The Competency Development in Practical Skills by Hand-on activities for Industrial Education Students (Electrical Engineering Learners)

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Abstract
This study was aimed to develop learning competency in practical sessions by using Hand-on activities. The tools used to collect data were a questionnaire, assessment test and Delphi technique. The purposive sampling of this study were 80 senior students in Electrical Engineering Education from King Mongkut's University of Technology Thonburi. The Delphi technique sampling groups were selected from 10 experts as the mainstream vocational education. The research finding were the student samples had insufficiency of knowledge, skills and attitudes for competency's need of vocational education. The results of Delphi technique found that the basic competency can divided to 3 domains; cognitive, affective and psychomotor. The factor of these are consist of basic electronic (design circuits by computer, testing circuits and electronic instrument skills). Hand-on activities modules were design as lesson plan by job analysis and contain with knowledge and skill in the basic of electronic including to do PCB electronic board, soldering and coil wiring transformer.

Keywords: Hand-on activities, job analysis, competency

Introduction

Education which is knowledge based economy is important especially in these current economic situations. National Economic and Social Development plan for No.11 B.E. 2555 to 2559 (draft),Factor of Consideration of planning for curriculum development, Office of the national economic and Social Development surveyed analyzed and presented the issues about The challenges and opportunities of Thailand is a result of the region Economic concentration affected the connection of International economic in the region is increasing and expand the asia economic rapidly. Global economy will change the center to the Asia and also the advancement of electrical technology electronics and computer with the human living that is Thailand has to prepare curriculum to be ready for the changing by manage knowledge systematically, develop and Create new knowledge as well as the application of appropriate technology in the current status and the future follow by the university context including the regulation from National Education Act of B.E. 2542.It caused Education reform to develop the capacity of both teachers and Education Personnel such as being Educational reform leadership, creating and developing curriculum, classroom research promotion etc. and Quality Assurance. Due to the important of this problems, researcher who is the part of graduate producer, have to develop teachers and Education Personnel to be on top of the vision for economic change, so the purpose of this study was to study the properties of vocation knowledge, vocation ability, vocation attitude and Capacity

Research Methodology

1. Objectives

1. To study on the problems, obstructions and development of Electrical instructor competencies requirements.
2. To build competency in part of knowledge, skills and attitudes.
3. To develop practical competencies, according to teacher professional required (Electrician).

2. Scope of the Study

2.1 In part of studying on the problems, obstructions and development of Electrical instructor competencies requirements. The sample groups were selected from Electrical teacher who had been teaching at least 2 years in technical colleges.

2.2 In part of learner's test by through competency from knowledge, skills and attitudes.

2.3 In part of development of practical competencies, according to teacher professional requirement (Electrician). The sample groups selected for this study comprised 3 sections of Electrical technology education student, King Mongkut's University of Technology Thonburi 5^{th} grade.

3. Research Instrument

3.1 A questionnaire on the problems, obstructions and development of Electrical instructor competencies requirements

3.2 A questionnaire on development of practical competencies, according to teacher professional requirement (Electrician).

4. Research Methodology

Data Collection, Researcher used a questionnaire with the sample groups were Electrical teacher, as follows

4.1 Practical competencies requirement study. a questionnaire of value of expert opinion about the problems, obstructions and Electrical instructor development competencies requirements (Delphi Technique) to summarize the opinion and the main issue.

4.2 Course structure was determined by base separation

1. Group meetings (Focus Group) and create a suitability of development of practical competencies, according to teacher professional requirement (Electrician) questionnaire by divided to Knowledge skills and Attitude.
2. Design base competencies, Hand-on activities modules were design as lesson plan by job analysis
3. The sample groups practice in practical part to develop competencies

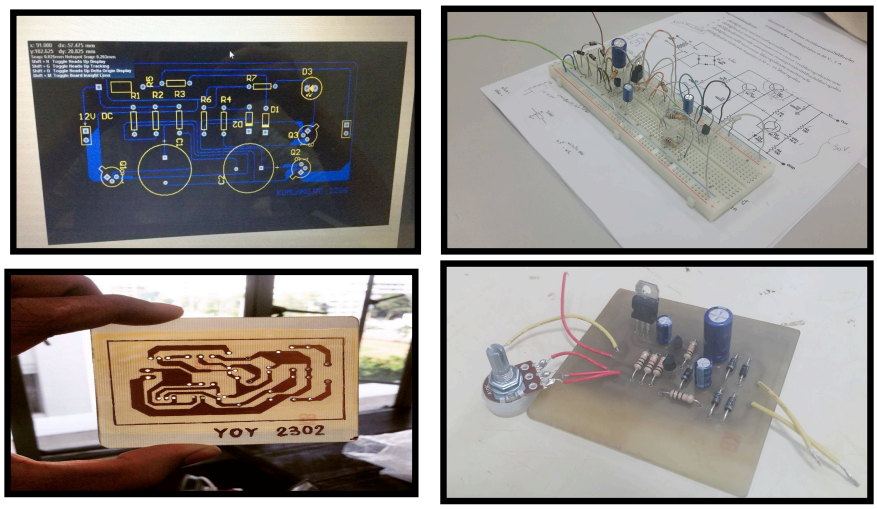

Figure1. Develop practical competencies, according to teacher Professional required (Electrician)

5. The data analysis

The data were analysed by percentage, mean, standard deviation using Delphi technique to analysis and also correlation (median and interquartile range)

6. Results

1. The problems, obstructions and Electrical instructor development competencies requirements

1.1 Vocational Knowledge Problems

First of vocational knowledge problems is measurement knowledge($\bar{X}$ = 3.82, SD. = .85) second problem is electrical and electronic devices knowledge problem ($\bar{X}$ = 3.78, SD. = .86) designing and drawing by computer knowledge problem ($\bar{X}$ = 3.73, SD. = .89) Device testing knowledge problem ($\bar{X}$ = 3.71, SD. = .90) Mathematics for Industry knowledge problem ($\bar{X}$ = 3.70, SD. = .78) English Language knowledge problem respectively ($\bar{X}$ = 3.70, SD. = .86)

1.2 Vocational Skills Problems

First of vocational skills problems is Design and Drawing circuit skill ($\bar{X}$ = 3.75, SD. = .94) Secondly is Using Computer to Process and Collect Data skill ($\bar{X}$ = 3.73, SD. = .91) Measuring and Checking circuit skill ($\bar{X}$ = 3.72 , SD. = .94) Using Technology skill ($\bar{X}$ = 3.66, SD. = .82) Creating circuit skill ($\bar{X}$ = 3.64, SD. = .90) Maintenance devices skill ($\bar{X}$ = 3.59 , SD. = .89) devices testing skill ($\bar{X}$ = 3.58, SD. = .81) Create Project of Industry skill ($\bar{X}$ = 3.57, SD. = .96) respectively

1.3 Good Attitude towards Work Problems

First of good attitude towards work problems is Enthusiasm ($\bar{X}$ = 3.88, SD. = .88) Secondly is Work Success Oriented Mind ($\bar{X}$ = 3.83, SD. = .85) Honesty in Work Duties ($\bar{X}$ = 3.81 , SD. = .93) Development knowledge from resources center ($\bar{X}$ = 3.80, SD. = .86) An effort solve problem ($\bar{X}$ = 3.71, SD. = .77) To be consistent in work ($\bar{X}$ = 3.61, SD. = .83) Have reason in to listen idea of colleague ($\bar{X}$ = 3.64, SD. = .95) To Suggest Matter for Consultation ($\bar{X}$ = 3.60, SD. = .89) Punctuality ($\bar{X}$ = 3.60, SD. = .91) To devote time give with work and function ($\bar{X}$ = 3.58, SD. = .94) respectively

2. Comparison of the needed of development of practical competencies, according to teacher professional requirement (Electrician)

Table - 1 Shown the comparison of vocation Knowledge requirement

	vocation Knowledge	**Electrical Engineering**		**Electric Engineering**		**Computer Engineering**		**F-test**	**Sig**
		$\overline{X}$	**S.D.**	$\overline{X}$	**S.D.**	$\overline{X}$	**S.D.**		
1.	Knowledge of Thai communications in vocation	3.00	1.000	3.90	0.664	3.70	0.984	2.676	073
2.	Knowledge about English	3.00	1.000	3.62	0.590	3.82	0.769	2.711	070
3.	Knowledge about security	3.33	0.577	3.97	0.523	4.21	0.600	4.862	009**

4. Knowledge about mathematics for Industrial technicians	3.00	0.000	3.82	0.573	3.97	0.770	3.490	.034*
5. Knowledge about science applications	3.00	0.000	3.80	0.539	3.64	0.603	3.899	.023*
6. Knowledge about electrical devices and electronics	4.00	0.000	3.90	0.536	4.18	0.635	3.044	.051
7. Knowledge about rules and formulas	3.33	0.577	3.59	0.744	3.76	0.561	0.992	.374
8. Knowledge about Device testing	3.33	0.577	3.91	0.657	4.18	0.584	3.679	.028*
9. Knowledge about Circuit designs	3.67	0.577	4.03	0.601	4.24	0.663	2.086	.129
10. Knowledge about Industry management	3.67	0.577	3.84	0.616	4.09	0.631	2.257	.109
11. Knowledge about Electrical technology	3.00	0.000	4.01	0.545	3.85	0.619	5.394	.006**
12. Knowledge about Approximate Price	4.33	0.577	4.22	0.510	4.21	0.650	0.068	.935
13. Knowledge about using computer to Design and drawing circuit	4.00	1.000	4.17	0.483	4.15	0.712	0.150	.861
14. Knowledge about measurement	4.00	1.000	4.18	0.443	4.45	0.564	4.077	.019*

Table - 2 Shown the comparison of vocation Skills requirement

Vocation Skills	**Electrical Engineering**		**Electric Engineering**		**Computer Engineering**		**F-test**	**Sig**
	$\overline{X}$	**S.D.**	$\overline{X}$	**S.D.**	$\overline{X}$	**S.D.**		
1. Skills in read and design the circuits	3.67	0.577	4.40	0.515	4.39	0.609	2.688	.072
2. Skills in use computer to Process and Collect Data	3.33	0.577	3.73	0.697	3.97	0.529	2.359	.099
3. Skills in Checking Circuit	3.33	0.577	3.86	0.779	3.73	0.761	0.945	.391
4. Skills in use technology	3.67	0.577	4.21	0.565	4.21	0.781	1.090	.339
5. Skills in Create Tools	3.67	0.577	4.01	0.545	3.82	0.882	1.372	.257
6. Skills in Create Equipment	3.33	0.577	3.96	0.467	3.79	0.696	2.902	.059
7. Skills in Create Project of Industry	3.00	0.000	3.72	0.746	3.73	0.674	1.458	.237
8. Skills in Control Electric Circuit	3.67	0.577	3.98	0.593	4.12	0.696	1.109	.333
9. Skills in Create Circuit	4.00	0.000	4.37	0.569	4.21	0.740	1.221	.298
10. Skills in Maintenance Devices	3.67	0.577	4.29	0.584	4.15	0.712	1.963	.145
11. Skills in Measuring and Checking Circuit	3.67	0.577	4.23	0.697	3.97	0.637	2.525	.084
12. Skills in Practicing	3.33	0.577	3.62	0.823	3.52	0.906	0.325	.723
13. Skills in Basic Electric Industry	3.33	0.577	3.75	0.586	3.75	0.696	0.749	.475
14. Skills in Basic Electronic	3.33	0.577	3.53	0.544	3.64	.742	0.570	.567

Table – 3 Shown the comparison of Good Attitude towards Work requirement

Good Attitude towards Work	Electrical Engineering		Electric Engineering		Computer Engineering		F-test	Sig
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.		
1. Concentrade on work	4.33	0.577	4.41	0.558	4.73	0.452	4.357	.015*
2. Work Success Oriented Mind	4.33	0.577	4.29	0.545	4.58	0.561	3.205	.044*
3. Development knowledge from resources center	4.00	1.000	4.34	0.519	4.18	0.528	1.483	.231
4. An effort solve problem	4.00	0.000	4.14	0.585	4.33	0.479	1.629	.200
5. Maintenance machine	4.577	0.333	.557	0.058	.683	0.119	1.337	.266
6. Cleaning machine/and equipment	4.33	0.577	4.24	0.581	4.15	0.619	0.325	.723
7. To be consistent in work	4.33	0.577	4.25	0.547	4.24	0.561	0.037	.963
8. Punctuality	4.00	1.000	4.30	0.508	4.52	0.566	2.553	.082
9. Honesty in Work Duties	4.00	0.000	4.30	0.508	4.61	0.556	4.952	.009**
10. devote time for work and duty	4.00	0.000	4.28	0.599	4.36	0.603	0.607	.547
11. Show well-mannered with the boss	3.67	0.577	4.22	0.571	4.36	0.653	2.185	.117

Table – 3 Shown the comparison of Good Attitude towards Work requirement (or)

Good Attitude towards Work	Electrical Engineering		Electric Engineering		Computer Engineering		F-test	Sig
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.		
12. Show well-mannered with the friend and woke-man	3.67	0.577	4.25	0.460	4.24	0.614	1.938	148
13. Work group to create	4.00	0.000	4.30	0.550	4.42	0.502	1.196	306
14. To Suggest Matter for Consultation	3.67	0.577	4.34	0.519	4.42	0.614	2.671	073
15. Have reason in to listen idea of colleague	3.67	0.577	4.33	0.494	4.42	0.614	2.880	060
16. Practicable in order by intend	4.00	1.000	4.29	0.504	4.36	0.549	0.729	485
17. Help associate some time	3.67	0.577	4.15	0.553	4.27	0.674	1.650	196

Table 4 Competency requirement of the teacher (electrical teacher)

Knowledge property in the vocation	Agreement Level		
	$\overline{X}$	S.D.	Agreement Level
1. Knowledge of Thai communications in vocation	4.2500	.50196	High
2. Knowledge of English	4.2188	.54610	High
3. Knowledge of security	4.1641	.55808	High
4. Knowledge of mathematics for Industrial technicians	4.1094	.56449	High
5. Knowledge of science applications	4.0781	.62253	High
6. Knowledge of electrical devices and electronics	4.0859	.53282	High
7. Knowledge of laws and calculating	4.0703	.56378	High
8. Knowledge of devices testing	4.0703	.65428	High
9. Knowledge of circuit design	4.0625	.59855	High
10. Knowledge of Industrial administration	4.0547	.70217	High
11. Knowledge of electrical technology	4.0156	.56099	High
12. Knowledge of estimates	3.9766	.56770	High
13. Knowledge of circuit design by computer	3.9688	.65132	High
14. Knowledge of measuring instrument	3.9544	.57928	High

Skills property in the vocation	Agreement Level		
	$\overline{X}$	S.D.	Agreement Level
1. Ability to read and design the circuits	4.3828	.54874	High
2. Ability to use computer to evaluate and record data	4.3203	.61393	High
3. Ability to test the devices	4.2422	.62426	High
4. Ability to use technology	4.1953	.62819	High
5. Ability to make an instrument	4.1484	.83739	High
6. Ability to make an equipment	4.0078	.62110	High
7. Ability to make industrial project	3.9531	.65037	High
8. Ability to control electrical circuit	3.8984	.54469	High
9. Ability to make an electrical circuit	3.8125	.77103	High
10. Ability to repair the devices	3.7813	.66330	High
11. Ability to measure and check the circuit	3.7031	.72481	Average
12. Ability to practice	3.5859	.68837	Average
13. Ability to operate basic industrial electrical			
14. Ability to operate basic electronics			

Attitude property in the vocation	Agreement Level		
	$\overline{X}$	S.D.	Agreement Level

Attitude property in the vocation	Agreement Level		
	$\overline{X}$	S.D.	Agreement Level
1. concentrate on work	4.4922	.54695	High
2. Result based approach	4.3750	.59339	High
3. Demonstrate to learning outside	4.3672	.55940	High
4. Attempt to solve the problem	4.3516	.54107	High
5. Conserve an electrical device	4.3438	.55327	High
6. Cleaning machine/and equipment	4.3359	.53650	High
7. Attend class constantly	4.3281	.53403	High
8. Punctuality	4.3047	.52585	High
9. Honesty in Work Duties	4.3203	.56028	High
10. Devote time for work and duty	4.2969	.53241	High
11. Show well-mannered with the boss	4.2891	.53466	High
12. Show well-mannered with the friend and woke-man	4.2500	.54700	High
13. Work group to create	4.2422	.59850	High
14. To Suggest Matter for Consultation	4.2344	.50951	High
15. Have reason in to listen idea of colleague	4.2187	.58777	High
16. An effort solve problem	4.2031	.59339	High
17. To help organize or community	4.1875	.55769	High

Results on Competency requirement of the teacher (electrical teacher), first knowledge property in the vocation to total up agreement level high, second skills property in the vocation to total up agreement level high, third attitude property in the vocation towards to total up agreement level high.

Table 5 Competency of electrical teacher

Competency of electrical teacher	Agreement Level		
	$\overline{X}$	S.E.	Agreement Level
1. Mathematics and calculation	4.2812	.61478	High
2. Science	4.1641	.60102	High
3. Basic of electrical and electronic	4.1484	.60301	High
4. Drawing and design by computer	4.1484	.54830	High
5. English	4.1094	.59932	High
6. Basic practical	4.1094	.57202	High
7. Measuring and testing the instrument	4.0937	.62036	High
8. Basic electrical instrument	3.9922	.71226	High
9. Security and Pollution control	3.8672	.50563	High
10. Electrical device maintenance	3.7734	.66237	

Results on competency of electrical teacher, most competency of electrical teacher that is mathematics and calculation, next below is science, basic of electrical and electronic, drawing and design by computer, English, basic practical, measuring and testing the instrument, basic electrical instrument, security and pollution control and electrical device maintenance

Table 6 CORRELATIONS

Competency requirement of the teacher (electrical teacher) Needed			
P-value	Knowledge	Skills	Attitude
Knowledge	-	.749**	.743**
Skills	.749**	-	.802**
Attitude	.743**	.802**	-

Results on correlations between competency requirements of the teacher (electrical teacher) needed. Respondents of correlation knowledge, skill and attitude in problems and obstacles and competency requirements of the teacher (electrical teacher) needed has correlation kind of significant 0.01

Conclusion

The purposes of this research were to Capacity requirement of the teacher (electrical teacher) include vocational knowledge, vocational skills, Good attitude towards work and competency of electrical teacher. The samples student of Electrical technology education department in Faculty of Industrial Education and Technology, King Mongkut's University of Technology Thonburi number 81 person. The Results on Competency requirement of the teacher (electrical teacher), first knowledge property in the vocation to total up agreement level high, second Skills property in the vocation to total up agreement level high, third attitude property in the vocation towards to total up agreement level high. Results on competency of electrical teacher, most competency of electrical teacher that is mathematics and calculation, next below is science, basic of electrical and electronic, drawing and design by computer, English, basic practical, measuring and testing the instrument, basic electrical instrument, security and pollution control and electrical device maintenance. Results on correlations between competency requirements of the teacher (electrical teacher) needed. Respondents of correlation knowledge, skill and attitude in problems and obstacles and competency requirements of the teacher (electrical teacher) needed has correlation kind of significant 0.01

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