

Selected Personal Factors as Determinants of Final Grades in Technical Drawing 2

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ABSTRACT

This study determined the interest of First Year Engineering students towards engineering program at Lyceum of the Philippines University (LPU) in Batangas City during SY 2011-2012 as the primary data in predicting the final grades of engineering students in Technical Drawing (TD) 2 together with the gender, type of high school attended and high school Grade-Point Average (GPA) as secondary data. Descriptive method of research was utilized in the study. Students with high category of GPA during high school have also higher interest towards the engineering program while students with high level of difficulty towards engineering have low interest towards the program. The obtained weighted mean of the students who wanted to be included in the Top Engineering Students or Dean's List best predicts the Final Grades in Technical Drawing 2. Female respondents have significantly higher intention to become dean's lists than male respondents. Engineering students from government high schools were more confident that they can handle the difficulties of engineering and they are more serious to obtain high grades than students from private high schools.

Keywords: Grade-Point Average, Technical Drawing, gender difference, Private High Schools.

INTRODUCTION

Several factors might have been affecting the performance of the students in certain aspects of their college life that need to be discovered in order to achieve greater success. It has been acknowledged that learners' attitudes toward engineering influence their pursuit of academic and career goals in engineering fields (Kim, Keller & Baylor, 2007). Interest in pursuing certain program in tertiary level is an important factor in considering the success of the students. It drives the motivation of the person to reach his dreams no matter how hard to travel the road towards certain direction that would bring not only his thoughts in the reality but also along with his presence. Keller (2004) stated that students are expected to be motivated when their curiosity is aroused, when they perceive the content to be relevant to their goals and interests, when they are confident that they can succeed, and when they experience feelings of satisfaction with their learning experiences and outcomes.

It is interesting to note that students' perception of how engineers contribute to society, confidence in their communication and computer skills, adequate study habits and affinity for teamwork are all statistically identical for engineering and non-engineering majors (Nocito-Gobel, Collura, Daniels & Orabi, 2003).

This study explored the interest of first year engineering students towards engineering program and how would it be related to their high school GPA and Final Grades in TD 2. Technical drawing, also known as drafting, is the act and discipline of composing plans that visually communicate how something functions or has to be constructed. Drafting is the visual language of industry and engineering (Goetsch, Chalk & Nelson, 2000). It is a means of clearly and concisely communicating all of the information necessary to transform an idea or a concept in to reality. Therefore, a technical drawing often contains more than just a graphic representation of its subject. It also contains dimensions, notes and specifications (Taffesse & Kassa, 2005).

Technical Drawing is one of the courses of engineering freshmen to acquire skills in drawing views of projections and analyze the complexity of isometric figures. This is one of the course requirements for engineering students to be able for them to draw illustrations of worded problems in mathematics and other related courses in engineering sciences. Therefore, exploring students' ability to perform technical drawing would be essential to their future engineering school projects.

Significant difference between the responses of male and female respondents was also considered in the study as well as the difference between private and public as type of high school attended by the respondents. Gender was considered as an important variable in the study to identify the difference in the level of interest of males and females in the engineering program and how would it helped to explain their performance in Technical Drawing. Reasons for the under-representation have been explored, and include differential socialization and aspirations along gender lines, which is related to differential attraction to engineering in general and more specifically to the various fields of engineering, as well as different educational and professional climates for the genders in these various disciplines (Hartman & Hartman, 2009).

As a service-oriented university, it is important to provide satisfaction to the customers especially in helping them accomplish the program to the university where they have started (Laguador, 2013). Therefore, it is the main intention of the study to identify the areas of interest of the students that might be the possible causes of their problems in facing some minor and major challenges in engineering. This study primarily aimed to analyze the freshman engineering students' interest towards the engineering program as determinant of their final grades in Technical Drawing 2.

Differences in the interest towards the engineering program were tested in terms of gender, type of high school attended and Grade Point Average categories. Test of relationships were also investigated between the interest of the engineering students towards the program and

the following variables: perceived level of difficulty of the engineering program, high school GPA, and final grade in Technical Drawing 2. The findings of the study would serve as a substantial insight in formulating student development activities that could enhance the interest of the students towards the engineering program.

METHOD

Descriptive type of quantitative research method was utilized in the study. Quantitative Research is characterized by the use of statistical analysis with the objectives of describing, comparing and attributing causality. Each of these objectives is done through the assignment of numerical values to variables and the mathematical analysis of those values (Zulueta & Costales, 2003).

Subject

Eighty one (81) freshmen students served as the respondents of the study who were enrolled in Technical Drawing 2 during the 2nd Semester of School Year 2011-2012.

Instrument

A researcher-made instrument was used to determine the interest of the engineering students towards engineering program while documentary analysis was used to obtain the final grades of the students in Technical Drawing 2. The survey instrument used to determine the level of interest of engineering students towards engineering program was tested the reliability using the test-retest method to the student – respondents not included in the study. The respondents were offered five-point Likert Scale answerable by Strongly Agree, Agree, Moderately Agree, Disagree, and Strongly Disagree.

The researcher administered the pilot testing personally to answer some questions of the students on terms and statements which they found confusing. Rephrasing and restating the questions were done in the instrument to make it more suitable to the level of respondents' understanding. After a week, the researcher asked the same group to answer again the same set of questions. The computed 0.85 Cronbach's alpha signified that the questionnaire was acceptable based on "rule of thumb" which lies within the range of "Good" (George and Mallery, 2003). The final grades of the engineering students in Technical Drawing 2 were obtained from the University Registrar's Office.

Procedure

The survey was administered personally by the researcher during the first week of classes while final grades of the students in Technical Drawing 2 were obtained at the end of 2nd Semester SY 2011-2012. All students were informed regarding the objectives of the study and the answers gathered from the survey were treated with strict confidentiality and were solely used in the purpose of the present research. They were also given five (5) minutes to answer the ten questions regarding their interest towards the engineering program as well as rating the degree of difficulty of engineering from 1 as very easy and 10 as very hard.

Data Analysis

The data were collected, classified, tabulated and coded for the analysis and interpretation. The following statistical tools were applied in the data obtained from the instrument used in the survey including the frequency count, percentage, weighted mean, Cronbach – alpha for testing the reliability of the instrument, Pearson –Product Moment correlation Coefficient was used to determine the relationship between the interest of the students and the personal variables identified in the study while Independent Sample T-test was used to determine the differences between gender, type of high school attended.

RESULTS AND DISCUSSION

Table 1 presents the profile of the respondents in terms of gender, type of high school attended and high school GPA.

Table 1: Profile of the Respondents

Personal Profile	F	%
Gender (N = 81)		
Male	58	72
Female	23	28
Type of High School Attended (N = 81)		
Private	44	54
Public	37	46
HS Grade Point Average (N = 71)		
Low	24	34
Average	25	35
High	22	31

Majority of the first year engineering students are male with 58 or 72 percent while their female counterpart is composed of 23 or 28 percent. Forty-four (44) or 54 percent of the respondents came from private schools against 37 or 46 percent from public high schools. Most of the respondents have HS GPA from low to average level with 24 or 34 percent and 25 or 35 percent, respectively, while the least group obtained high GPA comprised of 22 or 31 percent. There is a discrepancy in the number of respondents in the high school GPA due to the number of transferees without submitted high school report card to the University Registrar’s office.

Table 2 presents the perceived level of difficulty of engineering program.

Table 2: Perceived Level of Difficulty of Engineering Program

Range	Degree	F	%
1-2	Very Easy	3	4
3-4	Easy	3	4
5-6	Moderate	19	26
7-8	Difficult	31	42
9-10	Very Difficult	17	23
Mean: 7.03	Hard	73	100%

Thirty-one (31) or 42 percent of the respondents perceived the level of engineering course as “Difficult” while 19 or 26 percent answered “moderate level” and 17 or 23 percent perceived it as “Very Difficult”. Three or 4 percent of the respondents answered very easy and another 3 or 4 percent perceived the engineering course as “easy”. The weighted mean of 7.03 implies that in general, engineering students have perceived engineering program as “difficult”. Eight (8) respondents did not indicate their answers in the level of difficulty. One of the most significant implications of the meritocracy of difficulty in engineering is how it led engineering students to distinguish themselves from students in other majors and to place their discipline in a clearly superior position to others (Stevens, Amos, Garrison & Jocus, 2007).

Table 3 presents the final grades of engineering students in Technical Drawing 2.

Table 3: Final Grades of Engineering Students in Technical Drawing 2

Range	Description	F	%
96 – 100	Excellent	2	2.74
	Very		
91 – 95	Satisfactory	11	15.07
86 – 90	Satisfactory	21	28.77
81-85	Fair	19	26.03
76 – 80	Poor	7	9.59
75 and below	Very Poor	13	17.81
Mean: 84.10		73	100.0

Majority of the engineering students obtained their final grades in Technical Drawing 2 ranging from 86 – 90 percent and 81 – 85 with 21 students or 28.77 percent and 19 or 26.03 percent, respectively while 11 students or 15.07 percent obtained very satisfactory final rating and 13 students or 17.81 percent obtained very poor performance rating in Technical Drawing 2. Seven (7) or 9.59 percent obtained poor rating and 2 or 2.74 percent obtained excellent rating. The over-all mean of 84.10 implies that the final grades of the engineering students in Technical Drawing 2 obtained a fair performance rating. However, eight (8) students received incomplete remarks due to inconsistency of submitting their drawing activities, exercises and assignments.

Table 4 presents the level of Interest of Freshmen Engineering towards Engineering Program.

Table 4: Comparative Level of Interest of Freshmen Students towards Engineering Program

Interest towards the Course	Gender		HS Attended		HS Average			Total		
	WM		WM		WM			WM	VI	Rank
	M	F	Pri	Pub	Low	Ave	High			
1. I believe, I can finish engineering.	4.37	4.39	4.29	4.42	4.05	4.50	4.72	4.41	A	3
2. I want to become an engineer someday.	4.77	4.78	4.76	4.81	4.81	4.73	4.89	4.80	SA	1
3. I have no second thought of taking up engineering.	3.84	3.43	3.61	3.84	3.52	3.91	3.50	3.66	MA	10
4. I'm confident that I can handle all the challenges and difficulties of engineering.	4.07	4.17	3.93	4.33	3.75	4.14	4.28	4.05	A	7
5. I will devote most of my time in studying my lessons.	3.98	4.26	3.95	4.13	3.86	4.09	4.33	4.08	A	6
6. I'm aiming to be included in the Top Engineering Students' List or Dean's Lister.	3.60	4.04	3.61	3.84	3.38	3.82	4.33	3.82	A	9
7. I can balance my time between my academic subjects and university/college activities.	4.00	3.96	3.90	4.06	3.76	4.05	4.11	3.97	A	8
8. I will prove to myself that I really deserved to take engineering.	4.49	4.43	4.41	4.55	4.29	4.45	4.72	4.48	A	2
9. I will take all my academic subjects seriously to obtain high grades.	4.28	4.57	4.17	4.55	3.86	4.64	4.72	4.39	A	4
10. I am ready to face the challenges of engineering no matter how hard it is.	4.26	4.30	4.15	4.45	3.90	4.27	4.67	4.26	A	5
Composite Mean	4.17	4.23	4.08	4.30	3.92	4.26	4.43	4.19	A	

Looking at the table it shows that majority of the respondents wanted to become engineers someday (WM = 4.80) and they wanted to prove that they really deserved to take engineering (WM = 4.48) but it is also contrasting that almost one-third of the respondents are moderately

agree of having no second thought of taking up engineering (WM = 3.66) which is the lowest among the indicators at rank number 10. Even though they wanted to become an engineer in the future, they still have the tendency to shift to another course. They also believed that they can finish engineering (WM = 4.41) and they will take all their academic subjects seriously to obtain high grades (WM = 4.39) on rank numbers 3 and 4, respectively.

They also agreed that they can balance their time between academic subjects and university/college activities (WM = 3.97) and they are aiming to be included in the Top Engineering Students' List or Dean's List (WM = 3.82) with the least weighted mean scores and agree verbal interpretation.

Table 5 reveals the significant relationship between the level of interest of the respondents and their high school GPA, perceived level of difficulty of engineering programs and their final grade in Technical Drawing 2.

Table 5: Relationship between the Level of Interest of the Respondents and their High School Average, Difficulty Level and Final Grade in Technical Drawing 2

Interest towards the Course	HS GPA		Difficulty Level		TD 2	
	r-value	Sig	r-value	sig	r-value	sig
Interest 1	0.372	0.003**	-0.328	0.005**	.377	.003**
Interest 2	0.043	0.741	-0.03	0.804	.083	.529
Interest 3	-0.009	0.942	-0.335	0.004**	.064	.627
Interest 4	0.269	0.036*	-0.247	0.038*	.115	.386
Interest 5	0.289	0.023*	-0.137	0.252	.261	.044*
Interest 6	0.425	0.001**	-0.281	0.017*	.399	.002**
Interest 7	0.166	0.197	-0.035	0.769	.004	.977
Interest 8	0.166	0.196	-0.139	0.245	.259	.046*
Interest 9	0.530	0.000**	-0.239	0.044*	.351	.006**
Interest 10	0.382	0.002**	-0.121	0.313	.268	.038*
Over-all	0.433	0.000	-.317	.007	.355	.005

***Correlation is significant at the 0.01 level (2-tailed)*

**Correlation is significant at the 0.05 level (2-tailed)*

Those students with high GPA in High School, they also have higher perception in finishing engineering and at the same time, handling all the challenges and difficulties of the program and they have higher devotion to study their lessons as well as they have higher view to be included in the top engineering students' list. Those students with high GPA have also higher interest to take all subjects seriously to obtain high grades and they are ready to face the challenges of engineering. The degree of relationship between high school GPA of the respondents and their interest towards the course is directly proportional.

The students with high perceived level of difficulty of engineering program they also have lower interest to finish engineering; they are the ones with second thought of taking up engineering; with lesser confidence to handle challenges of engineering and aiming low to be included in the top engineering students as well as less serious to obtain high grades. The level of relationship between the degree of difficulty of engineering program and their interest towards the course is inversely proportional. The higher the perceived level of difficulty of engineering is the lower their interest towards the program.

Meanwhile, those students with high GPA have also high interest to finish the engineering program with high devotion in studying while aiming to be included in the Top Engineering Students' List and proving that they really deserved to pursue engineering. They also have high interest to take all their academic subjects seriously to obtain high grades and they have high readiness to face the challenges of engineering. However, those with low GPAs have also low interest on these indicators.

The significant difference between the level of interest of the respondents and their profile is revealed in Table 6. In terms of the significant difference between gender, the interest of female respondents in aiming to be included in the Top Engineering Students' List or Dean's List is significantly differ in the perception of male respondents. Therefore, female respondents have higher intention to be included in the dean's lists than male respondents.

Table 6: Significant Difference between the Level of Interest of the Respondents and Their Personal Profile

Interest towards the Course	Gender		Type of HS Attended	
	t-value	Sig	t-value	Sig
Interest 1	-.122	.903	-0.687	0.49
Interest 2	-.085	.932	-0.413	0.68
Interest 3	1.925	.058	-1.117	0.27
Interest 4	-.581	.563	-2.43	0.02*
Interest 5	-1.627	.108	-1.082	0.28
Interest 6	-2.123	.037*	-1.096	0.28
Interest 7	.232	.817	-0.907	0.37
Interest 8	.357	.722	-0.864	0.39
Interest 9	-1.669	.099	-2.294	0.03*
Interest 10	-.233	.816	-1.819	0.07

***Correlation is significant at the 0.01 level (2-tailed)*

**Correlation is significant at the 0.05 level (2-tailed)*

Engineering students from public high schools is more confident that they can handle all the challenges and difficulties of engineering and they will take their academic subjects more seriously to obtain high grades than students from private high schools.

It can be noted that both genders have no difference in their interest to become an engineer; they have no differences in terms of confidence that they can handle the challenges of the

course, devotion in studying, balancing their time between academics and non-curricular activities and proving themselves that they deserved to take engineering.

Engineering students from public high school have significantly higher confidence that they can handle all the challenges and difficulties of engineering as well as higher interest of taking seriously all their academic subjects to obtain high grades than students from private high school.

Table 7 (a-c) shows the predictor of the final grade of the engineering students from the indicators of students' interest towards the engineering program.

Table 7(a): Predictor of the Final Grade in Technical Drawing 2 of the Engineering Students (Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.409(a)	.167	.153	7.15369

a Predictors: (Constant), Q6

Table 7(b): Predictor of the Final Grade in Technical Drawing 2 of the Engineering Students (Analysis of Variance)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	585.798	1	585.798	11.447	.001(a)
	Residual	2916.990	57	51.175		
	Total	3502.788	58			

a Predictors: (Constant), Q6

b Dependent Variable: Draw1

Table 7(c): Predictor of the Final Grade in Technical Drawing 2 of the Engineering Students (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	70.853	3.969		17.852	.000
	Q6	3.469	1.025	.409	3.383	.001

a Dependent Variable: Draw1

$$Y = 3.469 X + 70.853$$

As seen from the result of Table 7 (a-c), it provides the r and r² value, the r value is 0.409 which represents the simple correlation and therefore indicates moderate degree of correlation. The computed r² indicates how much of the dependent variable, final grade in TD 2 can be explained by the independent variable, "I'm aiming to be included in the Top Engineering

Students' List or Dean's Lister". In this case, 16.7% of the variance in final grade in TD 2 is explained by indicator number 6.

Table 7(b) indicates that the regression model predicts the outcome variable significantly well. This is because the statistical significance of the regression model is 0.001 which is less than the level of significance of 0.05. Overall, the model which is the "*I'm aiming to be included in the Top Engineering Students' List or Dean's Lister*" is significantly good enough in predicting the outcome of the final grade in TD 2.

"I'm aiming to be included in the Top Engineering Students' List or Dean's Lister" predicts the Final Grade of Engineering Students in TD 2 with 16.7 percent guarantee based on the statistical analysis. This is the only indicator of interest towards the engineering program that could be considered with patterns of results nearly the same with their final grades in TD 2 while other indicators do not establish nearly similar outputs. Therefore, students with high interest to become included in the Top Engineering students exert more effort to obtain high grades in TD 2.

CONCLUSION AND RECOMMENDATION

The College of Engineering must provide services that could enhance the motivational skills of the Engineering students to aim high grades and realize the importance of having good grades in college. Due to their innate thinking of getting passing grade in engineering is enough already defeats the real objectives of exerting greater efforts in studying. They must be encouraged to apply their full potential to obtain high academic performance not only in Technical Drawing but in all minor and major courses. They must acquire good study habits and culture of excellence in addressing their interest towards the program that would develop their character to become a remarkable professional engineer in the near future. In the study conducted by Osa-Edoh and Alutu (2012) revealed that there is a high correlation between study habits and students' academic performance. Through classroom management and discussion, teachers can share not only their knowledge and skills but also attitude needed by the students to attain their ultimate goal of having good career in engineering. Giving wisdom and inspiration would create an atmosphere of obtaining series of accomplishments until it becomes a habit of achieving pure success.

Results showed that first year engineering students are dominated by male from private schools having 83 – 87 high school average. Majority of the engineering students obtained final grades in Technical Drawing 2 ranging from 81 – 85 and 86 – 90 percent with an over-all mean fair performance rating of 84.10 percent. The engineering program was perceived difficult by the first year engineering students.

Engineering students have high level of interest towards the engineering program. Students with high category of high school average have higher interest towards the engineering program while students with high level of difficulty towards engineering have low interest

towards the program and students with high interest towards the engineering program have also high final grades in Technical Drawing 2.

Female respondents have significantly higher intention to become dean's lists than male respondents. Engineering students from public high schools is more confident that they can handle the difficulties of engineering and more serious to obtain high grades than students from private high schools while students in low category of high school average have responses significantly differ from the students with high average category. The weighted mean scores of students who wanted to be included in the Top Engineering Students or Dean's List best predict the Final Grades in Technical Drawing 2.

The College of Engineering could provide services like trainings or seminars that would enhance the level of interest and motivation of the students to give their full potential in acquiring the proper skills not only in technical Drawing but in all courses enrolled and they must adapt the attitude and live the character of future engineering professionals. Brackett (2007) emphasized that to "inspire" is literally to "breathe in," to actively pull sustenance from a proffered external source. She also stressed that active student determination based on some sense of self may couple with instructor inspiration to promote academic success. Teachers are great part of students' achievements through giving proper stimulus and direction to go beyond their expected limits.

The researcher hereby recommended that the Dean of the College of Engineering must include in the General Orientation to freshmen the challenges and possibilities that might happen to them as students of engineering to provide them an overview not to discourage but to inspire them to finish the program. Faculty members must show their support to the students with low ability to catch up their lessons and provide adequate remedial teaching or give extra activities for the students to practice at home.

Part of the learning process in Lyceum of the Philippines University-Batangas is the implementation of Outcomes-Based Education (OBE) which is also the main thrust of most Higher Education Institutions in the Philippines today to go along with the standards of foreign universities and colleges all over the world (Laguador & Dotong, 2014). Students should be guided accordingly towards the development of their skills and competencies in technical drawing through innovative methodologies of teaching drawing.

Faculty members must provide extra effort to increase the level of interest of the students to exert also extra effort in their subject through giving recognitions for something rewarding that the students have done in the projects or activities and other extrinsic motivation that would lead the mind-set of the students to a higher degree of concentration. Reward system *may* contribute to engendering appropriate learning approaches in students (Mclean, 2001). Teacher may provide extra projects and assignment for those students who are frequently not attending regular classes for them to realize the consequences of their absences (Laguador & Pesigan, 2013)

Students must be given more projects and activities at home and in school which will be performed in collaborative manner to enhance their capability to lead and academic performance in different subjects and discipline that will be incurred by the course (Laguador, Velasquez & Florendo, 2013). Engineering students must not only be kept informed and oriented regarding the significance of their grades in college for their future employment but the department must also focus in teaching the students through classroom interaction on valuing the process of how they learned or discovered to become productive and responsible individual through maintaining high grades or in the case of engineering even obtaining passing grades are very much important (Laguador, 2013).

The graduates considered the following work-related values with very much contribution to their replacement are: The following values and characteristics might also be integrated in the technical drawing which are considered important by the graduates: perseverance and hard work, honesty and love for truth, love for God, professional integrity, supportiveness, punctuality, efficiency and courage (Laguador & Dotong, 2013).

Male students must be given enough encouragement to recognize the value of having good record of grades for their future employment and showing them the importance of the process on how did they obtain high grades is already an achievement for bearing a remarkable behavior of true engineering students. Students from private high schools must learn how to appreciate the challenges and difficulties of engineering through working with projects patiently and add more concerns to their grades.

Employers preferred graduates who are proactive, trainable, cooperative team players and who can carry all responsibilities with ease and result-oriented individuals with high regards toward the achievement of company's mission (Laguador & Ramos, 2014), therefore, engineering students along with the skills in technical drawing must also be taught these characteristics to ensure employability.

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