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Mukesh Kumar
Research Scholar, Department
of Education, OPJS
University, Churu, Rajasthan,
India

A study of the students' perceptions of engineering classroom learning environments and their association with attitudes towards engineering

Mukesh Kumar

Abstract

The present study compares the engineering classroom learning environments of selected Private and Government engineering colleges of Jammu city in relation to their attitudes towards engineering. Data was collected from 200 students pursuing engineering in one Private and one Government co-educational engineering college. To assess the classroom learning environments of engineering students, Actual and Preferred versions of Questionnaire What Is Happening in This Class (WIHIC) along with Attitude towards engineering Scale were administered. Directed by the research objectives, numerous statistical analyses were performed. These included Cronbach's alpha reliability, Mean correlation, Means, Standard Deviations, t-Test, Simple, multiple correlation and regression coefficients etc. The results show that WIHIC along with Attitude scale is a reliable and valid tool for measuring classroom learning environment in engineering classroom settings. The results also show that students of both types of colleges would prefer an enriched learning environment than the one they presently perceive on all WIHIC dimensions. The results also highlight students' positive attitude towards engineering. This study strongly supports the view that the nature of the classroom environment strongly influences students' attitudes towards engineering. The results of gender differences with references to students' perceptions of their engineering classroom learning environments shown that out of seven scales of WIHIC only one scale, i.e. Teacher Support is significant and no gender differences in their attitudes towards engineering have also been obtained in this research. The results of the comparison of the engineering classroom learning environments between selected private and government colleges show that three out of the seven scales of WIHIC (Teacher Support, Task Orientation and Equity) differ significantly in the two types of colleges in terms of their engineering classroom learning environments.

Keywords: Learning environment, students' perceptions, engineering education

Introduction

India has the potential to be a global technology leader. The Indian economy has been growing at the rate of 9% per year. The Indian industry has also become globally competitive in several sectors and can increase its global market share. A critical factor in this will be the success of the technical education system in India. (Banerjee and Muley, 2007) [2]. Engineering education in India has a long tradition, the beginning of which goes back to the year 1847. In that year the Thomason College of Civil Engineering at Roorkee was established which, later became the Roorkee University (1949), the first engineering university in the country. This was followed by the establishment of the College of Engineering in Pune in 1854, which is still in existence. It was only after Independence that engineering and technological education got a great boost. The development of technical education has been one of the major achievements of the post-independence period. The creation of the All-India Council of Technical Education in 1945 and the Report of the Scientific Manpower Committee (1947) has a far-reaching influence in this development. The reports of the Engineering Personnel Committee (1956) and the Committee for Postgraduate Engineering Education and Research (1961) gave an impetus to higher-level technical education (Devassy, 2007) [4].

Understanding that the experiences of students pursuing an engineering degree is an important issue for the pedagogy of engineering programs, a study by Korte and Smith (2007) [13] sought to identify students' perceptions of their educational experiences and their motivations for and dreams of a career in engineering.

Corresponding Author:
Mukesh Kumar
Research Scholar, Department
of Education, OPJS
University, Churu, Rajasthan,
India

The study also provided a snapshot of the current status of engineering education from the perspective of engineering students including students' decisions behind their choice of engineering as a discipline, the learning experiences of engineering students, and gender-related perspectives regarding engineering education. The findings suggest opportunities to improve the educational process for students in engineering programs. There is an increasing interest and concern regarding the role of learning environment in undergraduate engineering education in the recent years.

Most of the research studies favour an assessment of the academic programmes in engineering education (Fraser, 1998) ^[6], however aspects related to learning environments and attitudes of the budding engineers have been overlooked. The present study attempts to assess student's perceptions of their Engineering classroom learning environments and its association with attitude towards Engineering.

Need and Significance

Engineering education in India has seen tremendous growth over the past decade, both in number of students and number of colleges; however the average quality of the colleges and graduated students has become suspect (Sengupta, 2006) ^[17]. Indian Engineering Education represents one of the largest educational systems in the world. The challenges posed by this rapidly growing system in our country are extremely complex. While addressing the strategy of nurturing a large number of highly intelligent postsecondary students in a proper manner, quality of engineering education emerges as the issue of paramount importance. A core set of such needs must be identified. It should include skills related to manufacturing, computer technology, interpersonal relations, and analytical techniques and psychosocial aspects. Most of the research studies favour an assessment of the academic programmes in engineering education (Fraser, 1998) ^[6], however aspects related to learning environments and attitudes of the budding engineers have been overlooked. The present study attempts to combine the field of learning environments and engineering education in terms of certain student outcomes such as attitudes towards their course etc. So, in the present study existing learning environments in the Engineering classrooms have been studied to know their nature and to bring certain modifications according to the needs of the Engineering students and demands of engineering classrooms. From a researcher's point of view, I was interested in understanding students' perceptions of learning environments that exists in the classrooms of engineering colleges. These colleges comprise an important part of professional education. I was also interested in assessing the attitudes of students towards their engineering course. Hence I decided to conduct research into the above mentioned aspects as very few studies have been undertaken combining the two fields of learning environments and engineering education.

Objectives of the study

1. To determine the reliability and validity of What is Happening In This Class (WIHIC) questionnaire for use with engineering students in government and private colleges of Jammu.

2. To assess the student's perception of their engineering classroom learning environments in government and private colleges of Jammu along with their attitudes towards engineering.
3. To investigate associations between students' engineering classroom learning environments and their attitudes towards engineering.
4. To investigate whether gender differences occur in students' perceptions of their engineering classroom learning environments and attitudes towards engineering.
5. To compare the engineering classroom learning environments of government and private colleges of Jammu.

Sample

The sample was consist of 200 engineering students (both boys and girls) taken from two engineering colleges of Jammu city (One Government and one Private). The sample was chosen carefully so as to be representative of the population and comprise of co-educational classes in order to permit an unbiased test of gender differences. The sample was selected randomly and students studying in the 3rd year of their engineering programme were part of the sample.

Tool employed

The data collected for the study was quantitative in nature and the data collection was done using a tool i.e. what Is Happening in This Class (WIHIC) Questionnaire for assessing students' perceptions of their actual and preferred engineering classroom learning environments. The What Is Happening in This Class (WIHIC) questionnaire was developed by Fraser, Fisher and McRobbie (1996) ^[5] to study the perceptions of the students for interpreting their classroom learning environments. In the final version, there are 56 items under seven scales with eight items in each scale. The seven scales of the WIHIC questionnaire are Student Cohesiveness, Task Orientation, Teacher Support, Involvement, Investigation, Cooperation and Equity. The attitude of the students towards engineering course was assessed by using a scale developed from the Test of Science Related Attitude (TOSRA) developed by Fraser (1981).

Statistical Techniques Employed

The statistical techniques used in this study were Cronbach Alpha Reliability, Discriminant Validity, Means, Standard deviations, t-test, Simple and Multiple correlations and standard regression coefficient.

Major Findings

1. The study showed that WIHIC along with attitude scale is a reliable and valid tool for measuring Classroom Learning Environment in engineering classroom setting.
2. Students perceive their actual Engineering Classroom Learning Environment to demonstrate student cohesiveness, task orientation, investigation, cooperation and equity which gives a positive picture about their psycho-social environment. This indicates that students are more helpful and supportive of each other. They get support and timely help from teachers in the class. They are cooperative towards each other and get equal opportunities in the engineering

classroom. The result for the paired t-test indicates that there were significant differences in the actual and preferred learning environments as perceived by the students for all the scales of WIHIC except equity. The results of the attitudes towards Engineering Scale revealed that students generally have positive attitudes towards Engineering.

3. The regression analysis indicates that none of the scales of WIHIC retained its significance at any level. Hence the learning environments in engineering classrooms do not predicts the attitudes of students towards Engineering.
4. The results of the gender differences revealed that out of seven scales of WIHIC only one scale i.e. Teacher Supports was significant. This means that female students may perceive more teacher supports and feel that teachers take more personal interests in them as compared to male students. It is also evident from study that there were no gender differences between male and female students in their attitude towards Engineering.
5. The results of the comparison of the Engineering Classroom Learning Environments between private and Government colleges showed that three out of seven scales of WIHIC differ significantly. These were Teacher Support, Task Orientation, and Equity scales. Thus it means that students may get more support and timely help from teacher in Government colleges than in the private colleges. Also the skills and processes of enquiry and their use in the problem solving and investigation were more emphasized in Government colleges.

Educational Implications

1. For the first time a comparative study of the Engineering Classroom learning environments has been undertaken in selected private and governments colleges of Jammu (J&K) using the learning environments questionnaire (WIHIC).The results have shown that WIHIC can be considered as a reliable tool in engineering classroom settings. The study is likely to be significant to teachers by providing information that can be used to improve the learning environment in ways that are likely to enhance attitudes towards their subjects.
2. The study is significant because the outcomes can provide guidelines for policy makers and teachers to improve engineering education.

Delimitations of the Study

This study is confined to 200 students only. This study is limited to Engineering Colleges of Jammu only. A limited time was available for collecting data from the colleges. Due to paucity of time the present study is only quantitative in nature, whereas using qualitative analysis could have enhanced the results. Also, only two engineering colleges of Jammu were taken for this study, and taking more colleges would have contributed to the richness of the data.

Suggestions for future research

1. A sample of 200 students was taken in the present study. However, the same study can be conducted using a large sample.
2. In future, research based on a comparison of engineering classroom learning environments of single-

sex and coeducational colleges could be a worthwhile study.

3. The present research study provides grounds for future research that would enable the various agencies of higher education to bring improvement in classroom learning environment especially by modifying curriculum development, teacher interpersonal behaviour, instructional strategy etc.
4. Experimental studies are needed for examining approaches for helping teachers to improve their classroom learning environments as well as for investigating its impact on student outcomes.
5. Lastly, future research studies on engineering classroom learning environments should explore possibilities for developing creativity amongst students and teachers and enhance their creative potential.

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