

The Relationship Between Academic Self-Efficacy and Learning Performance in Problem-Based Learning Environment

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Abstract: This research aims to investigate the relationship between Academic Self-Efficacy (ASE) of university students in PBL Environment and their Learning performance. Learning performance comprises of learning satisfaction, learning attitude and learning score. The data was collected from 78 students of both genders, with average age of 18 years old and from various countries, selected from the second year of their undergraduate study participated in this research. The learning performance of participated students was captured at the end of PBL activities. A questionnaire adapted from Klobas was used to measure the academic self-efficacy ($\alpha=.71$). The data was analyzed using Bivariate Pearson's correlation coefficients in SPSS to determine the degree of correlation or association between Academic Self-efficacy and learning performance. The analysis of the data indicated that a significant relationship exists between Academic self-efficacy and Learning Performance ($r=0.32$, at 0.01 level)

Key words: Academic self-efficacy • Learning performance • Problem-based learning • Outcome-based education

INTRODUCTION

A paradigm shift from traditional lecture system to outcome-based education (OBE) have been occurred in the past decades, whereby student centered approach such as problem-based learning (PBL) is being adopted to measure the learning outcome and students' performance. In the OBE system, students' learning will be measured in terms of what they are capable of doing at the end of learning, not what has been taught. Thus, problem based learning (PBL) is being increasingly adopted in higher education as one of the teaching and learning strategy in OBE.

PBL environment is defined as a constructivist learning environment designed in such a way as to stimulate a situation for the students to gain or acquire content knowledge of the subject area through the philosophy of "learning how to learn the material" for its students [1]. In this environment, learning is triggered by a carefully selected and well-designed problem that demand from the learner in acquisition of critical knowledge, problem-solving proficiency, self-directed learning strategies and team participation skills. It has become an important notion that learning how to learn is

the key to PBL in higher education as it transforms university students to become independent and lifelong learners.

The academic achievement of the students in PBL environment is measured through the learning performance at the end of their PBL activities. It is expressed as a function of the sum of learning satisfaction, learning attitude (subjective measure) and learning score (objective measure) throughout the learning process in the PBL environment.

Academic self-efficacy refers to students' beliefs in their capabilities to learn, to accomplish a task, or to succeed in an activity. It is the "self-evaluation of one's ability and/or chances for success in the academic environment" [2]. It is worthwhile to investigate the relationship between the learning performance and academic self-efficacy in the PBL environment.

Academic self-efficacy is the "self-evaluation of one's ability and chances for success in the academic environment" [2]. In his study of academic self-efficacy of college students, [2] found that academic self-efficacy had the highest correlation ($r=.496$) as a predictor of GPA, which is a common measure for academic success. Parajes [3] found academic self-efficacy to be a strong predictor

of academic performance in college students with positive correlations ranging from $r = .49$ to $r = .71$. Chemers, Hu and Garcia [4] also found academic self-efficacy to be a significant predictor of academic performance and expectations. As students' academic expectations and self-efficacy increased, they were more likely to "show higher performance" [4]. These results remained true after researchers controlled for possible effects of high previous high school GPA [4]. In fact, many research show that self-efficacy influences motivation, learning and academic achievement [5]. Papinczak [6] reported that students with greater self-efficacy scored their PBL performance more highly. She also found that self-efficacy was correlated with self-assessment. The confidence in students' ability to do well would be expected to assign higher marks for themselves on PBL performance.

Purpose: Although there exists a large body of literature related to relationship between academic self-efficacy and academic performance in traditional teaching approach, those mentioning the relationship between academic self-efficacy and learning performance in PBL are few in number. Given the evidence that academic self-efficacy is closely linked to academic achievement, it is crucial to explore the relationship of academic self-efficacy and learning performance of students in PBL environment. The adage that "success breeds success" may prove to be particularly applicable because students who enjoy initial academic success in PBL environment gather momentum on its own and may become more confident in their abilities. This will directly and strongly bound to affect the success of their performance and therefore be more likely to produce further academic and occupational successes.

Research Hypotheses: This study consists of one null hypothesis with three subsidiary null hypotheses, as shown:

H01: There is no statistically significant positive correlation exists between academic self-efficacy and learning performance in PBL environment.

H01a: There is no statistically significant positive correlation exists between academic self-efficacy and learning satisfaction in PBL environment.

H01b: There is no statistically significant positive correlation exists between academic self-efficacy and learning attitude in PBL environment.

H01c: There is no statistically significant positive correlation exists between academic self-efficacy and learning score in PBL environment.

MATERIALS AND METHODS

Sample: The population of interest in the current research was the students at the university level with familiarity in Physics. Purposive sampling (total population sampling) was adopted in this study as the participants have the particular set of characteristics and the research hypotheses highlight the relationship between variables obtained from the participants. The study employed a purposive sample comprised of subjects from an undergraduate Physics course in the American Degree Transfer Program at Taylor's University Malaysia in Fall 2015 Semester. The course had a total enrollment of 78 students. The list of students registered for the physics course will be obtained from the students roll in the registrar office of Taylor's University. All 78 students participated in the study. Bivariate Pearson's correlation coefficients tests in SPSS were run to determine the degree of correlation or association among the variables. These variables include the participants' scores of academic self-efficacy, learning satisfaction, learning scores, learning attitudes and learning performance for all the participants in the correlation matrix. The Pearson's correlation tests will provide statistical analysis to confirm or reject the hypotheses.

Variables: The variables involved in this studies includes Academic self-efficacy and learning performance.

Academic Self-Efficacy: Self-efficacy is defined as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances [7]. Academic self-efficacy is conceptually defined as students' level of confidence and self-judgment on their capabilities to learn, to accomplish a task, or to succeed in an activity with regards to their confidence to learn and accomplish the learning task. This will affect their thoughts, feelings, motivation and persistence in the PBL environment. Academic self-efficacy is operationalized as academic experience with regards to ability in handling academic assignments or activities on a self-report eleven-point Likert scale to measure the level, generality and strength of their confidence to learn and accomplish a learning task in the PBL environment.

Learning Performance Composes of Two Terms:

“Learning” is an active process of gaining information, understanding, or capabilities [8][9][10] whereas “performance” is the achievement of goals. In the context of this research, it comprises of three constructs, learning satisfaction and learning attitude are subjective measure and learning score is the objective measure. It is defined as the learning satisfaction with regards to the benefits of information seeking process through construction and make sense of the information gathered and knowledge acquisition and application of knowledge gained to perform the learning task. It is expressed as a function of these indicators, with weightage assigned to the respective indicators as shown in the figure 1.

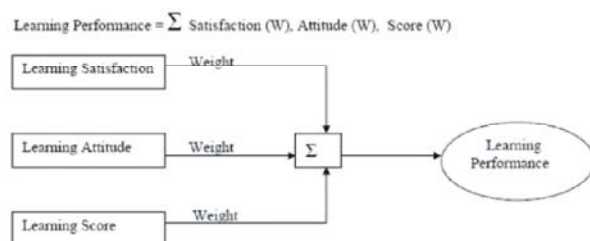


Fig. 1: Expression of Learning Performance

Learning performance is operationalized as student's motivation in knowledge acquisition with regards to knowledge retention and application of knowledge to solve problem that exhibit a positive attitude towards working out the solution in a team effort to achieve the goal.

Data Collection: At the end of PBL activities, students will complete the questionnaire of academic self-efficacy scale consisted of 27 items adapted from [11]. The Likert-response format designed to measure academic self-efficacy ranging from “0 indicates definitely not able to do this” to “10 indicates can definitely do this” for each item. They will also record their learning satisfaction which was measured using 10-items of self-report measure rated on a scale varying from 1 being “strongly disagree” to 5 being “strongly agree” on the learner's satisfaction questionnaire adapted from the usefulness instrument developed and tested by [12]. Learning attitude was measured using 8-items instrument to evaluate student's attitude by facilitator during the whole PBL activities inclusive the assessment for the report presentation of the learning task on a scale varying from 1 being “unsatisfactory” to 5 being “exceptionally satisfactory”. Learning score was the assessment on a test sheet

consists of 15 multiple-choice questions designed for the topics on course unit conducted in PBL, answered by the students after the PBL activities.

RESULTS

Scatter Plots: A scatter plot provide a clue to the relationship between the pairs of variables. Figure 2 to Figure 5 show the scatter plots of learning performance as well as its secondary constructs: learning satisfaction, learning attitude and learning scores against the academic self-efficacy. The scatter plots show that learning satisfaction, learning attitude, learning scores and learning performance are found to be positively correlated to academic self-efficacy. Correlation analysis will be carried out to statistically test on the hypotheses which hypothesize the correlation between learning performance and Academic self-efficacy.



Fig. 2: Scatter plot of learning Satisfaction and Academic Self-efficacy

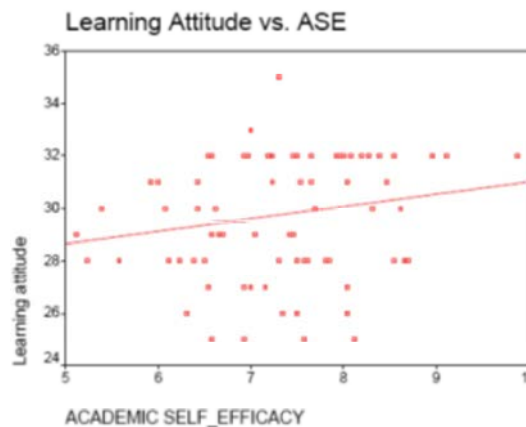


Fig. 3: Scatter plot of learning Attitude and Academic Self-efficacy



Fig. 4: Scatter plot of learning scores and Academic Self-efficacy



Fig. 5: Scatter plot of learning Performance and Academic Self-efficacy

Pearson's r: Bivariate Pearson's correlation coefficients tests in SPSS was run to determine the degree of correlation or association among the variables. Table 1 shows the result of the correlation between learning performance and academic self-efficacy.

Testing of Hypothesis H_{01}

H_{01} : There is no statistically significant positive correlation exists between academic self-efficacy and learning performance in PBL environment.

The Pearson product-moment correlation coefficient indicated that there was a statistically significant positive correlation between academic self-efficacy and learning performance of all students after a PBL session, ($r = 0.320$, $n = 78$, $p < .01$, one-tailed). Thus, the null hypothesis H_{01} was rejected. Overall, there is a statistically significant positive correlation between academic self-efficacy and learning performance. The statistical analysis revealed that higher academic self-efficacy corresponds to higher learning performance.

Testing of Hypothesis H_{01a}

H_{01a} : There is no statistically significant positive correlation exists between academic self-efficacy and learning satisfaction in PBL environment.

The Pearson product-moment correlation coefficient indicated that there was a statistically significant positive correlation exists between academic self-efficacy and learning satisfaction for all students after a PBL session., ($r = .257$, $n = 78$, $p < .05$, one-tailed).

Table 1: Correlation table for Learning performance and academic self-efficacy

		Learning Performance	LEARNING ATTITUDE	LEARNING SCORE	Learning Satisfaction (Posttest)	LEARNING SATISFACTION IMPROVEMENT	ACADEMIC SELF_EFFICACY
Learning Performance	Pearson Correlation	1.000	.691**	.697**	.526**	.394**	.320**
	Sig. (1-tailed)		.000	.000	.000	.007	.002
	N	78	78	78	78	39	78
LEARNING ATTITUDE	Pearson Correlation	.691**	1.000	.447**	-.002	.072	.190*
	Sig. (1-tailed)	.000		.000	.494	.333	.048
	N	78	78	78	78	39	78
LEARNING SCORE	Pearson Correlation	.697**	.447**	1.000	-.099	-.003	.155
	Sig. (1-tailed)	.000	.000		.194	.493	.087
	N	78	78	78	78	39	78
Learning Satisfaction (Posttest)	Pearson Correlation	.526**	-.002	-.099	1.000	.764**	.257*
	Sig. (1-tailed)	.000	.494	.194		.000	.012
	N	78	78	78	78	39	78
LEARNING SATISFACTION IMPROVEMENT	Pearson Correlation	.394**	.072	-.003	.764**	1.000	.301*
	Sig. (1-tailed)	.007	.333	.493	.000		.031
	N	39	39	39	39	39	39
ACADEMIC SELF_EFFICACY	Pearson Correlation	.320**	.190*	.155	.257*	.301*	1.000
	Sig. (1-tailed)	.002	.048	.087	.012	.031	
	N	78	78	78	78	39	78

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Thus, the null hypothesis H_{01a} was rejected. Overall, there is a moderate, statistically significant positive correlation between academic self-efficacy and learning satisfaction. The statistical analysis revealed that higher academic self-efficacy corresponds to higher learning satisfaction.

Testing of Hypothesis H_{01b}

H_{01b} : There is no statistically significant positive correlation exists between academic self-efficacy and learning attitude in PBL environment.

A Pearson product-moment correlation coefficient indicated that there was statistically significant positive correlation between academic self-efficacy and learning attitude of all the students after a PBL session., ($r = .190$, $n = 78$, $p < 0.05$, one-tailed). Thus, the null hypothesis H_{01b} was rejected. Overall, there is a low, statistically significant positive correlation between academic self-efficacy and learning attitude. The statistical analysis reveals that higher academic self-efficacy corresponds to higher learning attitude.

Testing of Hypothesis H_{01c}

H_{01c} : There is no statistically significant positive correlation exists between academic self-efficacy and learning score in PBL environment.

A Pearson product-moment correlation coefficient indicated that the analysis did not support the positive correlation between academic self-efficacy and learning score of all students after a PBL session at the alpha level of significance. Although the two variables were positively correlated, the coefficient of correlation was not statistically significant, ($r = .155$, $n = 78$, $p > 0.05$, one-tailed). Overall, there is no statistically significant positive correlation found between academic self-efficacy and learning score.

DISCUSSIONS

The positive correlation between academic self-efficacy and learning satisfaction, learning attitude as well as learning performance were anticipated as most of the previous research have indicated close link between attitudes and experience and the attainment of self-efficacy, as [7][13][14] articulated that efficacy perceptions develop from gradual attainment of skills and experience over time. However, the low effect size of positive correlation between academic self-efficacy and learning score illustrate that multiple choice questions

may not be the appropriate testing instrument used in PBL evaluation. The academic self-efficacy instrument deployed in this research was orientating in the PBL situation which emphasizes lifelong learning and not so much on traditional lecturing specific. Thus, the academic self-efficacy was significantly correlated to the learning satisfaction and learning attitude, but not significantly correlated to learning score. This is consistent with the research findings that self-efficacy is considered to be situation specific or domain sensitive [15]. According to Cassidy and Eachus [16], an individual may exhibit high levels of self-efficacy within one domain while exhibiting low levels within another domain. Obviously the students in this study exhibit high self-efficacy in PBL oriented evaluation such as learning satisfaction and learning attitude, but low level of self-efficacy in traditional lecture oriented evaluation such as test with multiple choice questions. In this aspect, structured short-answer questions which have the ability to measure problem-solving abilities as well as knowledge recall are more appropriate format for PBL evaluation.

CONCLUSIONS

Scatter plots and Pearson's Product Moment correlation coefficient provide both graphical representations of the relationship and strength of association between the two variables and their associated subsidiary constructs in this study. Scatter plots provide a visualized description of relationship between academic self-efficacy and learning satisfaction, learning attitude, learning score as well as learning performance. Academic self-efficacy was found to be positively correlated to learning satisfaction, learning attitude, learning score as well as learning performance, as shown in the scatter plots. The academic self-efficacy was found to have statistically significant positive correlation with learning performance, learning satisfaction and learning attitude of the students. However, the positive correlation between academic self-efficacy and learning scores was not statistically significant.

REFERENCES

1. Ang and Lim, 2007. Taylor's graduate capabilities: A conceptual framework. Paper presented at the 2nd Teaching and Learning Conference organised by Taylor's University College, Kuala Lumpur.

2. Robbins, S.B., K. Lauver, H. Le and A. Carlstrom, 2004. Do Psychosocial and Study Skill Factors Predict College Outcomes? A meta-analysis. *Psychological Bulletin*, 130(2): 261-288.
3. Pajares. F. and J. Kranzler, 1995. Self-efficacy beliefs and general mental ability in mathematical problem solving. *Contemporary Educational Psychology*, 20(4): 426-443.
4. Chemers, M.M., B.F. Garcia and L.T. Hu, 2001. Academic self-efficacy and first-year college student performance and adjustment. *Journal of Educational Psychology*, 93(1): 55-64.
5. Mahyuddin, R. *et al*, 2006. The relationship between students' self-efficacy and their English language achievement. *Jurnal Pendidik dan Pendidikan*, 21: 61-71.
6. Papinczak, T.A., 2007. A study of participative assessment and reflection on learning among first year medical students. Unpublished doctoral dissertation, University of Queensland, Australia.
7. Bandura, A., 1997. *Self-efficacy: The exercise of control*. New York: Freeman.
8. Edmondson, A., 1999. Psychological safety and learning behaviour in work teams. *Administrative Science Quarterly*, 44: 350-383.
9. Garvin, D.A., 2000. *Learning in action: A guide to putting the learning organization to work*. Boston: Harvard Business School.
10. Senge, P., 1990. *The fifth discipline*. New York: Doubleday.
11. Klobas, J.E., S. Renzi and M.L. Nigrelli, 2007. A scale for the measurement of self-efficacy for learning (SEL) at university. Dondena Working Papers No 2. Carlo F. Dondena Centre for Research on Social Dynamics Università Bocconi, Milan, Italy. Retrieved from http://www.dondena.unibocconi.it/wps/wcm/connect/Centro_Dondena/Home/Working+Papers/Working_Paper_2_CdR_Dondena
12. Davis, F.D., 1989. Perceived usefulness, perceived ease of use and user acceptance of information technology, *MIS Quarterly*, 13(3): 319-340.
13. Bandura, A., 1977. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2): 191-215.
14. Bandura, A., 2001a. Social cognitive theory: An argentic perspective. *Annual Review of Psychology*, 52(1): 1-26.
15. Kurbanoglu, S. Serap, 2003. Self-efficacy: a concept closely linked to information literacy and lifelong learning. *Journal of Documentation*, 59(6): 635-646
16. Cassidy, S. and P. Eachus, 1998. Developing the computer self-efficacy (CSE) scale; investigating the realtinship between CSE, gender and experience with computers”, *Computer Self-Efficacy Web Site*, available at: www.chssc.salford.ac.uk/healthSci/selfeff/selfeff.htm (accessed May, 5, 2016)