

## Self Efficacy and Academic Achievement among Female Engineering Students Studying In Single Sex and Co-Education Institutes

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### ABSTRACT

The present study was designed to investigate whether the single sex and coeducation environment have any impact on developing self efficacy beliefs and academic achievement of female engineering students. The sample consists of 150 female engineering students studying in single sex and co-education institutes at RTM Nagpur University, Nagpur. Data were collected by administering self efficacy scale developed by Mathur and Bhatnagar (2012). For academic grade the average of percentage among various semesters were calculated. Mean standard deviation and One Way ANOVA was used to analyze the data. Result revealed that students studying in single sex and coeducation institutes differ significantly in academic achievement, but no significant difference was found on self efficacy scores of both the groups.

**Keywords:** *Single sex, Co-education, Self efficacy, Academic achievement, Undergraduate female engineering students*

In India, engineering is the most preferred career option for the students at 10+2 level. Broadly there are only two career options for students at 10+2 level in India, one is engineering and the other is medicine. Lucrative career in various public and private organizations, handsome salary, and employment in abroad, avenues for entrepreneurship attracts more and more students to opt for engineering courses. This demand for engineering courses have encouraged opening a large number of government and private engineering colleges across the country. The numbers of IITs, NITs, Government Engineering Institutes and Private Engineering Institutes have reported tremendous increase in the past decade. In spite of this, there is cut throat competition among students for getting admissions in IITs and NITs and prestigious private engineering institutes.

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Received: April 5, 2017; Revision Received: June 5, 2017; Accepted: June 20, 2017

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However, most of the engineering institute offers education in co-education set up. A very few number of engineering institutes offers education in single sex set up. The number of single sex institutes especially for boys are even less in numbers. This less number of single sex institutes indicates less inclination of students towards these institutes.

Even though the number of girls taking admission in engineering is increased by a large number in last decade but still male students rules on roll list. Educationist, industry leaders and social reformers are consistently taking efforts to attract female to this male dominated field. This has resulted in the development of single sex engineering institutions especially for women. These women institute offers a great benefit to women engineers in different ways. In this male dominated career path, most of the job opportunities while campus placement is offered to male students. Women engineering institutes offers this special benefit for women engineers as the entire opportunities while campus placement are served to female students only. This reduces the burden of competition with male students and results in developing confidence in female students. In the women engineering institutes girls handle all the difficult assignment and projects on their own, they act freely, develops new skills and take active participation in all the activities. This fosters creativity, collaboration and confidence in girl students and hence fosters self efficacy of girl students. Moreover, single sex institutes provides better learning environment. Girls are away from all the distractions and focus more on studies. They concentrate on their studies and hence achieve better academic scores.

But do the female students studying in single sex institutes reports more efficacy than female students studying in co-education institutes? Do they perform better than female students studying in co-education institutes? Do these single sex institutes improve the academic scores of the students? The current study is an attempt to find the answers of this tickling question.

Single sex or Co-education is a never ending debate. There have been considerable research and policy debates about pros and cons of single sex and coeducation environment. The advocates of both the type of environment have listed a number of advantages for both the type of institute. The proponents of Single Sex institute believes that educating students in single sex institutes increases interest in academic and co-curricular activities which boosts confidence in students and results in improving students' achievement.

Single sex environment is basically preferred by students and parents at elementary, secondary or postsecondary levels. However, a very few number of students prefer for single sex institutes in higher education, particularly, in technical education. There are many benefits to girls being educated in single sex environment of a girls' school. Without competition from boys, girls in girl's school are free to pursue academic excellence in any area they choose. Research shows that

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girls in single sex schools engage in more healthy competition and risk taking than girls in co-educational schools.

### ***Self efficacy***

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. A strong sense of efficacy enhances human accomplishment and personal well-being in many ways (Bandura A, 1994). Self-efficacy beliefs influence how people think, feel, motivate themselves, and act. Self-efficacy beliefs have been found to be sensitive to subtle changes in students' performance context, to interact with self-regulated learning processes, and to mediate students' academic achievement (Zimmerman B. J., 2000). The application of self efficacy beliefs has positive effects on cognitive and affective outcomes (Haung, 2003). A strong sense of self-efficacy, especially for women students who are under-represented in engineering classrooms, can help them persist and enable them to become practicing engineers (Marra R.M., et.al, 2009). Studies have shown self efficacy is an integral to students to achieve good academic pursuits in engineering and other technical or non-technical fields.

### ***Self efficacy and academic achievement***

Self efficacy plays a vital role in boosting confidence in students. A number of research studies indicate that students with greater efficacy do excel in studies and co-curricular activities. Ponton M. K., et.al (April 2001); Appelbaum S. H, Hare A. (1996) emphasized on the role of self efficacy as an important mediator of goal setting and performance. Yusuf M (2011) in his useful research investigated the impact of self-efficacy, achievement motivation, and learning strategies on students' academic achievement. Chemers M. M., Li-tze Hu, Garcia B. F. (2001) examined that self-efficacy directly and indirectly showed powerful relationships to academic performance and personal adjustment of college students. Fantz T. D., Siller T. J. Demiranda M. A. (2011) addressed the long term effects of pre-collegiate engineering experiences on student self efficacy. Tor B. (1995) in his valuable study investigated gender differences regarding perceived self-efficacy and academic performance 154 college students in business administration. In an interesting research Yazachew A. T. (2013) investigated the level of students' self-efficacy, gender difference in self-efficacy and achievement and also relationships between self-efficacy and achievement for second year students in the fall of 2012 in Analytical Chemistry. Yong F. L. (2010) examined the self-efficacy and expectancy for success of 105 pre-university engineering and business students from a private university. Fedler R, et.al (1995) examined gender difference in the students' academic performance and retention.

Study after study the concept of self efficacy gain popularity and was considered as one of the strong predictor of academic achievement. Many studies have been conducted on self efficacy and academic achievement but adequate research on self efficacy of female students studying in

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single sex and coeducation environment has not yet presented. The present study is an attempt to judge to the impact these two different learning set up on self efficacy and academic achievement of female engineering students.

### *Type of institute and academic achievement*

Type of institute that students attend has significant impact on student's socio-emotional and academic development. Several studies have been conducted to study how single sex or coeducation setting affect or effect students' academic outcomes. Mael, F. A. (1998) discussed the role of co-education versus single sex on socio-emotional, interpersonal and career development of adolescent. The predominance of research certainly shows a role for single sex schools for providing academic and attitudinal benefits at least for few students. Whitlock S. (2006) in his valuable work investigated the effects of single and co-educational environment on the self efficacy of middle school girls. The study revealed that single sex classes have a more supportive learning environment, and have better conduct than coeducational classes. Pathan S. S. (2011) explored attitude of students towards and their untouched problems in single sex and coeducation institutes. In a recent study, Pahlke E, Hyde J. S, Allison C. M. (2014) used meta-analysis to analyze studies that have tested the effects on students of Single Sex (SS) compared with coeducational (CE) schooling. Mehmood T., et.al. (2013) analyzed emotional problems of students in co-education set up. The findings of the study supported for co-education set up. Ogden C. E. (2011) in his detailed study compared students performance in single sex and co-education settings in urban middle schools. The results revealed that female students in both settings, i.e. Single Sex and Co-education showed greater academic gains than male students. Woodward L. J, Fergusson D. M, Horwood L. J. (1999) studied the effect of single sex and co-education schooling on children's academic achievement.

Past research, much of which focuses on the primary and secondary level of education the present research focuses specifically on engineering education. Adequate research in engineering education is not available as there are very few institutes which provide engineering education in single sex setup.

## **METHODOLOGY**

### *Participants*

The current study was conducted at a Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur. The sample consisted of 150 undergraduate female engineering students. These students are selected randomly and studying in various private institutions in different semesters at different branches of engineering. The age of the students ranges between 18-22 years. The students belong to different socio-economical background. The details of the sample size are presented in table 1

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*Table 1: Details of sample size*

| Types of institute | n   |
|--------------------|-----|
| Single sex         | 75  |
| Co-education       | 75  |
| Total              | 150 |

### *Measures*

The self efficacy scale developed by G.P. Mathur and R.K. Bhatnagar (2012) was used for the present investigation. The scale consists 22 items in Eight Area—I. Self Regulatory Skills, II. Self influence, I self Confidence, IV. Social Achievement, V. Self, VI. Self Evaluation, VII. Self Esteem, VIII. Self Cognition. A 5 point Likert scale was used to measures students' self efficacy level. Students have to respond to each item as 'Strongly Agree', 'Agree', 'Uncertain', 'Disagree' and 'Strongly Disagree'. Average percentages of all the semesters were used as a measure of academic achievement.

The scale is more appropriate for Indian social condition, each item describes human self efficacy in different situations. The reliability co-efficient of the scale was measured by test-retest on a sample of 600 (300 male, 300 female). In male it ranges between .73 to .81 and in female .79 to .86 and is significant at .01 level of significance.

To obtain the concurrent validity co-efficient of self efficacy scale, the scale was compared with the views of expert rating. Validity ranges in male .73 to .81 and in female .76 to .83.

## **RESULTS**

The mean scores of self efficacy of the female students studying in single sex and co-education are presented in following table:

*Table 2: Mean and Standard Deviation for self efficacy scores*

| Data Group                      | Self efficacy |      |
|---------------------------------|---------------|------|
|                                 | Mean          | SD   |
| Female students in Single Sex   | 71.64         | 6.47 |
| Female students in Co-education | 71.32         | 6.44 |

One way analysis of variance (ANOVA) were then analyzed to determine whether or not there was a significant mean difference in self efficacy of both the group. The results of Analysis of Variance are presented in table 3:

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**Table 3: ANOVA Table for self efficacy scores**

|               | <b>Sum of square</b> | <b>df</b> | <b>Mean Square</b> | <b>F</b> | <b>Sig</b> |
|---------------|----------------------|-----------|--------------------|----------|------------|
| Between Group | 3.840                | 1         | 3.840              | 0.092    | 0.762      |
| Within Group  | 6173.60              | 148       | 41.714             |          |            |
| Total         | 6177.40              | 149       |                    |          |            |

The computed F value for self efficacy is  $F = 0.092$ ,  $p = 0.762 > 0.05$ . Hence, there is no significance difference in self efficacy of female students studying in Single Sex and Co-Education.

Similarly, the mean and standard deviation of academic scores of both the groups were obtained. The data is presented in the following table:

**Table 4: Mean and Standard Deviation for academic scores**

| <b>Data Group</b>               | <b>Academic score</b> |           |
|---------------------------------|-----------------------|-----------|
|                                 | <b>Mean</b>           | <b>SD</b> |
| Female students in Single Sex   | 68.84                 | 8.01      |
| Female students in Co-education | 63.72                 | 8.05      |

The significant differences in Academic scores of both the groups were analyzed by applying One Way ANOVA. The ANOVA results are presented in following table:

**Table 5: ANOVA Table for Academic scores**

|               | <b>Sum of square</b> | <b>df</b> | <b>Mean Square</b> | <b>F</b> | <b>Sig</b> |
|---------------|----------------------|-----------|--------------------|----------|------------|
| Between Group | 984.782              | 1         | 984.782            | 15.273   | 0.000      |
| Within Group  | 9542.969             | 148       | 64.180             |          |            |
| Total         | 10527.750            | 149       |                    |          |            |

The results showed that there was significant difference in academic achievement,  $F=15.273$ ,  $p = 0.00 < 0.01$ . This shows that the difference is significant at 0.01 levels.

## **DISCUSSION**

In this study we have examined the impact of single sex and co-education set up on self efficacy and academic achievement of female undergraduate engineering students. The major purpose of the study was to analyze whether single sex or co-education set up contribute for improving self efficacy and academic scores of female engineering students. The findings and implications of the study are discussed below.

The findings of the study show that female engineering students studying in single sex and co-education institutes do not differ significantly on self efficacy scores. This result can be interpreted as below.

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Self efficacy plays an important role in choosing a career path. High or low self efficacy determines how much challenging task a person will take up and also his ability to persist and succeed the task. When students opt for engineering courses, they are already aware about the difficult curriculum of engineering courses. Along with the difficult subject matter, students also have to work on challenging projects. The frequent examinations and assignments add more burden on students for preparation. These challenges of engineering courses are common for both male and female, and for both the type of institutes, i.e. single sex and co-education institutes. Single Sex or Co-education set up do not offer any special benefits to its female engineering students to cope up with these challenges. Hence, the girls attending single sex or coeducation institutes do not differ significantly on self efficacy scores.

Although the results suggest that there is no significance difference in self efficacy of female engineering students, from the mean efficacy score it is evident that female students studying in single sex institutes reported more efficacy than female students studying in co-education institutes.

Whilst the result favored single sex learning set up for better academic outcomes. The result of the present study showed significant difference in academic achievement of both the groups. Female students studying in single sex institutes obtained better academic scores than female students studying in co-education institutes.

Several possible explanations could account for the better academic scores of those who attended single sex institutes. The age group of the sample of the present study ranges between 18-22 years. Students at this young adult stage are more likely to get distracted from the social environment. These distractions may come in various forms. Students at this age are more conscious about their look and appearance and have strong urge to attract others. They form close friendship with fellow students, and spend most of the time for unnecessary activities with the fellow group. This results in poor time management. The major distraction at co-education set up is that students at this young adult stage build strong emotional relationships with students of opposite gender. This definitely affects the score of the students.

These distractions are less present in single sex set up. Also, when students opt for female engineering institute, at the time they are more focused on their studies. Hence, we may conclude that single sex institute provide better learning environment for female students. More focus and determination towards studies helps students to achieve good academic scores.

### **CONCLUSION**

Empirical evidence of this study suggests two general conclusions about the effectiveness of single sex and co-education set up. First, single sex set up does not contribute much for

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developing self efficacy in female engineering students. Second, it is evident from the academic scores of the students that female students studying in single sex institutes focus more on their studies and achieve good scores. Hence we may suggest that single sex institute provide better learning environment for female engineering students. Whilst with these two differing results we may not clearly support for single sex institutes.

### ***Acknowledgments***

The author appreciates all those who participated in the study and helped to facilitate the research process.

***Conflict of Interests:*** The author declared no conflict of interests.

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**How to cite this article:** Ramteke P. V, Ansari R. J (2017), Self Efficacy and Academic Achievement among Female Engineering Students Studying In Single Sex and Co-Education Institutes, *International Journal of Indian Psychology*, Volume 4, (3), DIP:18.01.116/20170403, DOI:10.25215/0403.116