarded, G7_certificate, G8_importance, G9_usefulness, S-Significant, NS-Not Signiifcant

Table XIV B, Male Response on S-React Model Training Program, Standardized Scale Score With Mean=50, Std.Dev=10

Items	1, Very Low	2, Low	3, Medium	4, High	5, Very High	mean significance at 5%, scale-3, if < 33.5
G1	24.73	28.86	31.42	40.78	54.07	S
G2	24.75	27.29	32.55	44.94	57.44	S
G3	0.00	26.16	37.50	49.14	61.20	
G4	0.00	30.02	38.53	48.49	59.83	
G5	0.00	22.36	30.98	42.94	55.66	S
G6	30.55	34.94	38.84	47.75	59.11	
G7	24.75	29.51	33.74	41.87	54.41	
G8	0.00	30.02	38.80	45.24	55.49	
G9	31.40	35.95	37.50	41.38	53.51	

Table XV shows correlation coefficients in different groupings. Particularly between responses with respect to general workers and construction workers with 0.99 in the case of both females and males. Likewise the correlation between female and male responses in the case of 'barriers of skill development' of general workers is 0.99 and that of construction workers is again 0.99. The correlation of female and male responses in the case of environment factors and S-React model training program are 0.98 and again 0.98, respectively.

Table XV, Correlation Between Groups and Gender Responses

Description	r, coefficient of correlation
female responses - between general and construction workers	0.99
male responses - between general and construction workers	0.99
industry workers barriers - group correlation between female and male responses	0.99
construction workers barriers, - group correlation between female and male responses	0.99
training environment or factors - group correlation between female and male responses	0.98
training methods - group correlation between female and male responses	0.98

Tables XVI A, XVI B, XVI C and XVI D show details about number of responses respectively, for general workers barriers of skill development, construction workers barriers of skill development, training environment and S-React model training program. These tables show interpolated(approximate) standard mean score position with respect to scales, arithmetic mean and standard deviation of actual scale-scores in each case of male and female groupings. The results show the mean values are above the scale of high or score of 4.0 except in very few cases. The items of 'construction industry is not suitable' and 'training can be given at their residence' received scores less than 4.0 from both males and females. Likewise, the item peer support received less than 4.0 score from female. The t-test for any differences between arithmetic means of female and male yielded with no significant differences in all cases or items at 5% confidence level.

T Table XVI A, Consolidated Responses For Barriers Of Skill Development Of General Workers Able XV, Correlation Between Groups and Gender Responses

	Female				Male				
Items	Col-1	Col-2	Col-3	Col-4	Col-1	Col-2	Col-3	Col-4	t-test
C1	125	4.70	4.64	0.57	180	4.65	4.60	0.59	NS
C2	125	4.49	4.44	0.68	179	4.50	4.46	0.66	NS
C3	125	4.36	4.29	0.81	178	4.29	4.19	0.90	NS
C4	125	4.45	4.42	0.61	180	4.49	4.40	0.80	NS
C5	122	4.73	4.63	0.69	177	4.66	4.50	0.90	NS
C6	123	4.36	4.31	0.76	179	4.47	4.40	0.75	NS
C7	122	4.43	4.25	1.00	177	4.28	4.08	1.12	NS

Note: Col-1, No. of responses; Col-2, Interpolated mean position; Col-3, arithmetic mean; Col-4, std. deviation; NS=Not significant

Table XVI B, Consolidated Responses For Barriers of Skill Development of Construction Workers

	Female				Male				
Items	Col-1	Col-2	Col-3	Col-4	Col-1	Col-2	Col-3	Col-4	t-test
D1	116	4.65	4.49	0.89	172	4.61	4.41	0.98	NS
D2	123	4.54	4.50	0.63	176	4.49	4.35	0.92	NS
D3	122	4.53	4.48	0.66	174	4.44	4.36	0.78	NS
D4	125	4.35	4.31	0.72	173	4.35	4.25	0.86	NS
D5	125	4.47	4.46	0.58	176	4.48	4.39	0.79	NS
D6	125	4.69	4.58	0.78	175	4.64	4.51	0.84	NS
D7	123	4.40	4.38	0.61	173	4.46	4.41	0.71	NS
D8	125	4.37	4.23	0.96	175	4.34	4.17	1.03	NS

Note: Col-1, No. of responses; Col-2, Interpolated mean position; Col-3, arithmetic mean; Col-4, std. deviation; NS=Not significant

Table XVI C Consolidated Responses for Training Environment or Factors

	Female				Male				
Items	Col-1	Col-2	Col-3	Col-4	Col-1	Col-2	Col-3	Col-4	t-test
E1	126	4.48	4.13	1.36	177	4.54	4.34	1.03	NS
E2	125	4.53	4.42	0.82	176	4.54	4.47	0.72	NS
E3	124	4.10	3.88	1.17	172	3.82	3.60	1.30	NS
E4	125	4.34	4.23	0.89	176	4.21	4.07	0.99	NS
E5	126	4.56	4.42	0.89	175	4.54	4.36	0.98	NS
E6	126	4.39	4.25	0.94	175	4.41	4.26	0.98	NS
E7	125	4.22	4.08	1.00	176	4.25	4.02	1.16	NS
E8	124	4.61	4.39	1.01	175	4.44	4.14	1.20	NS
E9	124	4.54	4.40	0.92	175	4.49	4.35	0.91	NS
E10	123	4.83	4.74	0.91	171	4.79	4.68	0.67	NS
E11	119	4.14	3.97	1.05	172	4.09	3.93	1.00	NS
E12	122	4.33	4.20	0.96	173	4.32	4.17	0.98	NS
E13	122	4.66	4.57	0.69	173	4.63	4.49	0.85	NS
E15	124	4.24	4.10	0.99	171	4.31	4.19	0.94	NS
E15	124	4.25	4.12	0.97	172	4.09	3.93	1.08	NS
E16	124	4.58	4.50	0.74	173	4.58	4.53	0.62	NS
E17	123	4.25	4.12	0.97	171	4.53	4.37	0.91	NS

Table XVID, Consolidated Responses For S-React Model Training Program

	Female				Male				
Items	Col-1	Col-2	Col-3	Col-4	Col-1	Col-2	Col-3	Col-4	t-test
G1	125	4.75	4.66	0.67	174	4.69	4.61	0.69	NS
G2	125	4.41	4.39	0.62	173	4.40	4.36	0.70	NS
G3	124	3.95	3.94	0.78	175	4.07	4.05	0.71	NS
G4	124	4.14	4.10	0.79	175	4.13	4.07	0.82	NS
G5	123	4.61	4.59	0.51	175	4.56	4.51	0.61	NS
G6	125	4.28	4.03	1.20	174	4.20	4.05	1.02	NS
G7	124	4.71	4.60	0.73	173	4.65	4.54	0.77	NS
G8	124	4.33	4.25	0.83	175	4.46	4.32	0.92	NS
G9	125	4.83	4.65	0.92	175	4.71	4.45	1.12	NS

Table XVII-A shows response of male and female categories on approximate cost of training, standard score with mean=50, standard deviation=10. The ranges 1000-2000 and 2000-4000 fall on either side of the population mean. The correlation between female and male score is very high and nearly 1.0. There is no significant difference between actual and expcted standard scores at 5% confidence level using chi square test. Table XVII B – shows response of female and male samples on who shall bear the cost of training, in numbers, percent multiplied by 100. Maximum response is 35% from female indicating government has to bear the cost, whereas maximum response from male is 33% indicating workers have to bear the cost. The second to maximum response is 32% from female indicating companies to bear the cost and male response is 32% indicating government to bear the cost.

Table XVIII shows response on whether samples have long standing learning wish. The expected frequency is obtained from contingency table and the Chi square test shows no significant difference between actual and expected frequency at 5% confidence level, however it is significant at 10% level. The ratio of actual to expected frequency for female response for 'yes' is the least with 0.79.

Table XVII A Response on Approximate Cost of Training, Standard Score With Mean=50, Standard Deviation=10

cost range	female	male	All samples
500 - 1000	39.0	38.0	38.4
1000 - 2000	48.7	47.8	48.1
2000 - 4000	54.8	54.5	54.6
4000 - 6000	58.5	58.5	58.5
above 6000	64.8	64.5	64.6

Table XVIIB Response On Who Shall Bear The Cost Of Training, In Nos, Percent Multiplied By 100

Description	Female Nos.	Male Nos.	All Samples Nos.
workers	22.0	33.3	28.6
government	35.0	32.2	33.3
companies	32.5	24.6	27.9
all or combined	10.6	9.9	10.2
Grand Total	100	100	100

Table XVIII Response on Whether Samples Have Long Standing Learning Wish

Description	actual, nos	expected , nos	ratio=actual/ expected
female,yes	25	32	0.79
female,no	53	46	1.15
male,yes	95	88	1.08
male,no	122	129	0.95
Total	295	295	

V. Discussions

Studies of Barnabas *et.al.*[1] on empowerment of women construction workers from Trichy district of Tamilnadu and our present studies in the close proximity of Trichy district, namely Thanjavur, Dindugul and other districts have close relevance. Our study is a consequence of training of female coolie workers as assistant mason and evaluating its effectiveness. Barnabas *et.al.* [1] proposed a methodlogy that female construction workers can be trained the same way as men are trained in masonry work, informally at work-places. Our S-React training of female coolie workers was an attempt using that methodology but in controlled conditions as an experiment. While, we agree with Barnabas et.al. [1] on their major findings of gender bias, we find a small fraction of men who also remain unskilled in their entire productive life, due to caste discrimination at work places. These poor families work in construction sites as small groups, both men, women and children. Therefore, both men and women from underprivileged communities suffer; women doubly suffer.

Table VI shows that majority of our female samples are coolie workers and a small fraction of men are coolie workers. Samples are skewed that female samples can be taken as coolie workers and men samples, a mix of men right from coolie workers to owners and engineers, so our study will be throwing more light on female coolie workers as compared to a collective sample of male coolie workers, mason, supervisors, engineers and owners. The particular mix of samples of mason, head mason, supervisors, engineers and owners have a distinction that they have attained certain level of skills as compared to the female coolie workers, therefore both difference and similarity between male and female samples of this study would be interesting.

Barnabas *et.al.* [1] observe, "Though the contractors are willing to accept women as masons by giving them training and placement in the construction sector, it has been found, the social forces that have perpetuated the concept of women as inferior workers are inimical to any such move"; whereas, we find interesting results from our study. One issue is cost of training and who has to meet the cost of training; samples have given equally distributed responses indicating government, company, workers and combination of all who can bear the cost. The female response was significantly different with respect to item (Table-11A) C4 - low wages as one of a major contributing factor of barriers of skill development. If they have good income, they could easily apportion it towards training cost and 67.5% of female have indicated that either government or company can bear the cost of training; only 22% of the female have indicated that workers can bear the cost as against 33% of male responses who indicated that workers can bear the cost. We could expect a vicious cycle as between poverty, low income and not able to meet the cost of training on their own resulting into lack of skill or training, low productivity and low income, which again result into poverty. As cost of technical education or training is costlier than general education [8] and owners or contractors have reservations on meeting the cost of training as trained workers may not stay with them after training due to migrant and casual nature of employment in construction industry, cost is a major factor in skill development of workers [15].

Table-11A, 'D-7, lack of motivation' of female construction workers is another item of significance to be addressed in training. This is evident while considering the responses (Table-18) on their long standing wish to learn anything, female samples have scored the least 'yes' responses at only 0.79 as a ratio of actual to expected frequency. The response (Table-7) on areas of interest of what the samples want to know or learn, female samples have responded for areas like 'development of children' and 'money' each with 32.5% responses, the least response was for 'work' with only 9.8%. In the case of male, the maximum response was for 'money' with 33.5% , second comes 'work' with 24.6% and the least is 'health' with 17.3%., therefore men and women samples have different priorities for learning or knowing.

Baruah [2] report based on their survey, "the need to upgrade, diversify, and certify the skills of women in new technologies and emerging standards in the construction industry. Closely related were recommendations to provide women with on-the-job training at construction sites, the need to link women to large-scale employment opportunities in the public and private sector, and the need for state and national-level policies that enable women to translate their training and skills into sustainable

employment opportunities." Baruah [2] and Barnabas et.al. [1] recommend training at construction sites, our samples in this study also prefer training at work places as the response (Table XIII A, XIII B) E10 - work place training is significantly different and further emphasized by the fact that average score for (Table XVI C) E11 - training at residence is below 4.0, a lower value than rest of the items in the table. We have to consider another aspect that there are few difficulties in training workers at work places or at sites. The preferred ratio of skilled to apprentice worker is 4:1 [9], as higher proportion of apprentice will hamper progress and quality of work. Even before any trainee can be inducted at work place, they require to have priming on basics, on work and personal safety. Further, the skilled workers must be both willing to train the apprentices and must be patient enough as work will be slowed down and productivity will be low, and in course of time trainers may lose interest to train any apprentices. Our earlier studies (authors2009) show that hardly a head mason trains two to three masons in a year at an average. The head mason also fear that if more people are trained, the trained would be competing with them for job. Therefore, training at sites could be taken up as a planned activity with suitable induction and motivation program, such that apprentices either formal or informal are well primed and productive.

CWFI [3] brings out few barriers of training of construction workers, such as, availability of suitable programs, proper timing and location, competing demands of children and families, lack of formal education and opposition of men. Our study also confirms the barriers as illiteracy, and lack of numeracy; preferences on work place as training location and interest on children development. Baruah [2] note, "it is easier for women to acquire the skills than to subsequently find employment as skilled workers." Our experience with trainees of S-React training is also very similar that trained workers could not get employment to their newly acquired skill level [19]. Justin et.al.[7] bring out the major obstacles faced by women and ethnic minorities and migrant workers in Europe. They list items such as lack of opportunities for work based training, output based wage system, and informal methods of recruitment are the major obstacles. Coupled to the above obstacles are, "low status of construction industry, with hard working conditions and strictly defined working hours, the persistence of a 'macho' work culture, discrimination and harassment, and lack of work and family policies, realities and a form of "institutional discrimination" confining them to the 'bad jobs' of construction." They also report that ethnic minorities and migrant workers are over represented in bottom ladder of the jobs. The above conditions and discrimination are very similar here in India and hence we have incorporated items in our questionnaire items such as E4- training on small machines and tools, E5 – training on quality supervision and E6- training on managing sites which give better quality of work-life than the present conditions. For all these items, both arithmetic mean and interpolated mean of standard score fall between the scales 'high' and 'very high' (Table-16C), although the medium(median) scale score is not significantly different from population mean of 50 (Table XIII A, XIII B). For item E4-training on small machines and tools of male responses, there is no significant difference between actual and expected standard scores.

S-React model training program is a baby step solution to overcome the barriers of skill development of female and male coolie workers in construction industry. The training inducts unskilled workers in tools, methods and practicals relating to trade of mason or brick layer. Just four days of training was sufficient in our case to make them qualify as assistant masons, opening a larger opportunity. The training was given at work place, cost was kept low by opting for small productive wholesome jobs, creating positive learning experience. The training program is not a complete solution; however, the responses from both male and female samples are encouraging. The items G1- National importance, G2-wholesome and part training, G5-reflective learning are well appreciated by both male and female samples and the medium scale is different from population mean (Table XIV A, XIV B) with arithmetic mean and the population mean falling within scales high and very high(Table XVI D). In similar note, female samples have well appreciated item G-7 obtaining of government certificate, whereas, female samples have given low score to the item G3-peer support for which the arithmetic mean is less than 4.0.

Another interesting inference that we draw based on t-test on actual scores, based on arithmetic mean, the standard deviation of male and female samples for items for any differences between their mean indicate that there are no significant difference at 5% confidence level. In

other wards, as there is no difference in their opinion and judgments on various items, the gender equality is affirmed here through our studies regarding their judgments or opinions about their work environment in general, paying special attention that female samples are majority unskilled coolie workers, whereas male sampels are majority skilled workers.

The questionnaire was first designed as an online feedback form [17,20], improved the form, and administered both through online [5] and through interviews. Present questionnaire is partly an interest-rating inventory, which can be used to identify profiles of the samples from their responses; however, such a study is not reported in this paper.

It is apparent that underprivileged and those who lose job in other industries and agriculture, the minorities and the migrant people take up ,manual unskilled jobs at the bottom rungs of the construction industry. This can be seen as a vocational compromise [6]) based on immediate livelihood options. However, they seek moving upward and progressing forward, but for the barriers and competitive forces, they remain oppressed. A possible solution may lie in compulsory skill development in areas or trades of their interest for fifteen days in each year, which will make them in few years as skilled workers. Suitable mechanism to meet the cost of training or ways and means are to be devised covering all workers starting from the lower rungs in the construction industry, particularly covering the female workers. There is also a good sense, as we find difficulty in getting youth opting for construction industry, we can't lose those who have already opted and working in the construction industry, ways and means to retain them and skill develop them are to be well planned and implemented so that both skill shortage and empowerment of poor women are addressed. As there are no differences in the interest inventories as between civil engineering technician, brick layers, civil engineers and civil engineering manager as they have common interest codes [10, 11, 12, 13] of RC (Realistic and Conventional) and I(Investigative); in other words a female technician or a brick layer can rise to become a manger or an engineer, why should such an opportunity be refused to a worker?

VI. Conclusion

The major findings of our study are 1) female construction workers can be given proper motivation, 2) opportunities can be created to improve their literacy and numeracy, 3) they can be trained in areas or trades of their liking taking their views, 4) training can be given near or at their work places, 5) training can be given by supervisors and engineers and 6) training can be mostly practical based.

Cost of training and sharing the cost of training are major issues which require resolution, which. can be handled through policy decision by government, by making compulsory 15-days work-site based training in each year for all women working in construction industry in their choice of trade or liking, fully paid through industry development fund. The training can be planned during lean-work period so that main work activities are not affected.

The S-react training program is a baby step solution addressing some of the concerns of female workers and coolie workers.

Future study or research can focus on issues relating to career counseling and growth of women construction workers. Focus on design, development and implementation of work-site based training programs for female workers, on continuos basis.

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