

The Effects of Learning Styles and other Psychological Variables on Predicting to Students' Academic Achievement Based on Learning Evaluation Method in Adolescent Problem and Guidance Class

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Abstract

The purpose of this study were to examine psychological variables, covering majors, gender, learning styles, GPAX, attitude to subject, academic self – efficacy and procrastination that predicted academic achievement, including studying interaction among majors, gender and learning styles affected to academic achievement and used GPAX as a controlled variable in evaluation by testing and by case study. Data were collected from 77 bachelor degree students in two classes. The instruments combined all of 80 items Honey & Mumford learning styles, attitude to subject, academic procrastination, academic self – efficacy, academic achievement testing and adolescent problem case study. Data analyses used stepwise regression and MANCOVA. The results found that (1) in evaluation by testing, there were three variables of majors, academic self – efficacy and GPAX of 2.00 – 2.50 that predicted academic achievement by 41.1% (2) in evaluation by case study, there were only learning styles as reflector and theorist that predicted academic achievement by 17.6%. In addition to test interaction among majors, gender and learning styles when controlling GPAX, there were interaction between majors and gender when evaluated by testing ($p < 0.01$) and there were interaction between majors

and learning styles when evaluated by case study ($p < 0.01$). Furthermore GPAX did not affect to academic achievement. The applications of all results were discussed.

Keywords: Academic Achievement; Learning Styles; Psychological Variables

Introduction

Academic achievement is the most desirable of all instructors. Knowing the learners have increased in their knowledge whether or not, the instructors have used various ways to evaluate their students' knowledge and have tried to develop students by many methods including studying to find out which variables that have affected to students learning in order to improve relevant factors which have been the most effectiveness.

Nowadays, learning and teaching are realized to the differences of students, but in the past educators tried to study outside relevant variables, for example, environment factors, how these variables correlated to the students in terms of achievement. By this way, to change and to control these variables were not still only limited to environment factors but it has been expanded to emphasize the importance of students by finding out teaching methods that have correlated and have suited to individual learners. Due to individual differences, each student has preferred different in learning methods and own styles towards learning which is called student learning styles. According to many researchers, it was summarized that learning style be attributes or method that individual students preferred in extracting and processing data. It combines of cognitive, affective and psychomotor behavioral dimensions which indicate how a student perceives, learns and interacts with learning environment. (Kolb, 1984; Keefe, 1990; Dunn and Dunn, 1993; Felder, 1996; Veznedaroglu & Ozgur, 2005 cited in Sen and Yilmaz, 2012: 1482 – 1483). Although teachers must know learning styles of the students that is essential issue to prepare learning activities, they must choose teaching methods according to individual learners too.

Through literature reviews, it was shown that there were different factors in each subject which influenced to learning, these factors such as background of students for example fields of study. Past research demonstrated that learners who studied in different fields of study had different learning styles accorded to different personal academic competence. (Emamepur and Shams, 2004; Rahmanpur, Palezeyan and Zamane, 2008; Rahmani, 2012) GPAX and current grade were mostly able to predict academic achievement as the best variable. Furthermore,

high school GPA was considered the most important factor in predicting academic ability. (Diseth, 2011; Koning, et al., 2012) Also, cognitive variables for example, academic self – efficacy, was found the role of predicting academic achievement both directly and indirectly. (Zuffiano, et al., 2013; Carroll, et al., 2009) Some research was found the role of academic self – efficacy as either a mediator or a moderator at the same time in regard to academic performance. (Zhu, et al., 2011: 2476) According to Zare, Rastegar and Hosseini (2011: 1166) academic self – efficacy appeared to be an important role because it affected academic performance through students' motivation and learning. (Dinther, Dochy and Segers, 2011: 95) Other variables such as attitude to subject, academic procrastination etc., as mention earlier are interesting because adolescent problem and guidance subject is not a core major field of study both computer and technology students. In the real situation, students who are not in core field of study, are less interesting in this subject than students who are in core field of study. Because of the essence of subject to teaching professional career, the instructors must use the advantage of skill in this subject for counseling to adolescent learners, so both fields of students must register and learn this subject. Moreover, previous researches were demonstrated that positive attitude toward subjects was one of other variables that obviously affected to higher achievement in students. (Yaratan and Kasapoglu, 2012) and some previous research result was found the strong correlations among attitude, learning and academic achievement. (Bahar, 2010) Another variable, procrastination, was one of previous variables that found the negative association toward academic achievement. Through literature review, the meaning of procrastination was these performance, for example ignore academic responsibility, lack of interest in the classroom and interest in other activities, absent from class and replace by other activities, etc. The result from previous studies were found procrastination affected and correlated to academic performance in learning. (Hussain and Sultan, 2010; Rotenstein, Davis and Tatum, 2009) According to Vahedi (2011) also found that academic procrastination could have predicted anxiety that affected to students' learning in negative side.

However, literature reviews had been evidently confirmed, majority of researches had studied with subjects that students generally had low achievement or as the subjects in science content or quantitative content which was difficult to understand in learning such as math (Ganley and Vasilyeva, 2011; Kazemi, 2012; Vandecandelaere, et al., 2012; Falch and Naper, 2013) statistics (Monde'jar – Jime'nez and Vargas – Vargas, 2010; Zare, Rastegar and Hosseini, 2011) science and technology (Akpinar, et al., 2009) physics (Erkol, Kisoglu and Buyukkasap, 2010) chemistry (Kaya and Geban, 2011; Tarhan and Sesen, 2010; Onen and Ulusoy, 2012) Biology (Veselinovska, Gudeva, and Djokic, 2011) and English (Yilmaz, 2010; Rostami, Hejazi and Lavasani, 2011; Shaw, 2012), while social science subjects Ex. Adolescent problem and Guidance was as a part of teachers' professional career, but it lacked evidently which variables were able to predict academic achievement and how many variables were able to predict it. If instructors study variables in variety not only learning style but also other variables, it will help instructors to use instructional methods and design academic activities support to students' characteristics and tries to limit variables that drawback to students. As a result, students will be advantaged toward to the highest academic achievement. In conclusion, there were two purposes in this study as follows:

1. To predict academic achievement from majors, gender, GPAX, learning styles, attitude to subject, academic self – efficacy and procrastination in the condition of evaluation by testing and case study.
2. To study interaction among majors, gender and learning styles that affected to academic achievement in the condition of evaluation by testing and case study, including controlling the influence of GPAX.

Research hypotheses

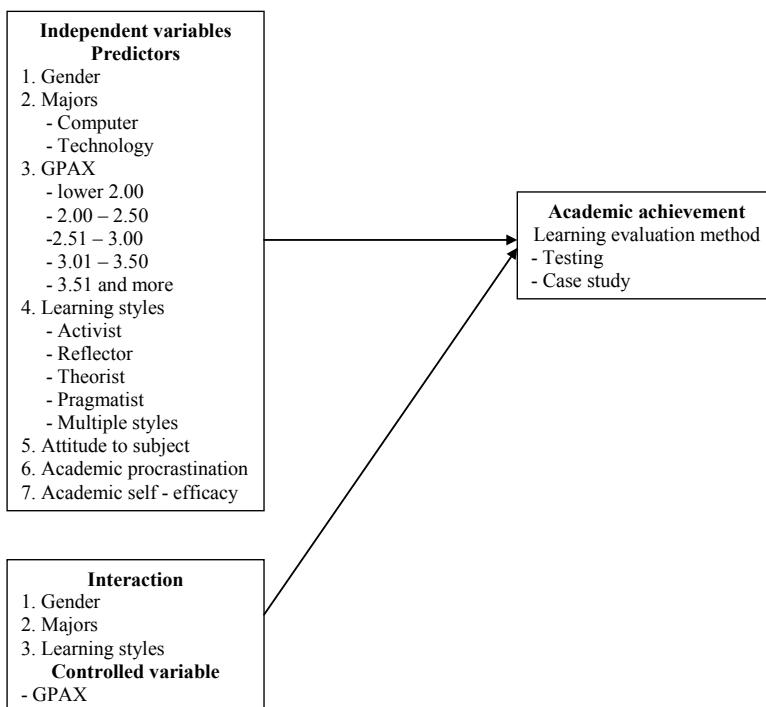
1. Majors, gender, GPAX, learning styles, attitude to subject, academic self – efficacy and procrastination were able to predict to academic achievement in the condition of evaluation by testing.
2. Majors, gender, GPAX, learning styles, attitude to subject, academic self – efficacy and procrastination were able to predict to

academic achievement in the condition of evaluation by case study.

3. There were interaction among majors, gender and learning styles that affected to academic achievement in the condition of evaluation by testing when GPAX was a controlled variable.

4. There were interaction among majors, gender and learning styles that affected to academic achievement in the condition of evaluation by case study when GPAX was a controlled variable.

Conceptual framework



Population and Sample

The population of this study were four classes of 147 bachelor degree students who registered to adolescent problem and guidance subject on second term of year 2012, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi.

The sample were selected from two classes of totally 77 bachelor

degree students second year of Technology and Educational Communication and fourth year of Computer Education Majors by purposive selection, because four classes of this subject were taught by two instructors and the researcher wanted to study from the classrooms that were taught by the same person. The differences of instructors were able to differ in learning activities.

The scope of study

The research especially studied the students who registered to the class of adolescent problem and guidance, 2nd term of year 2012.

Methods

This study was survey research under two core evaluation methods (1) evaluation by testing and (2) evaluation by case study. Data collection used questionnaires, separated by each variable, while GPAX of each student was collected from university's database. Whereas the instructor evaluated by testing, the instructor used testing scores from both midterm and final scores. Also, on the questionnaires, the instructor had given students to fill their name on the questionnaires in order to check the scores and match them with each of student learning styles, separated into 5 categories (theorist, activist, reflector, pragmatist and multiple styles of learning). Giving the students to fill their name aimed to set groups of students for different styles of learning and using these different groups for case study in the following part, then student groups must have discussed by using brainstorming and presented their groups' answers in front of the classroom. After the instructor received scores from all questionnaires, these scores were analyzed and categorized through research hypotheses.

Research Instrument

The instruments comprised of questions about personally fundamental background as majors, gender, GPAX and other instruments.

1. Learning styles questionnaire. The 80 items of Honey & Mumford (2006) was used. The questions had combined 4 types of learning

styles: activist, reflector, theorist and pragmatist. In this study, multiple styles of learning was added. The students who had multiple styles of learning were used for the meaning of students who received equally learning styles scores of 2 types and more than 2 types. The students had received 1 or 0 of score for each item. The calculator of reliability with KR – 20 was 0.75. The correlation between each item and total scores of whole items using Pearson Product Moment correlation coefficient was 0.74 - 0.77.

2. Attitude to adolescent problem and guidance subject. This instrument was developed from 20 items of attitude about teaching of Bayot, et al. (2005 cited in Monde'jar – Jime'nez and Vargas – Vargas, 2010: 693) It had been separated into 2 components (1) affection (subject interesting level, anxiety level, and stress) (2) evaluation (student perception to available in currently and to career in the future). It was 5 rating scale level. The reliability with Cronbach's alpha was 0.81 and 0.78 - 0.82 for correlation between each item and total scores of whole items.

3. Academic procrastination. The instrument used questionnaire from Cakici (2003 cited in Babadogan, 2010: 3268) 19 items with 5 levels rating scale. The Cronbach's alpha reliability was 0.87.

4. Academic self – efficacy was developed from Yilmaz, Gurcay and Ekici (2007) items of Turkish of the academic self – efficacy scale. It had combined of 7 items with 5 levels of rating scale and reliability with Cronbach's alpha was 0.66.

The IOC calculation of all questionnaires in this study was 0.67 – 1.00.

5. Academic achievement testing in adolescent problem and guidance subject. The content of testing came from subject content. It was used for midterm and final testing. The characteristics of this test were multiple choices testing that the students had received 1 score or 0 score when answer was right or wrong. The midterm covered 3 units as the introduction to adolescence, adolescent problem and the cause of problem and helping, enhancing and developing adolescence. The final also covered 3 units as the introduction to guidance, guidance and adolescent problem

solving and the role of teacher in helping adolescence. The p value was 0.2 – 0.8 for both midterm and final. The r value was 0.2 – 0.67 for midterm and 0.2 – 0.76 for final. Using KR – 20 calculated reliability with value of 0.64 for midterm and 0.65 for final.

6. Academic achievement testing by case study. The instructor gave case study about adolescent problem as group work. After students had read case study, students in group wrote 3 answers. The total score was 10 scores. The students in group activities analyzed situation about adolescent problem and used brainstorming to discuss and answer the questions, then students took answers to present in front of the classroom. The group work was formed by grouping members who had learning styles as the same style. If students who equally received scores of learning styles as 2 or more than 2 learning styles, these types of students had to be grouped into multiple styles of learning. When learning styles in any groups had many students, the instructor had separated them into many groups as follows:

Classroom 1 : Computer education composed of 7 groups (1) activist 1 group (3 persons) (2) reflector 3 groups (5, 5 and 4 persons) (3) theorist 1 group (4 persons) (4) pragmatist 1 group (4 persons) and (5) multiple styles of learning 1 group (5 persons)

Classroom 2: Technology and educational communication composed of 10 groups (1) activist 1 group (5 persons) (2) reflector 4 groups (5, 5, 5 and 4 persons) (3) theorist 1 group (4 persons) (4) pragmatist 2 groups (4, 4 persons) (5) multiple styles of learning 2 groups (6 and 5 persons)

Data collection

1. The questionnaires as research instruments (1. – 4.) were taken to collect data from sample 77 persons on December, 24, 2012 – February, 27, 2013. It was essential to give the students wrote their name to be matched to learning styles in order to arrange group activities by using case study in section 2 of this study. The other academic achievement testing as in adolescent problem and guidance subject (the fifth of research

instruments) was used to midterm and final while academic achievement testing by case study was used to arrange classroom activities before final. The instructor investigated the knowledge and skills of students how these groups applied knowledge and skills which were adapted to situation in case study.

2. Checking scores from all questionnaires.
3. Analyzing data for all hypotheses.

Results

1. The result of analysis multiple regression coefficient, factors affected to academic achievement in adolescent problem and guidance when factors were evaluated by testing condition, using stepwise analysis. These results were shown on table 1 and table 2 as follows:

Table 1: Analyses of multiple regression, multiple correlation coefficient (R), R^2 and statistical significance testing.

Predictive variables	R	R^2	SEE	F
-major	.561	.314	3.6850	34.371**
-major, academic self – efficacy	.612	.375	3.5422	22.182**
-major, academic self – efficacy, GPAX of 2.00 – 2.50	.641	.411	3.4630	16.947**

Table 2: Predictor coefficient (b , β), standardized error of predictor coefficient (SE_b), constant of prediction, and statistical significance testing.

Predictors	Unstandardized coefficients		Standardized coefficients	
	β	SE_b	Beta	t
(Constant)	18.742	2.672		7.015**
Major	4.588	.821	.509	5.587**
Academic self – efficacy	.356	.108	.318	3.290**
GPAX of 2.00 – 2.50	-1.800	.856	-.201	-2.103*

** Significance at .01

* Significance at .05

As table 1 Evaluated by testing, there were 3 variables (majors, academic self – efficacy and GPAX of 2.00 – 2.50) that powered to predict together to academic achievement. These 3 variables correlated .641 to academic achievement and were able to explain variance in dependent variable 41.1% with statistical significance at .01 level.

2. The result of analysis multiple regression coefficient, factors affected to academic achievement in adolescent problem and guidance when instructor evaluated by case study, using stepwise analysis. These results were shown on table 3 and table 4 as follows:

Table 3: Analyses of multiple regression, multiple correlation coefficient (R), R^2 and statistical significance testing.

Predictive variables	R	R^2	SEE	F
-Reflector	.278	.077	.6376	6.263*
-Reflector, Theorist	.420	.176	.6063	7.929**

Table 4: Predictor coefficient (b , β), Standardized error of predictor coefficient (SE_b), Constant of prediction, and statistical significance testing.

Predictors	Unstandardized coefficients		Standardized coefficients	
	β	SE_b	Beta	t
(Constant)	9.208	.101		91.126**
Reflector	-.496	.146	-.375	-3.396**
Theorist	-.708	.237	-.330	-2.989**

** Significance at .01

* Significance at .05

As table 3 There were 2 types of learning styles (reflector and theorist) that powered to predict together to academic achievement when the instructor evaluated by case study. These 2 types of learning styles correlated .420 to academic achievement and were able to explain variance in dependent variable 17.6% with statistical significance at .01 level.

3. The result of interaction among majors, learning styles and

gender affected to academic achievement (both by testing and case study). These results were demonstrated as table 5, 6, figure 1 and table 7, respectively.

Table 5: Mean and standard deviation of academic achievement in adolescent problem and guidance when the instructor evaluated by testing and by case study, separated by major, learning styles and gender.

Dependent Variable	N	Total scores	Major		Computer		S.D.	
			Technology		\bar{X}	S.D.		
1.by testing	77	50	26.737	.683	31.266	.839		
2.by case study	77	10	9.141	.097	8.770	.119		
Academic achievement	N	Total scores	Learning styles					
			activist		Reflector		Theorist	
			\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.
1.by testing	77	50	28.113	1.410	28.271	.756	29.436	1.373
2.by case study	77	10	9.336	.200	8.608	.107	8.495	.195
Academic achievement	N	Total scores	Gender				Multiple styles	
			Male		Female			
			\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.
1.by testing	77	50	28.016	.907	29.662	.522		
2.by case study	77	10	8.924	.129	9.003	.074		

Table 6: Multivariate analyses of covariance (MANCOVA) of academic achievement when the instructor evaluated by testing and by case study, separated by each variable and interaction among variables.

Source	Dependent variable	SS	df	MS	F	P
Corrected model	Testing	841.589	19	44.294	3.923	.000**
	Case study	20.026	19	1.054	4.619	.000**
Intercept	Testing	723.037	1	723.037	64.037	.000**
	Case study	58.098	1	58.098	254.603	.000**
GPAX	Testing	1.767	1	1.767	.157	.694
	Case study	.121	1	.121	.531	.469
1.Major	Testing	132.484	1	132.484	11.734	.001**
	Case study	1.017	1	1.017	4.455	.039*
2.Learning styles	Testing	16.276	4	4.069	.360	.836
	Case study	7.182	4	1.796	7.869	.000**
3.Gender	Testing	24.453	1	24.453	2.166	.147
	Case study	.076	1	.076	.331	.567
1 * 2	Testing	93.612	4	23.403	2.073	.096
	Case study	9.489	4	2.372	10.395	.000**
1 * 3	Testing	164.521	1	164.521	14.571	.000**
	Case study	.096	1	.096	.421	.519
2 * 3	Testing	42.956	4	10.739	.951	.441
	Case study	.291	4	.073	.319	.864
1 * 2 * 3	Testing	8.545	3	2.848	.252	.859
	Case study	.489	3	.163	.714	.548
Error	Testing	643.586	57	11.291		
	Case study	13.007	57	.228		
Total	Testing	65952.500	77			
	Case study	6162.500	77			
Corrected total	Testing	1485.175	76			
	Case study	33.032	76			

Testing: R Squared = .567 (Adjusted R Squared = .422)

Case study : R Squared = .606 (Adjusted R Squared = .475)

** P < .01

* P < .05

From table 6, it was shown that GPAX do not influence to academic achievement. The release of GPAX influence did not reduce variance of academic achievement.

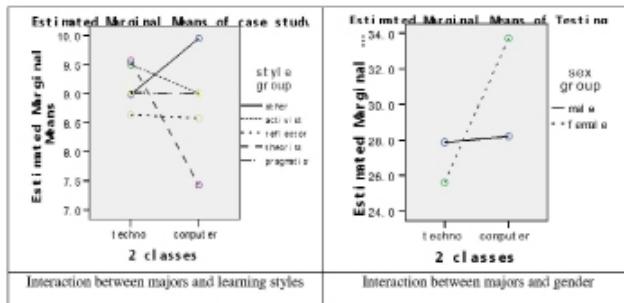


Figure1 Interaction in evaluation by case study and testing

Figure1: Interaction in evaluation by case study and testing

Because of evaluation by testing, it was not found statistical significance, so it was not demonstrated the comparison between variables. It was only demonstrated the details of evaluation by case study as table 7.

Table 7: The comparison of academic achievement when the instructor evaluated by case study between learning styles in each match.

Dependent Variable	Group	Group	Mean differences	Standardized error	P
Academic achievement					
Evaluation by case study	Multiple	Activist	.133	.244	.588
		Reflector	.861	.174	.000**
		Theorist	.974	.237	.000**
		Pragmatist	.458	.221	.043*
	Activist	Reflector	.728	.227	.002**
		Theorist	.841	.280	.004**

Table 7: (Continued)

Dependent Variable	Group	Group	Mean differences	Standardized error	P
Academic achievement					
Evaluation by case study		Pragmatist	.325	.262	.220
	Reflector	Theorist	.113	.223	.613
		Pragmatist	-.403	.201	.050
	Theorist	Pragmatist	-.516	.259	.051

The result of hypotheses testing about interaction among majors, learning styles and gender were found that no interaction among 3 variables that affected to academic achievement when the instructor evaluated both by testing and by case study. There were 2 interactions which one was interaction between majors and gender that were able to explain variance 56.7% ($R^2 = 0.567$) of academic achievement when the instructor evaluated by testing and another was interaction between majors and learning styles that were able to explain variance 60.6% ($R^2 = 0.606$) of academic achievement when the instructor evaluated by case study after releasing the influence of GPAX.

Discussion

From research results, it was able to conclude the research results that were separated by the objectives of research as follows.

1. The predictions of academic achievement through adolescent problem and guidance class were classified by gender, majors, GPAX, learning styles, attitude to subject, academic procrastination and academic self – efficacy into two evaluations (1) testing and (2) case study.

1.1 Evaluation by testing. From total variables, it was found that there were three variables; majors, academic self – efficacy, and GPAX of 2.00 – 2.50 that predicted or explained the variance of academic achievement by the percentage of 41.1 ($p < 0.01$) and it was able to explain

these results classified by this three variables as follows:

1. Majors. Majors were good predictors in predicting academic achievement as the first variable. This study demonstrated students with major of computer education had higher academic achievement than students with major of technology and educational communication because both fields had differences in knowledge and educational background. Computer students came from science – math secondary school background but technology students came from various background which covered both secondary school and vocational school. The result of this study confirmed to the study of Rahmani (2012: 1030 – 1034). Students who came from different majors should have differed in academic achievement. Furthermore, it still accorded to Bayrak (2012: 843 – 847) that differences in class level associated with differences in students' characteristics that affected to academic achievement.

2. Academic self – efficacy. This study showed the results as same as many researches from the past in the direction that self – efficacy correlated to academic achievement. (Zuffiano, et al., 2013; Diseth, 2011; Carroll, et al., 2009; Dinther, Dochy and Segers, 2011; Zhu, et al., 2011; Zare, Rastegar and Hosseini, 2011; Zimmerman and Kitsantas, 2005) All of these researches were found both direct and indirect influences through self – efficacy as mediator to academic achievement because academic self – efficacy reflected persons' trust in own abilities about learning achievement. The trust of person could connect to positive learning performance that covered academic interest, learning motivation, development in cognitive ability, including learning stress management, as a result, these variables affected to achievement in learning. (Bandura, 1997 cited in Zhu, et al., 2011: 2478) Self – efficacy was important variable because it influenced to learners' motivation and learning. (Dinther, Dochy and Segers, 2011: 95) On the other hand self – efficacy was a protector for negative behavior that obstructed to academic achievement that correlates to thwart in learning and affects to academic achievement in the future. (Carroll, et al., 2009: 797 – 798)

3. The GPAX of 2.00 – 2.50. This variable was able to predict

academic achievement. In this study, the result of study was found correlation GPAX only of 2.00 – 2.50 with academic achievement when the instructor evaluated by testing. Students who received GPAX of 2.00 – 2.50 had reduced academic achievement scores. Some researches were shown that there was correlation between academic achievement and GPAX through mediator as self – efficacy. (Diseth, 2011: 191) Moreover, some researches were still found that background of GPAX in high school correlated to academic achievement of bachelor degree and were able to predict academic achievement. (Koning, et al., 2012: 313) Akpinar, et al. (2009: 2804) found that there were significant differences among grade level through to students' attitude about science and technology in 4 components: enjoyment in science, enjoyment in science experience, science interest and anxiety to study science. Most of all studies were found grade was able to predict to academic achievement, except for this study, the result was found that only GPAX of 2.00 – 2.50 was able to predict academic achievement and negatively correlated to academic achievement when the instructor evaluated by testing.

1.2 Evaluation by case study. From total variables, it was found that there was only learning style as a good variable to predict academic achievement. Although there were five learning styles, it was found that only two types of learning styles as theorist and reflector that could predict together to explain the variance of academic achievement by the percentage of 17.6 ($p < 0.01$). The results were able to be explained as the following details:

- Learning styles. There were two types of learning styles as reflector and theorist that were able to predict to academic achievement. In this study, b value was negative. It reflected the more the students increased in this learning styles, the lower the academic achievement scores decreased. The phenomenon did not enhance to academic success because reflector style silently used inner thinking, observed data and information from other persons before conclusion. (Honey and Mumford, 1999 cited in Sample, n.d.) It was not suitable for brainstorming that had to cooperate together with group members while theorist style was a person who had

exactly structure, rule, and logic in thinking. Their thinking was narrow and strict to their own frame. It was not surprised why multiple style of learning receive the highest score in brainstorming activities because of its fulfillment about some limited characteristic of other learning styles. Otherwise different learning styles scores had different achievement because case study was more suitable to some of learning styles than other characteristics for example, the activist. This group style was suited to discussion or applied to causation in order to solve the problem in any situations which was important characteristic of learning by case study. It was important principle of brainstorming and was discussed the results as answer, consequently person in activist styles was the second who received scores lower than the multiple style of learning.

2. The study of interaction among majors, learning styles, and gender affected to academic achievement, separated into two evaluations (1) testing and (2) case study.

2.1 Evaluation by testing. There were interaction between majors and gender. Computer students had more differences on mean score of academic achievement between male and female but technology students had less differences on mean score of academic achievement between male and female. In comparing both majors, female students of both majors had more differences on mean score of academic achievement while male students of both majors had the same level on mean score. Wholly, computer students had higher academic success than technology students. Some of results associated with previous researches that found females had higher achievement in learning than males and had not favored dominance as equally as each dimension between male and female such as the results of researches from the past. (Jelas and Dahan, 2010: 720; Ingles, et al., 2011: 138; Ghazvini and Khajehpour, 2011: 1040; Ganley and Vasilyeva, 2011: 235)

2.2 Evaluation by case study. There were interaction between majors and learning styles. When the instructor compared between majors, computer students had higher different scores in achievement than technology students. It was still shown that computer students with multiple

styles of learning receive the highest score of all groups. The second mean score was activist and pragmatist. These two groups had the same level scores. The third group was reflector and the lowest score was group of students who had theorist learning style. In the opposite, technology groups of students, the groups of theorist and activist had received the highest score. Multiple styles and pragmatist were the second group and reflector was the group who received the lowest score in all groups. This might have been explained that each major had unique background in different fields of study, as a result, computer students had more scientific thinking style. The combination of many styles of learning was able to help fulfillment the recession of other styles, was able to have science and art in analyses and was able to solve the problem in a broader view while technology students had both science and art in thinking pattern, by this way, learning styles scores in each group was not differences from each other. Although theorist was the group who received the highest score, both majors still had some groups of styles such as pragmatist who received medium level of scores and reflector who received scores trend in the direction of lower. The cause of lower score trend of reflector came from preference in observation, kept data for analyses, used more time in learning and sat in back in learning and solving the problem. It might have said that the reflectors were able to learn well either by themselves or by observing and learn badly either in group or in the situation that did not enhance thinking for example traditional teaching (description).

However both computer and technology students had ratio of reflector in the most (42.9%). It was not able to accord to the classes of adolescent problem and guidance that used dominant teaching by description and case study. Both teaching did not enhance all groups of students especially the most group of students (reflector) but the instructor should have increased activities balanced both teaching by instructors and creating background understanding to the students. The students were able to use these backgrounds in analyses and syntheses. (Felder and Silverman, 1988: 680)

Although there were differences in the separation of learning

styles, because of the personality dimension, some part of learning styles were still overlapped between these two styles of learning (reflector and theorist). The trend showed that the reflector was able to use learning method as same as the theorist and also correlated to introvert personality. (Lawrence, 1982 cited in Felder and Silverman, 1988: 678) These results were also reflected in the trend of the theorists of computer group as well as the reflectors of technology group had the lowest score in academic achievement.

Suggestion

From this study, it was reflected when the instructors used traditional method as descriptive teaching, it did not suit for all styles of learning in learners or did not improve for all learning styles. In the opposite, teaching method using case study obviously affected to the results of all learning styles in different ways. Some style of learning was suited and increased to individual learning, whereas some style of learning was not suited with using case study and case study still added the following reduction in learning effectiveness. However, the results from this study reflected in the direction that the instructors had to integrate many teaching methods and variety in activities for increasing the learners' successes as these:

1. The suggestion from evaluation by testing.

1.1 Because of the differences in fields of study, the instructors may arrange and plan the ratio for various activities in different ways.

1.2 The instructors should increasingly reinforce individual students' self – efficacy through classroom activities, Ex. Teachers may reward with either the positive behavior or the successful product of students.

1.3 In this study, some rank of GPAX (2.00 – 2.50) associates to negative academic achievement. The instructors should enhance other additional components to these students who receive GPAX of 2.00 – 2.50 such as the contribution from the instructors in increasing students academic self – efficacy, the reduction of anxiety in learning

processes by using the appropriated activities for all these learners' learning styles.

2. The suggestion from evaluation by case study.

2.1 The instructors will arrange classroom activities that support equally by the ratio up to types of student learning styles, whether styles of learning are dominant or recessive by investigating individual learners styles before teaching.

2.2 In group activities, one group of learners should comprise of various learners' learning styles. The advantage of performance is to fulfill the recession of some learning styles and to exchange the knowledge and attitude among learners as a result to view a broader in the problem. Meanwhile some styles of learning cannot view further, combined group of some styles of learning helps to find out better answers and discussion than those who wholly compose only one style of learning.

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