Factors Affecting Project-Based Learning As Perceived by Electrical Power Instructors

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Abstract: Purposes of this research were to study general status of electrical power instructors, and to construct regression equation or prediction of variables affecting Project-Based Learning (PBL). The sample chosen for this study were 247 of electrical power instructors at vocational education institutes. The instrument used for data collection was a 7-rating scale questionnaire. The reliability of the instrument calculated by Cronbach Alpha Coefficient was 0.9839. The data was analyzed by using Mean ($\overline{X}$), Standard Deviation (S.D.), t-test, F-test, correlation coefficient, and multiple regression analysis. Results of the study were as follows. (1) Scientific Process, Interesting/ Attention, and Multiple Intelligence affecting the Project-Based Learning as perceived by electrical power instructors. (2) The independent variables or predicting variables chosen as part of regression equation or predicting equation were three variables according to priority of significance: Scientific Process (X_4), Interesting/Attention (X_3), and Multiple Intelligence (X_2). Correlation Coefficient between the prediction variables and Project-Based Learning was 0.975. The regression equation or the predicting on Project-Based Learning in type of raw score was:

$$Y = 0.474+0.336\ X_4+0.325\ X_3+0.254\ X_2$$

The regression equation or the prediction equation on the Project-Based Learning, in type standard score was:

$$Y = 0.380X_4+0.404X_3+0.282X_2$$

The prediction equation had the power of prediction 95% and error of prediction was 20.11%.

Keywords: Factors, Project-Based Learning, Electrical Power Instructors, Regression Equation or Predicting Equation

Introduction

The meaning of Project-Based Learning (or PBL) covers learners' opportunity to study, to search data, to set up goals/plans, then to design, to implement, to try out, to make a presentation on a report/a piece of work, and to evaluate their own learning according to their interest, aptitude as well as ability of him/herself as a group or individuality through thinking process, integrating, and system of scientific process at each step of operation (Mulkam, Suvit & Oratai, 2002; National Primary Education Commission, 2002). Moreover, while working on PBL, learners can share ideas, think and solve problems together under instructors' supervision, guidance, and assistance (Buck Institute for Education, 2002) until learners can create a meaningful and useful work towards themselves. What's more, PBL is necessary for today's educational system in enhancing one's capability to construct body of knowledge through thinking process and performing by oneself (Rung Kaewdaeng, 1998).

This complies with National Education Act, B.E. 2542 (1999) and Amendments (Second National Education Act, B.E. 2545, 2002) section 24 (2) and (3) which reads: "In organizing

the learning process…(2) provide training in thinking process, management, how to face various situation and application of knowledge for obviating and solving problems… (3) organize activities for learners to draw from authentic experience; drill in practical work for complete mastery; enable learners to think critically and acquire the reading habit and continuous thirst for knowledge" (Office of the National Education Commission, 2002). In this way of thought, learner's thinking and learning process can then be developed according to his/her potential. However, problems regarding instruction nowadays are that though teachers see the strengths of PBL, they do not understand this kind of instructional process, and that being a facilitator will burden their responsibility and work. Therefore, teachers still emphasize on content-based courses which are believed as separated pieces of mind but not to be a holistic one. What's more, instructional behaviors are still insipid, and focusing on learning by heart, without giving learners an opportunity to decide and/or to do practical work. Thus, learners will lack of skills to learn, to think and to develop themselves. This is why learners hardly see the relationship of learning, skills and its content (Prawase Wasee, 1999), resulting in being unable to apply their knowledge and skills to the future use.

Lastly, according to the rationale and problems mentioned above, the researcher felt the needs to conduct a study entitled "Factors Affecting Project-Based Learning as Perceived by Electrical Power Instructors." Consequently, the results of this study will be useful in designing and developing activity process to comply with Project-Based Learning. This study will also prove that if learners study through direct experience and/or real situation, they will be able to think, to do, to create a new body of knowledge, and to become a life-long learner at last.

Objective of the Study

The objectives of this study were to study general status of electrical power instructors, and to construct regression equation or prediction of variables affecting Project-Based Learning (PBL).

Expected Outcomes of the Study

The expected outcomes of this study were as follows:

1) Instructors could apply the findings of variables affecting Project-Based Learning in developing and improving the instruction with appropriateness. For example, if multiple intelligence is an important variable in PBL, classroom and activities inside classroom must comply with it so that learners could develop themselves according to such theories, e.g. Reading/Writing Center for Verbal/Linguistic Intelligence, Math Center for Bodily/ Kinesthetic Intelligence, and Music Center for Music/Rhythmic Intelligence, to name a few. Then, theories which could explain learner's learning development in all levels could be applied to learners and various activities must be done to suit all kinds of learners.

2) When learners are guided and supported properly, learners could think fluently and begin to see the problems, the way to solve them, how to do, and present the works with effectiveness and efficiency.

Conceptual Framework or Theoretical Framework

Conceptual framework or theoretical framework used in this study to construct regression equation or prediction of variables affecting Project-Based Learning (PBL) (Buck Institute for Education, 2002; Rung Kaewdaeng, 1998); (Autodesk Foundation, 1999); (Suchin Petcharak, 2001) were as follows: (1) A Facilitating, (2) Goal Setting, (3) Interesting/

Atttention, (4) Aptitude, (5) Ability, (6) Planning, (7) Thinking, (8) Integrating, (9) Scientific Process, (10) Sharing Ideas, (11) Authentic Assessment, (12) Transfer of Learning, (13) Multiple Intelligence, (14) Constructionism, and (15) Team Learning.

After all, the meaning of Project-Based Learning (PBL) can be identified as learning process
which allows learners to study, search, set goal and plan, practice and/or experiment according to learner's interest, preference and capacity. PBL in group and for individual relies on thinking process, integrating knowledge, and scientific method in each step. During PBL, learners will think, do, solve problems, and share knowledge together.

Research Methodology

a) Population and sample

Population of the study were 1,080 and sample were 247 electrical power instructors at vocational education institutes using simple random sampling.

b) Tools for data collection

The instrument used for data collection was a 7-rating scale. The reliability of the instrument was calculated using the Cronbach's alpha coefficient, which was 0.9839.

c) Data analysis

The data was analyzed by using mean ($\overline{X}$), Standard Deviation (S.D.), t-test, F-test, correlation coefficient, and multiple regression analysis through SPSS V11.0 (Statistical Package for the Social Sciences).

Results of the study

The results of the study were:

Phase I: General status of respondents

Most repondents were electrical power instructors. They were males (205 persons or 83%), aged 26-30 (46 persons or 18.61 %), teaching experiences less than 5 years (59 persons or 23.77 %), having experience as a project adviser less than 5 years (150 persons or 60.73%), graduated with bachelor degree (156 persons or 63.16%), working at technical colleges (235 persons or 95.14%).

Phase II: Analysis of each variable affecting Project-Based Learning (PBL) by using mean and standard deviation

The mean of 91 variables were between 5.955-4.329 and standard deviation was between 0.962-1.873. This indicates that these factors were average to greater levels and there was a dispersion of data at the greater level. The highest mean were Giving Suggestion and Guidance (Teacher), Endeavor to Finish Project (Learner), Giving Comfort and/or Helping Learner to Learn Easily (Teacher), Eagerness to Learn and to Know (Learner), and Stimulating Ideas to Learner (Teacher). On the other hand the lowest mean were Gender (Learner), Ability to Absorb and Reach Music Appreciation (Learner), Controlling and Expressing through Organs of Every Part of Body such as Hands and Feet (Learner), Knowing, Perceiving, along with Distinguishing the Differences Among Emotion, and Impulse as well as Feeling (Learner), and Complex Idea Skill (Learner).

Phase III: Correlation Coefficient among factors affecting Project-Based Learning (PBL)

Correlation Coefficient among factors affecting Project-Based Learning (PBL) of students as perceived by electrical power instructors was shown in Table 1.

Table 1: *Correlation Coefficient among factors affecting Project-Based Learning (PBL)*

Factors	Correlation Coefficient
1. Sharing Ideas (X_1)	0.582
2. Multiple Intelligence (X_2)	0.479
3. Interesting/Attention (X_3)	0.799
4. Scientific Process (X_4)	0.525
5. Facilitating (X_5)	0.547
6. Constructionism (X_6)	0.540
7. Thinking (X_7)	0.576
8. Goal Setting (X_8)	0.453
9. Planning (X_9)	0.722

From Table 1 the highest (0.799) to the lowest (0.453) factors were Interesting/Attention (X_3), Planning (X_9), Sharing Ideas (X_1), Thinking (X_7), Facilitating (X_5), Constructionism (X_6), Scientific Process (X_4), Multiple Intelligence (X_2), and Goal Setting (X_8)

Phase IV: Constructing multiple regression equation or predicting equation of variables affecting Project-Based Learning (PBL)

The 3 independent or predicting variables with the significance of 0.01 were: Scientific Process (X_4), Interesting/Attention (X_3), and Multiple Intelligence (X_2). Thus, the regression equation or the prediction equation on Project-Based Learning in type of raw score was:

$$Y = 0.474+0.336\ X_4+0.325\ X_3+0.254\ X_2$$

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These equations had the power of prediction 95% and error of prediction was 20.11%.

Conclusion and Discussion

The results of the study would like to discuss and conclude as follows:

1) Generally speaking, scientific process was the first step of Project-Based Learning because it is a body of techniques for investigating phenomena and acquiring new knowledge, as well as for correcting and integrating previous knowledge. It is based on observable, empirical and measurable evidence, and subject to laws of reasoning. (Wikipedia, 2006). This scientific process was relevant to Ron Brown (Song for Teaching the Scientific Process, 2006) who suggested 7 steps to help us think things through as in: 1) Observation, 2) Communication, 3) Comparing and Classifying, 4) Making a graph, a chart or categorize, 5) Predicting, 6) Making a good guess, and 7) Thinking alive. Thus, learners could use scientific process as a tool to search for knowledge and/or solutions systematically, correctly, and properly. To become this, learners must practice those above-mentioned skills and have a positive attitude towards sciences as well.

2) Besides scientific process, learners must pay attention to the project because it is associated with the learners' ability to concentrate on the task in hand

(Romiszowski, 1984). The results of effort would make learners aware of problems and finish the project. Besides, paying attention refers to the brain's ability to take all of the stimuli around us, immediately categorize and organize information as relevant or irrelevant, and focus the mind on one thing (WBGH, 2002). On the other hand, if one lacks of attention, one might become easily distracted by irrelevant sights and sounds, make careless mistakes, rarely follow instructions carefully and completely, and lose or forget things needed for a task (WBGH, 2002).

3) The findings were that Multiple Intelligences (M.I.) is a variable affecting Project-Based Learning (PBL) because to do a project, a learner must get involved with project creation. He/she must use "Visual/Spatial Intelligence" in order to think in images and pictures as well as to visualize accurately and abstractly so that he/she is able to determine and clarify the goals. Then, his or her academic success and confidence increases. "Logical/Mathematical Intelligence" will help understand a causal system or to manipulate numbers, quantities, and operations. Next, a learner will use his/her whole body or parts of it (hands, fingers, arms) to solve a problem, make something, or put on some kinds of production. This will be called "Bodily-Kinesthetic Intelligence". However, at this point of work a learner will have to use "Interpersonal Intelligence, and Intrapersonal Intelligence in order to complete activities as specified while "Verbal/Linguistic" or the capacity to use language to express what's on his/her mind and to understand other people, and Musical Intelligence will help improve their presentations. Thus, to improve learners' competence in developing projects through Multiple Intelligences (M.I.) (Gardner, 2000), his/her classroom should be equipped with these following tools as shown in Table 2.

Table 2: *How to Improve Learners' Competence through Multiple Intelligences (M.I.)*

Multiple Intelligences (M.I.)	Tools to Improve Learners
• Verbal-Linguistic Intelligence • Mathematical-Logical Intelligence • Visual-Spatial Intelligence • Music Intelligence	Learning Centers
• Bodily-Kinesthetic Intelligence • Naturalist Intelligence • Existential Intelligence	Simulations
• Interpersonal Intelligence • Intrapersonal Intelligence	Presentations

From Table 2 there are different types of "Learning Centers" such as 1) Reading/ Writing Center, 2) Illustration/Visual Expression Center, 3) Science/Experiment Center 4) Music Center, 5) Math Center, 6) Build-It, Paint It Center, and 7) Performance Center while "Simulations" can include these following tools: 1) Role-Playing, 2) Debating, and 3) Simulation Software such as SimCity, GenScope, and Virtual Walk Through. Then, for "Presentations", learners can write, make/invent/design/draw, figure out/analyze, and perform/present.

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