Women in Engineering, Do They Have Problems? Women in Engineering, Does it Matter?

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Abstract: Department of Engineering in universities generally make me as an icon, so that such a major is predominantly filled by male students. However, nowadays women also contribute a lot in choosing this department as a choice of purpose in life. Thus, the stereotype about this department still needs to be questioned since this becomes a problem for women who enter the world of engineering. This study used a quantitative comparison approach using t-test as its data analysis. The research used questionnaires with likert scale consisting of 29 questions. The results showed that there is a negative comparison of academic results of the Department of Engineering between male and female students; women are still under men in the achievement of academic results in the Department of Technical college, because the patriarchal culture inherent in this department is still embedded so that women do not really participate in learning in this department. It is also supported by the treatment of lecturers who tend to give full trust to men rather than women.

1 INTRODUCTION

Majors related to techniques in college are generally well known as majors of men, so that it is believed the majors are difficult for women since they are assumed not to get used to doing heavy works just like in those majors. However, in college there are engineering majors where many women now take part in that field as their choice, in line with Fox's notion that the participation and status of women faculty is also a pressing, national issue for reasons of social equity (or inequity) in access to, and rewards gained in, science and engineering (2010, p. 998). The closer to the nuts, bolts and plasters, the more masculine and the male culture as far away from the nut. Bolts and plaster are women's cultures (Faulkner, 2007, p. 339). Women are disadvantaged in the informal environment of their academic institutions, techniques have been regarded as male domains (Gupta, 2007, p. 508). In fact, many women are in the Engineering world but there are differences in access facilities between women and men, so that it will affect their performance in the field of engineering.

The engineering world is known as a masculine job where technique is seen as a job that requires muscle power and skill qualified. Unfortunately, men feel superior in work compared to women who feel vulnerable. Increasing women's representation in the technical world requires a more advanced heterogeneous version (Faulkner, 2007, p. 331). According to Seymour and Hewitt (1997) there is a perception among women that balancing families and careers in science is more difficult than other career fields, which can influence women's decisions to enter and survive in science engineering / SE (Camp, Gilleland, Perason and Putten, 2009, p. 367). There is a general perception that the mental form of women becomes small in this regard, so the performance of women in the Technique should be questioned, this needs to be studied in this study to see the comparison of performance of women and men in engineering majors in college. This research not only focuses on heavy work in Engineering, but in the academic world also needs to be examined the difference.

Gender is often identified with sex, whereas gender is different from sex. Gender is often also understood as a gift from a divine god or divinity, whereas gender is not solely the case. Etymologically, the word 'gender' comes from English meaning 'sex' (Echols and Shadily, 1983 - 265). The word 'Gender'

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can be defined as the apparent differences between men and women in terms of values and behavior (Neufeldt 1984: 561).

In terminological point of view, 'gender' is defined as cultural expectations of men and women (Lips 1993: 4). Another definition of gender is put forward by Elaine Show alter. According to her, 'gender' is the distinction between men and women seen from socio-cultural constructs (Showalter (ed.), 1989: 3) Gender can also serve as a concept of analysis that can be used to explain something (Umar, 1999: 34). More emphatically mentioned in the Women's Studies Encyclopedia that gender is a cultural concept used to distinguish the roles, behaviors, mentalities and emotional characteristics between men and women who develop in society (Mulia, 2004: 4).

From some of the above definitions it can be understood that gender is a trait which is used as a basis for identifying differences between men and women in terms of social and cultural conditions, values and behaviors, mentality, and emotions, as well as other non-biological factors. Gender is different from sex, although it is entomologically the same as sex (Echols and Shadily, 1983: 517). In general, sex is used to identify the differences between men and women in terms of biological anatomy, while gender concentrates more on social, cultural, and other nonbiological aspects. If the study of sex is more emphasis on the development of biological aspects and chemical composition in the body of a man and a woman, then gender studies emphasize the development of aspects of masculinity and femininity of a person.

Gender has an important position in one's life and can determine the life experience that it will take. Gender can determine one's access to education, the world of work and other public sectors. Gender also determines the health, life expectancy and freedom of movement of a person. Clearly, gender will determine the sexuality, relationships and abilities of a person to make decisions and act autonomously. Finally, it is the gender that determines what a person will become.

Based on the data and background above, this research will identify the problems that occur on the status and role of women as students in engineering majors. This research tries to answer the question about how big the patriarchal culture in the engineering students, the difference of lecturer's treatment at the time of practicum activity of the students and the comparison of the result of the man and woman learning on the engineering student.

2 METHOD

This study uses a quantitative comparison approach, the comparison between women and men in achieving learning outcomes in engineering majors in college. The study was conducted in one of the universities in Bandung, West Java, Indonesia. The student population in the Department of Engineering is known to be 178 persons, the samples used are probability sampling, giving equal opportunity to all members of the population to be members of the sample, with simple random sampling, the samples taken randomly regardless of the strata present in the population, the sample calculation was obtained for 52 students, 29 men and 23 women (see in Table 1).

Table 1: Sample.

	Men	Women	Total
Alumni	4	2	6
Class of 2014	7	3	10
Class of 2015	10	12	22
Class of 2016	8	6	14
Total	29	23	52

Research data obtained by using questionnaire as many as 30 questions, but on the calculation of the validity of one question is not valid so the matter becomes 29 questions. Problems developed based on the limits of the issues rose from the three indicators of research, as follows the Table 2:

Table 2: Research instruments.

Indicator	Scope of Problem	Item Question
Patriarchal Culture	Engineering students are generally dominated by men	1-10
	Stereotypes on the female Engineering students as the meek	
	Technique is a Department that many men interested in because many use of energy	
Differences in Lecturer's Treatment	Assumption of lecturers, men are more capable in practice than women	11-20
	Lecturers always entrust fully the responsibility of engineering equipment to men	
	Lecturers instruct women to follow men's activities	
Learning Outcomes	Result of Grade Point Average (GPA)	21-29

	Achievements during lectures	
	Practical ability	

The questionnaire was developed based on the above instrument, using the likert scale 1-4: 1: very appropriate, 2: appropriate, 3: inappropriate, and 4: very unsuitable. This scale aims to compare the scores of male and female responses. The results of this score in the analysis with inferential statistical calculation technique through the analysis of hypothesis comparative parametric test with the type of data two independent samples so that the calculation using independent sample T-test technique. T-test is a statistical calculation to compare differences in learning outcomes obtained between men and women in students majoring in Engineering in college. After the coding process, validity and reliability test, the comparison will be obtained in the final result with the independent sample T-test. The result will answer this hypothesis:

Ho: There is no comparison of learning outcomes between men and women in the Department of Engineering in college.

H1: There is a comparison of learning outcomes between men and women at the Department of Engineering in college.

3 RESULTS AND DISCUSSION

3.1 Results

Data obtained in this study indicate that there is a comparison of learning outcomes between men and women, significant value 0.01 <0.05, so the data are not homogeneous. The value of t arithmetic -1.56 at df 50. Df on t test is N-2 that is in this case 52-2 = 50. The value of t arithmetic compared with t table at df 50 and probability 0.05 that is equal to 1.67. Thus, the value of t arithmetic -1.56 <1.67 (t table), then the value of t arithmetic negative, there is a significant comparison of the results of female and male students study in engineering majors. Sig (2 tailed) or p value of 0.01 <0.05, since <0.05 then H1 is accepted so the ratio is statistically significant in probability 0.05.

The results of this comparison can be seen from the mean value of these two groups of different means that is -7.1, because the value is negative, then means men have a lower average than women. Men have an average of 70.30 while women are 63.20.

Comparison of learning outcomes between men and women in the Department of Engineering is not so visible, because the comparison of learning results is thin. Thus, in this case, men remain superior compared to women in the world of engineering in college. Students feel that there are differences of treatment and always compare between men and women in the performance of learning results of engineering in their majors, as in this graph, it explains the answers that support the three indicators of this study:

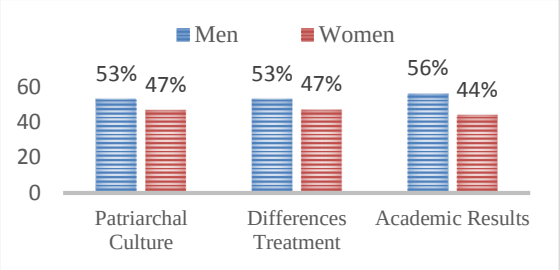

Figure 1: Comparison of learning outcomes of female and male students in engineering majors.

From Figure 1, it can be seen that there are indeed differences between men and women in the world of engineering.

3.2 Discussion

Patriarchal culture found in the Department of Engineering College has been felt by both students. Not only men but also women, this can be seen in the diagram, which both have an opinion that almost equal the percentage, this is one of the causes of comparison that makes women lower in value in the practice of engineering science, because the culture of patriarchy is still embedded for the students themselves. Men assume that women in the engineering department will not succeed (Carli 2016: 8). The social assumption of women has inferior intelligence compared with men, so women are still considered inferior to men (Mary 2007, p 29)

Differences in perceived treatment are still felt by both men are more privileged to cultivate, control and reign in learning in engineering majors, a common perception which states that the meek woman who makes her considered powerless when confronted by machines identical with majoring in Engineering. When speaking of gender identity in engineering majors, women tend to experience gender attacks that result in feelings that do not feel competent and lack of self-acceptance (Hall 2015, pp. 531). Women have decreased motivation due to gender stereotyped views in engineering majors (Deemer 2015, p.44). Women rarely choose engineering majors because women assume that technique is the arena of men, at least female role models in engineering, the view of

male chauvinism, and the lack of information women receive about engineering majors (Baryeh 200, p.180).

The academic results obtained by the Engineering students are more prominently displayed by men than women, so this is the problem of women in the world of Engineering, especially in college.

A program is needed to narrow the gap on gender issues in engineering (Fox 2011, p.603).

Differences in environmental opportunities can be seen from lecturers, curriculum and others can clarify the Gap between men and women in engineering majors.

4 CONCLUSIONS

Female students in engineering departments still lack full participation in taking over activities within their majors, because there is still a patriarchal culture and also the differing treatment of lecturers in comparing women and men in performance that will affect their academic outcomes. Women are still far from having best achievements in the world of engineering, while men have a wide opportunity for the full trust of lecturers in the responsibility of learning engineering in the majors.

REFERENCES

Baryeh, E. A., P. J. Squire, M. Mogotsi., 2001. *Engineering Education for Women in Botswana*, *38* (2), 173-182.

Carli, L. L., Laila Alawa, Yoon Ah Lee, Bei Zhao, Elaine Kim. 2016. *Stereotype About Gender and Science Women ≠ scientist, 40* (2), 1-17.

Camp, A. G., Gilleland, D. S., Pearson, C., Putten, J. V., 2009. *Differentiating Between Women in Hard and Soft Science and Engineering Disciplines*, *11*(3), 363-384.

Deemer, E. D., Chaihua Lin, Cristina Soto. 2015. *Stereotype Threat and Women's Science Motivation Examining the Disindentification Effect*. *24* (4), 1-14.

Echols, J. M., Hassan Shadily. 1983. *Kamus Inggris Indonesia.* Jakarta: Gramedia. Cet. XII.

Falk, N. A., Pattrick J. R., Tracy N. C., Fred H. B., Nancy E. B. 2017. *Expanding Women's Participation in STEM Insight from Parallel Measures of Self-Efficacy and Interest. 25* (4), 1-14.

Faulkner, W., 2007. 'Nuts and Bolts and People'. Gender-Trouble Engineering Identities. *Social Studies of Science, 37* (3), 331-356.

Fox, M. F., 2010. Women and Men Faculty in Academic Science and Engineering: Social Organizational Indicator and Implications. *American Behavioral Scientist, 53*(7), 997-1012.

Gupta, N., 2007. *Science, Technology and Human Values (Indian Women in Doctoral Education in Science and Engineering: A Study of informal Milieu at the Reputed Indian Institutes of Technology), 32* (5), 507-533

Hall, William M., Toni Schamader, Elizabeth Croft. 2015. *Engineering Exchanges: Daily Social Identity Threat Predicts Burnout among Female Engineers.6 (5)* 1 - 7

Lips, H. M. 1993. *Sex and Gander: An Introduction.* London: Myfield Publishing Company.

Mary, Frank Fox, Gerhard Sonnert, Irina Nikiforova. 2011. *Programs for Undergraduate Women in Science and Engineering: Issues, Problems and Solutions*. 25 (5). 589 – 615.

Mulia, S. M., 2004. *Islam Menggugat Poligami*. Jakarta: Gramedia Pustaka Utama. Cet. I

Neufeldt, V. (ed.). 1984. *Webster's New World dictionary.* New York: Webster's New World Clevenland.

Showalter, E. (ed.). 1989. *Speaking of Gender.* New York and London: Routledge.

Umar, N. 1999. *Argumen Kesataraan gender: Perspektif Al-Qur'an.* Jakarta: Paramadina. Cet. I.