

Role of Entrepreneurship Education on Entrepreneurial Self-Efficacy among Female Engineering Students: A Pre- and Post- Instruction Analysis

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Abstract

The purpose of the study is to examine the impact of entrepreneurship education on the entrepreneurial self-efficacy (ESE) of the female engineering students of Odisha. A self-administrated questionnaire has been used to collect longitudinal data from randomly selected female students pursuing engineering in different affiliated and autonomous colleges including the private universities. The data have been collected twice over a period of three years from the students. 750 valid and reliable data have been collected and analysed using t-test, ANOVA and regression analysis. The findings of the study suggest that the present method of entrepreneurship education has improved the entrepreneurial self-efficacy of the female engineering students in the post-instruction period compared to the pre-instruction period. However, it is not sufficient enough in significantly improving the ESE since, the quality of entrepreneurship education is not significantly predicting the five dimensions of ESE. Furthermore, it has been noticed that the current educational system predominantly emphasizes the prediction of the searching and planning components of the ESE (Education System Effectiveness). In contrast, the remaining three crucial aspects, including marshaling, human resource implementation, and financial resource implementation, remain statistically insignificant.

Keywords: Entrepreneurship Education, Entrepreneurial Self-efficacy, Longitudinal Study, Engineering, Odisha.

JEL Code: I23, L25, L26

Introduction

A nation must rely on entrepreneurship to spur economic growth, and it has a significant impact on national growth, particularly in countries with high per capita incomes (Carree et al., 2002; Stel et al., 2005). Women entrepreneurs constitute a rapidly growing share of independently managed enterprises, expanding the economy, and constitute the segment of micro and small business owners with immense potential for growth (Kelley et al., 2017; Verheul et al., 2006). However, in many developing nations women remain undervalued in business and face considerable challenges while going into self-

employment (Pordeli et al., 2009; Guzman and Kacperczyk, 2019). Many research and theories have sought to comprehend and eliminate gender-related issues in entrepreneurship in light of the untapped economic potential of women entrepreneurs (Verheul et al., 2006). Common entrepreneurial descriptors are typically masculine since most of the entrepreneurship research use samples of males, which have been a presumption of many researchers and academicians (Gupta et al., 2009; Henry et al., 2016). Developing a more nuanced perspective of women's experiences in self-employment might improve the traditional portrayal of the varying approaches to entrepreneurship, as indicated by a few researchers of recent times. At the same time, several studies highlighted on the fact that entrepreneurship education has significant potential to influence entrepreneurial intentions (Souitaris et al., 2007; Martin, McNally, and Kay 2013; Sanchez 2013; Bae et al. 2014; Rauch and Hulsink 2015), On the other hand, some researchers have reported contradicting results (Oosterbeek et al., 2010).

Furthermore, despite its extensive exploration within Western literature, the subject remains relatively unexplored within the Indian context. Specifically, there is a scarcity of research concerning the analysis of entrepreneurial education's effects on female students' entrepreneurial self-efficacy, both before and after instruction. This scarcity underscores the significance of this study, which seeks to bridge this gap by investigating whether the provision of entrepreneurship education to female students across various engineering disciplines facilitates the development of their entrepreneurial self-efficacy. In doing so, this study anticipates making a noteworthy contribution to the ongoing discourse surrounding the influence of entrepreneurship education on the entrepreneurial aspirations of female engineering graduates. This has been an important issue in the Indian context since in the field of engineering there is a lot of potential for innovation and entrepreneurship. If engineering students are not properly guided with effective entrepreneurship education, entrepreneurship development would not be possible. Besides, this study especially focuses on female entrepreneurship as this is one of the most ignored subjects and most of the female students

exhibited poor entrepreneurial intent as per several prior studies (Maharana and Chaudhury, 2022a).

Literature Review

One of the most encouraging features of entrepreneurship education is the potential to enhance students' confidence in engaging in entrepreneurial activities. Limited studies have been conducted in this dimension even though entrepreneurial self-efficacy (ESE) is a reliable indicator of confidence of an individual to successfully develop a business (Mauer et al., 2009). Entrepreneurial Self-Efficacy (ESE), a more specialized iteration of the concept "Self-Efficacy" introduced by Bandura (1997), pertains to an individual's recognized proficiency in initiating and managing a business venture. Despite its potential applicability in entrepreneurship education, there is a notable scarcity of empirical inquiries into the significance of ESE within educational settings (McGee et al., 2009). The present research revolves around the development of ESE and its categorization is based on entrepreneurial tasks established by Mueller and Goic (2003) and further advanced and refined by McGee et al. (2009), who suggested that the measurement of ESE has five dimensions namely; "Searching, Planning, Marshalling, Implementation of human resources and Implementation of financial resources". According to numerous studies, searching for an entrepreneurial opportunity is a very critical and crucial activity (Shane & Venkataraman, 2000). Recognition of the right opportunity has been the stepping stone to entrepreneurial development as it includes the identification of certain consumer needs, demand and supply gaps or a solution to a genuine business problem. Therefore, several definitions of entrepreneurship highlighted the opportunity search as the focus point (Kirzner, 1997; Stevenson et al., 1985). Nevertheless, there has been an unending debate on the question of whether opportunities are created or uncovered (Alvarez & Barney, 2007; Shane, 2012). Conversely many forms of entrepreneurship education put more emphasis on the development of the ability to identify business opportunities.

The relationship between entrepreneurship education and entrepreneurial intentions is often underrepresented (Pittaway and Cope 2007). As per social learning theory

(Bandura 1977), the choice of a profession is correlated with how well one believes in his abilities to execute particular activities. Self-efficacy is the name given to these beliefs. At first, Boyd and Vozikis (1994) linked entrepreneurial self-efficacy (ESE) to intentions and actions in entrepreneurship. However, Krueger and Brazeal (1994) later recognized it as an essential trait for embarking on an entrepreneurial path. When examining how gender impacts the connection between entrepreneurship education and entrepreneurial tendencies, earlier research presented an unclear depiction. While some studies (Oosterbeek et al., 2010; Westhead and Solesvik 2016) demonstrated the role of entrepreneurship education in entrepreneurship development as more positive (or less negative) in the case of men than women, few studies on the other hand reported contradicting views (Bae et al. 2014). Thébaud (2010) demonstrated that women necessitate a higher education to believe they are competent in handling activities associated with any business or self-employment. Normally, women perceive themselves as less capable in many activities that are often dominated by the male community, and entrepreneurship is such an activity that created strong social and cultural misconceptions of gender roles. Because of this, females, especially, require a greater degree of education in order to feel competent enough and prepare themselves to pursue a career in entrepreneurship.

Similar to this, Wilson et al., (2007) demonstrated the beneficial impacts of entrepreneurship education on ESE, which are stronger for women than for men. Considering that female students recognise the advantages of entrepreneurship education more favourably than their male counterparts, this particular gender-specific impact may be attributed to their learning experience at the university level (Packham et al. 2010). However, some studies have shown that gender has a contradicting impact on the relationship between EE-ESE (Shinnar et al., 2014; Hutasuht, 2018 Nowiński, et al., 2019). In conclusion, given the previous studies' inconsistent findings regarding the gender's role, we put forth the following hypothesis:

H01: The quality of entrepreneurship education has a strong impact on the development of entrepreneurial self-efficacy of female students.

Entrepreneurial education has been a part of curricula in

Indian higher educational institutions. Even though it is an important subject for engineering students, many engineering institutions offer this subject as an elective paper (Maharana and Chaudhury 2022a). Therefore, students get an opportunity to choose a subject from various other elective subjects. Besides this, many institutions have variations of this particular subject offered to male and female students. Furthermore, the significance of the engineering branches is prominent and popular from the employment point of view. Few engineering subjects attract more employment opportunities whereas some have very limited job opportunities. Therefore, there is a high possibility of unemployment post-completion of engineering. On the other hand, entrepreneurship education could provide students with the necessary enterprising knowledge and skill so that they build their careers in entrepreneurship. Moreover, studies on this particular aspect in the Indian context are very rare. Therefore, we presume the following hypothesis.

H02: The entrepreneurial self-efficacy of the female students of different branches is not significantly different in pre- and post-instruction observations.

There is little research assessing entrepreneurship education (Kailer, 2007; Storey, 2000). Such investigations, if they are carried out at all, often try to comprehend the students' attitudes toward the subject or course of study after it has been completed. Usually, studies ask the students about their opinions regarding the institution, subjects taught, the entrepreneurship course, their entrepreneurial activities and their career choices (Kailer, 2007). Experiments using a control group with longitudinal data were inadequate (Weber et al., 2009; Wilson et al., 2007). Surprisingly, when examining studies that compared students' self-efficacy before and after completing an entrepreneurship course, it was unexpectedly discovered that these studies had either produced negative effects or reported gender-related concerns (Cox et al., 2002; Nowiński, et al., 2019; Hoang, et al 2020). Cox et al. (2002) further explained that, the possibility that the student's education level would have influenced the data and that the disappointing findings could perhaps be interpreted positively because students might well have started the entrepreneurship programme

with an overconfident attitude, which after the programme became more realistic. Once again, they proceed to introduce an alternative approach to teaching, one rooted in experiential methods rather than traditional evaluation techniques. Regardless of the rationale behind this choice, the effects of entrepreneurial education on self-efficacy and entrepreneurial intent become less clear when various other personal characteristics of the students are considered. Another longitudinal study conducted by Oosterbeek et al. (2010) uncovered similarly unfavourable impacts of entrepreneurship education on students' intentions to initiate their own businesses, underscoring the imperative need for additional research and evaluation concerning the outcomes of entrepreneurial education.

H03: The entrepreneurial self-efficacy of the female engineering students are not significantly different in the pre- and post- instruction period.

Methodology

Method: The study was carried out on some selected female students at engineering colleges of Odisha. By using a random sampling method, 750 students have been chosen from five (ECE, CSE & IT, Civil, Mechanical and EEE) engineering branches. The first round of data has been collected in their first semester and then the second round of data has been collected after the completion of a semester in which they study entrepreneurship as a subject.

Sample: In the first round of data, the phone numbers and email IDs of the respondent student were collected and then their syllabus to ensure when they were going to complete the entrepreneurship subject. After completion of the subject, they were again contacted to fillup another questionnaire which basically enquired about the quality of entrepreneurship education and change in their entrepreneurial self-efficacy. In the initial sample which was distributed to 1000 students, only 876 students turned up leading to a response rate of 87.6%. in the second round, the same students were identified and coded based on their phone numbers and email ids. The final data set received was tallied with the first round of data and only 796 matched out of which only 750 samples were selected and the rest were rejected as those were incomplete and biased responses.

Tools: A self-administered questionnaire was used to collect data from the respondent female students. Any demographic-related has not been collected information since it was a judgmental sample where the students were female only and their age group was almost the same. However, other information like the engineering branch, quality of entrepreneurship education (QEE) and entrepreneurial self-efficacy (ESE) were collected. T-test, and F-test were used to analyse the data. ESE was measured using the questionnaire developed by McGee et al. (2009) which contains five dimensions of ESE namely; Searching, Planning, Marshalling, Implementing Human Resources and Implementing Financial Resources. The reliability level of these constructs has also been verified using Cronbach's alpha. Further, the quality of entrepreneurship education was estimated using a score card consisting of questions relating to the type of subject, total class time allocated to the subject and value-added instruction methods apart from classroom teaching. The coding of the responses was done as per the scores given in Table-1. A higher score indicated a higher quality of entrepreneurship education whereas a lower score indicated a poor or average quality instruction.

Findings and Discussion

The study aimed at investigating the impact of entrepreneurship education on the entrepreneurial self-efficacy of female engineering students of different autonomous and affiliated colleges. Table 1 provides information relating to the profile of the sample respondents. It can be observed that five major branches were selected for the study where CSE and IT have been clubbed into a single department since they are nearly similar subjects. Further, no skewness has been observed in the collection of data from different departments and it has been tried to collect samples of equal numbers from each branch. However, only in the case of Civil Engineering Department only 15.73% of the total responses were received since, there were a smaller number of female students. A similar difficulty was also faced in the case of the Mechanical Branch where only 18.53% of samples could be managed. The highest number of students responded from ECE (22.40%) followed by CSE (21.87) and EEE (21.47%).

Table-1: Profile of the Respondents (N=750)

Categories	Groups	Frequency	Percentage
Department/ Branch	ECE	168	22.40
	CSE-IT	164	21.87
	Civil	118	15.73
	EEE	161	21.47
	Mech.	139	18.53
Subject type	Elective with Credit (0.8)	136	18.13
	Compulsory with Credit (1)	482	64.26
	Compulsory without Credit (0.5)	132	17.60
Total classes allocated in a semester with an average class time of 40 to 50 minutes	30-35 (1)	113	15.07
	35-40 (2)	549	73.20
	40-45 (3)	88	11.73
Additional Instruction methods apart from classroom teaching	Case study method (1)	359	47.87
	Field exposure (industrial visits/ seminars/ workshops) (1)	198	26.40
	Role play and project (1)	87	11.60

Source: Author's own interpretation of primary data

Table 2 gives information relating to the descriptive analysis of the test variable ESE. As an adopted scale in this particular research has been used, there is a need to analyse the normality and reliability of the test variables. For this

purpose, Cronbach's alpha has been used for estimating the construct reliability, skewness and kurtosis for ensuring normality.

Table 2: Descriptive statistics of the components of Entrepreneurial Self-Efficacy

Entrepreneurial Self Efficacy	Mean	SD	Skewness	Kurtosis	Cronbach's α
Searching	3.953	0.393	-0.223	-0.643	0.877
Planning	3.922	0.384	-0.161	-0.619	0.861
Marshalling	3.946	0.383	-0.137	-0.595	0.843
Implementing HR	3.975	0.391	-0.145	-0.779	0.911
Implementing FR	3.947	0.389	-0.169	-0.604	0.882

*Values in parenthesis indicate the score for estimating QE. Source: Author's own interpretation of primary data

Observing the statistical parameters, it becomes evident that the skewness and kurtosis values fall within the range of 0 to -1. According to George and Mallery (2010), asymmetry and kurtosis values in the range of -2 to +2 indicate a normal univariate distribution. Likewise, Hair et al. (2010) and Bryne (2010) concur that data can be considered normally distributed when skewness ranges from -2 to +2 and kurtosis falls within the -7 to +7 range. Consequently, we can confidently infer that our dataset exhibits a normal distribution, validating its suitability for further statistical analysis.

Further, the subject of entrepreneurship development has been offered to the students in different formats. However, the affiliated colleges follow the university guidelines and provide the subject as compulsory and with three credits, whereas, many autonomous colleges and private universities provide it either as a compulsory without credit or as an elective with credit. When a subject becomes an elective or without credit students show least interest in it. This study also observed that about 65% of the students are offered this subject as a compulsory one with credit. Whereas, 18% of the students studied it as an elective with

credit and 17.6% as compulsory without credit. Similarly, the class hours for the subject also plays an important role. It has been observed that majority of these institutions offered 35 to 40 classes in this particular subject, whereas, very few of them (11.73%) offered 40-45 classes. Only 15.07% offered less than 35 hours of class time. Finally, additional instruction methods like industrial visits, seminars, conferences, role-play activities, project development, and internship play a vital role in the practical exposure of the students towards business entrepreneurship. Therefore, the responses of the students

regarding the availability of such add-on or value-added instructions along with classroom teaching have been recorded. It has been observed that very few institutions (11.60%) provide for role play and project development-related teaching. 47.87% of institutions include case analysis methods of teaching as an important part of subject instruction, and only 26.4% of institutions offer industrial visits, seminars and workshop-related facilities. Further, the students were asked to rank the quality of teaching on a scale of one to five to estimate the variable QEE.

Table 3: ESE of Respondents of Different Branch pre and post instruction

Dimensions of ESE	Instruction	F-statistics	Sig.
Searching	Pre	0.706	0.588
	Post	0.781	0.538
Planning	Pre	1.052	0.379
	Post	1.217	0.302
Marshalling	Pre	1.212	0.304
	Post	0.297	0.880
Implementing HR	Pre	0.502	0.734
	Post	0.369	0.831
Implementing FR	Pre	0.350	0.844
	Post	0.597	0.665

Source: Author's own interpretation of primary data

Table 3 depicts the ANOVA results pertaining to the analysis of the differences in the different dimensions of ESE among the students of the five departments. It has been observed that all the F-values are not statistically significant indicating no significant difference among the ESE of the students of different branches of engineering. This led to the acceptance of the null hypothesis H02 which states that there exists no significant difference in ESE of the female students of five engineering branches both pre- and post-instruction.

Table 4 given below presents the repeated measure t-test

Table 4: Entrepreneurial self-efficacy in pre- and post-instruction period (N=750).

Dimensions of ESE	Paired Differences		t-statistics	Sig. (2-Tailed)
	Mean	SD		
Searching	-0.084	0.184	-4.167	0.000
Planning	-0.107	0.169	-5.441	0.000
Marshalling	-0.057	0.165	-2.907	0.004
Implementing HR	-0.065	0.167	-2.925	0.003
Implementing FR	-0.103	0.180	-5.157	0.000

Source: Author's own interpretation of primary data

results of pre- and post-results of the students' ESE. It has been seen that all the five dimensions indicated a significant difference in before and after the teaching of entrepreneurial education subject. This also led to the rejection of the null hypothesis H03 which states that there exists no significant difference in the ESE of the female students in the pre- and post-instruction period. However, this improvement in ESE is further tested by analysing how far entrepreneurial education has been able to affect the level of ESE of female students in the post-instruction period.

For analysing the impact of the quality of entrepreneurship education on ESE in the post-instruction period, a linear regression analysis has been conducted by taking the five dimensions of ESE as the response variable and QEE as the predictor variable. This gave rise to a very interesting and clear picture regarding the role of entrepreneurship education on the ESE of female engineering students. It is evident from Table-5 that the searching and planning ability of the students were significantly increased due to entrepreneurship education. However, their marshalling and implementation of human resources have not been improved significantly due to the present form of entrepreneurship education. Similarly, the implementation of financial resources-related ability through exhibited positive improvement but not significant at 1% level of alpha. For analysing the impact of the quality of

entrepreneurship education on ESE in the post-instruction period, a linear regression analysis has been conducted by taking the five dimensions of ESE as the response variable and QEE as the predictor variable. This gave rise to a very interesting and clear picture regarding the role of entrepreneurship education on the ESE of female engineering students. It is evident from Table-5 that the searching and planning ability of the students were significantly increased due to entrepreneurship education. However, their marshalling and implementation of human resources have not been improved significantly due to the present form of entrepreneurship education. Similarly, the implementation of financial resources-related ability through exhibited positive improvement but not significant at 1% level of alpha.

Table 5: Quality of Education and ESE

Dimensions of ESE	F	β	SE	t-statistics	Sig.
Searching \leftarrow QEE	20.659*	0.031	0.007	4.428	0.000
Planning \leftarrow QEE	10.859*	0.023	0.007	3.295	0.001
Marshalling \leftarrow QEE	7.788*	0.009	0.007	1.286	0.198
Implementing HR \leftarrow QEE	16.067*	0.013	0.007	1.857	0.062
Implementing FR \leftarrow QEE	6.614*	0.018	0.007	2.285	0.023

Dependent variable: Dimensions of ESE

Source: Author's own interpretation of primary data

It is very interesting to note that the present form of entrepreneurship education is not enough in establishing ESE among female students. Many prior studies have inferred that entrepreneurship remained a male-dominated job. Studies also revealed that male students exhibited more entrepreneurial intent compared to their female counterparts (Smith et al., 2016; Feder and Nitu-Antonie, 2017; Nowiński et al., 2019; Arora and Jain, 2019; Maharana and Chaudhury 2022a). Besides, entrepreneurial intent developed through education is quite consistent in males but fades out in female students (Matthews & Moser 1996). Studies focused on gender-related issues in entrepreneurship claim that male students show more interest in entrepreneurship education as it helps in career development. However, the present findings of the study indicate something different. It shows more concern towards the development of ESE rather than towards

entrepreneurial intent. However, the positive relationship between ESE and EI has been proved by many prior researchers (Hsu 2019; Elnadi & Gheith 2021; Maharana and Chaudhury 2022b). Therefore, developing self-efficacy among the students has become more important and it is only possible through improved entrepreneurial education. More practical-oriented instruction methods, projects, role play, industrial visits and field exposure could add to the quality of instruction provided to the engineering students. This can be possible through a strategic change in the instruction methods and regular faculty orientation programs.

Implications

This study makes a distinctive contribution to the research on women's entrepreneurship development in India. It highlights the critical role of education in cultivating an

entrepreneurial mindset among students, underscoring the need for enhancements in the education system. The findings reveal a noteworthy increase in self-efficacy levels following the instructional period. Consequently, it can be deduced that tailoring instructional methods to align with the needs of female students holds significant potential for fostering women's entrepreneurship within the state.

Conclusion

Given the growing enthusiasm for entrepreneurship education across various domains of higher education, the imperative to assess its impacts is on the rise. This study unequivocally illustrates that the existing framework of entrepreneurship education enhanced the entrepreneurial self-efficacy of female engineering students after instruction. Nevertheless, it falls short of inducing a substantial improvement in entrepreneurial self-efficacy that is conducive to fostering entrepreneurial advancement. The observation of this particular study provides suggestions to improve the method of teaching as well as providing practical exposure to the students on different aspects of entrepreneurship development like opportunity identification, prototyping, product development, product testing or test marketing, risk analysis, budgeting, operational planning, human resource management, marketing planning and so on. This would certainly help the engineering students in the development of their self-efficacy level and entrepreneurial mindset.

Limitations and Scope

There are a few limitations in the study. First of all, we have a limited scope on the use of variables since this particular study adopted an experimental observation on the impact of the quality of entrepreneurship education on entrepreneurial self-efficacy. Further, we have not taken into consideration all the types of engineering college (i.e., affiliated, autonomous or university) while accessing the quality of entrepreneurship education. Secondly, the study has not taken into account the demographic characteristics of the students like their nativity, caste, financial status, and family background which could have a considerable impact on the development of entrepreneurial self-efficacy.

Further studies can consider these demographic variables to

analyse the impact of entrepreneurship education on entrepreneurial self-efficacy or entrepreneurial intent. The scope of the study can also be extended to different states and can be done in a more robust way if the career choice of the students especially, an experimental group to analyse entrepreneurial behaviour of the students.

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