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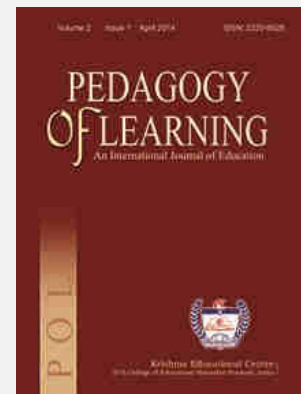
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Gender Differences in Self-efficacy and Perceived Competence among Engineering Students

Kiranjeet Kaur

Associate Professor, Department of Applied Sciences and Humanities, S.B.S. State Technical Campus, Ferozpur

E-mail: kirankiran2@rediffmail.com

Suninder Tung

Professor, Department of Psychology, Guru Nanak Dev University, Amritsar

E-mail: sunindertung_psy@yahoo.co.in

Corresponding Author: Kiranjeet Kaur

E-mail: kirankiran2@rediffmail.com

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Abstract

The present study investigated the gender differences in Self-efficacy and Perceived Competence among engineering students. Total sample of 559 students (305 boys and 254 girls) was taken from various engineering colleges of Punjab. Self-efficacy Questionnaire (SEQ-C, Muris, 2001) and Perceived Competence Scale (Pintrich and DeGroot, 1990) were administered. Three dimensions of self-efficacy i.e. Academic self-efficacy, Social self-efficacy and Emotional self-efficacy were studied along with perceived competence. To find out gender differences on these dimensions, t-test was applied on the collected data. The results of the study revealed that significant

gender differences existed on academic self-efficacy. These differences were found to be in the favour of female engineering students. Thus, the girls perceived themselves more academically efficacious than boys, possessed more confidence in their ability to succeed in engineering course and also displayed appropriate learning behaviors. However, significant gender differences were not found on other two dimensions of Self-efficacy i.e. Social Efficacy, Emotional Efficacy and Perceived Competence.

Keywords: Gender Difference, Self-efficacy, Perceived Competence, t-test.

Introduction

Self-efficacy refers to one's convictions to successfully execute a course of action required to obtain a desired outcome (Bandura, 1997). These self-beliefs develop through four main sources, such as mastery experience, vicarious experience, verbal persuasion and physiological states (Bandura 1997; Joet et al. 2011). Thus, self-efficacy is a reciprocal interplay between personal factors, behavioural actions and environmental factors (Bandura, 2012a.)

In academic settings, it refers to beliefs concerning students' involvement in learning academic tasks and related to students' continuous effort, determination, and perseverance in learning and their capability to perform given academic tasks at designated levels (Schunk, 1991). Zimmerman (2000) highlighted that, in the past two decades, self-efficacy had emerged as a highly effective predictor of students' motivation and learning. Further, it helped in predicting common motivational outcomes, such as students' activity choices, effort, persistence, and emotional reactions. Self-efficacy beliefs have been reported to be positively correlated with academic achievement and students' engagement in academic activities (Usher, 2009; Schunk and Mullen, 2012).

Various researchers have emphasized that, in order to understand relationship between abilities and achievement, along with self-efficacy beliefs, it is important to study perceived competence of the students. Bandura (1986) argued that reasonably precise judgments of capability, matched to a specific outcome, afforded the greatest prediction and offered the best explanations of behavioral outcomes, because these were typically the sorts of judgments that individuals use when confronted with behavioural tasks. In terms of self-beliefs, Lefcourt (1982) argued that students' doubts about their own abilities to achieve and to have control over their own academic destiny were more likely to discourage the required investment of effort. Valentine et al. (2004) clarified that perceived academic competencies were not equivalent to achievement, but the processes that supported and

maintained a sense of academic competence were likely to contribute to achievement.

In studies of college students, who pursued science and engineering courses, self-beliefs had been demonstrated to influence the academic persistence, necessary to maintain high academic achievement (Lent et al., 1986). Valkyrie (2006), while examining the components of self-regulated learning among college students, concluded that academic self-efficacy and self-efficacy for self-regulation were positively related to achievement. In their study, Walker et al. (2006) found that self-efficacy contributed uniquely to the prediction of meaningful cognitive engagement. Goulao (2014) also reported positive relationship between self-efficacy and academic achievement among adult learners.

Number of studies have investigated the gender differences in self-efficacy and perceived competence across various academic domains. Shiomi (1992) indicated that boys scored higher on the self-concept regarding mathematics and girls were higher on anxiety about mathematics factor. Tremblay and Gardner (1995) asserted that academic self-efficacy varied with respect to gender and ethnicity. Further, a number of research studies have found that girls exhibit lower academic self-efficacy than boys, particularly in mathematics, a finding consistent for children from diverse ethnic backgrounds (Edelin and Paris, 1995; Middleton and Midgley, 1997; Middleton, 1999). In one study, gifted girls were found to be biased toward under confidence, although most students were generally biased toward overconfidence (Pajares, 1996b). In some studies, researchers have reported that girls perform as capably as boys, in varied academic tasks, but nonetheless report lower self-efficacy, particularly at higher academic levels (Pajares and Miller, 1994; Pajares and Johnson, 1996). Self-efficacy beliefs have also been found to be positively related to the performance in context of virtual learning. However, statistically significance gender differences were not indicated in this context (Cascio et al, 2013 and Taipjutorus et al. 2012). Huang (2013) highlighted that in self-efficacy gender differences did exist but the direction varied as sometimes these differences were in the favour of females and sometimes in the favour of males.

Furthermore, Zeldin and Pajares (2000) in their qualitative study of the self-efficacy of adult women they posited that, when forming their academic self-efficacy beliefs, women may rely more on others' judgments of their capabilities than on their own previous mastery experience. Usher and Pajares (2006) explored that whether the sources of self-efficacy differ as a function of gender. It was reported that the mastery experience and social persuasions predicted girls' academic and self-

regulatory self-efficacy, whereas mastery and vicarious experiences predicted these self-beliefs for boys.

Zeldin et al. (2008) analyzed the ways in which their self-efficacy beliefs were created of men and women who selected careers in science, technology, engineering or mathematics (STEM) and subsequently influenced their academic and career choices. The analysis revealed that mastery experience was the primary source of the men's self-efficacy beliefs, whereas, in case of women, social persuasions and vicarious experiences were the primary sources of self-efficacy beliefs. Therefore, these findings suggested that different sources are predominant in the creation and development of the self-efficacy beliefs of men and women who pursue STEM careers. Further, it was reported that self-efficacy beliefs of men in these male-dominated domains were created primarily, as a result of the interpretations they made of their ongoing achievements and successes and women on the other hand, relied on relational episodes in their lives to create and strengthen the confidence that they could succeed in male-dominated domains.

Overall, these research studies highlight that self- beliefs play a significant role in determining the career choice, effort, persistence, and perseverance required by a student to achieve high in academic setting. Further these self-beliefs vary with gender and are academic domain specific.

Rationale of the Study

Higher education is recognized, as a critical input, in human development and social development in any society. It is recognized, as a key input, for the development of human capital that has a decisive role in promoting economic growth in any society. Moreover, the era of globalization has witnessed a sea change in the job market. Thus perspective of viewing education as a medium for getting better employment opportunities has resulted in more emphasis on professional education. The engineering institutions have come to constitute a major proportion of these professional institutions. This spurt in the growth of engineering institutions has provided an opportunity for more students, entering into higher education, to get a professional degree. As a result the number of students enrolling in the engineering courses has registered a massive increase in recent years. Gender role stereotypes have confirmed that in the past, STEM careers were considered to be meant for males. However, in the recent past, unprecedented changes in women's level of educational participation and occupational status have been observed. These shifts in the academic and occupational preferences have made demarcations in academic domains on gender lines blurred. Nowadays, large number of girls are opting their

career in the field of science and technology. In the light of these changes, it becomes all the more significant to further explore whether gender differences exist in self-beliefs among engineering students as these beliefs play a pivotal role in choice of one's career and performance.

Objectives

1. To study gender difference in Self-efficacy.
2. To study gender differences in Perceived Competence.

Methodology of the Study

Sample

In the present study, the sample consisted of 559 engineering students (305 boys and 254 girls) of age ranging between 17-23 years. The sample was taken from various engineering colleges of Punjab. Care was taken that the colleges so chosen were more or less homogenous with regard to socio-economic, cultural background and academic milieu.

Tools used for data collection

Following tests were used in the present study to collect the required information from the subjects:

1. Self- Efficacy Questionnaire – (Muris, 2001)

Self-Efficacy Questionnaire is a self-reporting scale that purports to measure adolescents' beliefs about their competencies in social, academic, and emotional domains. These three domains are as under:

Academic Self-efficacy refers to beliefs regarding academic competence i.e. ability to succeed in academics and display appropriate learning behaviours.

Social Self-efficacy involves beliefs regarding competence in developing and maintaining social relationships i.e. ability to relate and get along with other peers.

Emotional Self-efficacy refers beliefs regarding competence in controlling negative emotions i.e. ability to regulate unpleasant emotions.

The questionnaire is composed of 24 items. The three subscales each contain eight items in which participants rate their competence level on a 5-point Likert-type scale (1 = not at all to 5 = very well). Scores are summed to yield a measure of self-efficacy for each domain. The internal consistency reliability of the questionnaire

appeared to be satisfactory as the author reported Cronbach's alpha 0.88 for the total self-efficacy score and between 0.85 and 0.88 for the subscale scores.

2. Perceived Competence Scale – (Pintrich and De Groot, 1990)

Perceived Competence Questionnaire is an 8-item 5-point Likert scale adapted from a subscale in the Motivated Learning Strategy Questionnaire (MSLQ) (Pintrich and De Groot, 1990). This Questionnaire assesses student perception of their ability of learning in the particular course they are taking. The items comprising this scale assess two aspects of expectancy: Expectancy for success and Self-efficacy. Expectancy for success refers to performance expectations, and relates specifically to task performance. Self-efficacy is a self-appraisal of one's ability to master a task and includes judgments about one's ability to accomplish a task as well as one's confidence in one's skills to perform that task.

The reliability coefficient of Perceived Competence Questionnaire has been reported to be 0.93.

Results and Discussion

The present work aimed at studying the gender differences in self-efficacy and perceived competence. First of all, Means, Standard Deviations, Skewness and Kurtosis of all the measured variables were calculated and have been reported in Table 1. As the Skewness was quite small in most of the cases, therefore, data were amenable to statistical analysis.

Table 1: Showing Mean scores, Standard deviations (SD), Skewness and Kurtosis of the Variables Understudy

S. No.	Variable	Boys (N=305)				Girls (N=254)			
		M	SD	Sk	Kurt	M	SD	Sk	Kurt
1.	Academic Self-Efficacy	27.04	4.90	-0.06	-0.26	29.67	4.18	-0.22	-0.14
2.	Social Self-Efficacy	27.95	4.48	-0.26	-0.15	27.91	4.60	-0.34	0.05
3.	Emotional Self-Efficacy	26.46	4.35	-0.10	0.44	25.77	4.81	0.04	-0.24
4.	Perceived Competence	29.76	4.77	-0.90	2.40	30.10	4.44	0.83	2.97

(M-Mean, SD-Standard Deviation, Sk-Skewness, Kurt-Kurtosis)

In order to study the gender difference in self-efficacy and perceived competence among engineering students, t-test was applied on the collected data. The results obtained are reported in Table 2.

**Table 2: Showing t-ratios of Self-efficacy and Perceived Competence
(Boys, N=305; Girls, N=254)**

S. No.	Variable	Boys		Girls		t-ratio
		Mean	SD	Mean	SD	
1	Academic Self-Efficacy	27.04	4.90	29.67	4.18	-6.7**
2	Social Self-Efficacy	27.95	4.48	27.91	4.60	0.095
3	Emotional Self-Efficacy	26.46	4.35	25.77	4.81	1.77
4	Perceived Competence	29.76	4.77	30.10	4.45	-0.87

**Value significant at 0.01 level

Table 2 shows the Means, S.D. and t-ratios for both boys and girls sample on various variables under study. The t-ratio analysis suggests that boys and girls differ significantly on one dimension of self-efficacy i.e. Academic efficacy (6.7, $p < 0.01$). However, significant gender differences have not been found on other two dimensions of Self-efficacy i.e. Social - efficacy and Emotional - efficacy. Also, t-ratio has not been found to be statistically significant to establish gender difference on Perceived Competence.

Table 2 reveals that the significant gender differences existed on academic self-efficacy among engineering students. As the mean score of girls on Academic self-efficacy is higher than that of boys, hence the girls perceived themselves more academically efficacious than boys. Thus, they had more confidence in their ability to succeed in engineering course also displayed appropriate learning behaviours. Tremblay and Gardner (1995) have also asserted that academic self-efficacy vary with respect to gender. This result is in contradiction to the results reported by various researchers which indicated these gender differences in academic self - efficacy in the favour of boys (Edelin and Paris, 1995; Middletown, 1999).

The results further reveal that significant gender differences did not exist on Social self-efficacy. This implies that these male and female engineering did not differ from each other significantly on their ability to relate and get along with peers, and in maintaining their social relationships. Further, these students also did not differ significantly from each other on emotional efficacy. Hence differences related to their ability to regulate unpleasant emotions have not been found significant among the sample understudy.

Furthermore, Table 2 reveals that with regard to Perceived Competence, gender differences have not come out to be significant. Thus, these students did not differ

significantly from each other in perceiving themselves capable of learning, the particular engineering course, they had opted for.

Major Findings

The results of the study indicate that as far as the beliefs about social skills and emotional regulation are concerned, not much difference exists between female and male engineering students. Also these students do not differ from each other in their perception about their abilities to learn the course they have opted for. However, significant gender differences exist in academic self-efficacy.

Educational Implications

These results are quite encouraging for educators, parents and teachers. They are indicators of a positive change with regard to career choice. Girl students are not only are exploring their career in the academic domains such as science and engineering, which were traditionally been considered as male domain, but also possess higher confidence in their abilities to learn and perform.

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