Quality Circle: A perspective from Engineering Education

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Abstract
Quality circle is a participatory management technique used to solve the quality related problems by involving the employees in industries. Now-a-days the concepts of Quality circle have been implemented in educational institutions to improve the academic performance. Although exhaustive researches are conducted to implement quality circle concepts in educational institutions, many challenges still remain to be solved. An attempt has been made in this research to implement the quality circle concepts in an engineering institution. In this study, quality circle is formed by grouping students identified for experimental study. The pros and cons of implementation and academic performance improvement were studied. The results of the study revealed that implementation of quality circle concepts improved the involvement of students in the teaching-learning process, active learning and academic performance by 20 to 30 %.

Keywords: Active Learning, Higher Education, Passive Learning, Small Group, Teaching-Learning,

1. Introduction

Quality Circle (QC) is a small group of employees in the same work-area or doing a similar type of work who voluntarily meet regularly for about an hour every week to identify, analyze and resolve work-related problems, leading to improvement in their total performance and enrichment of their work life [1]. The concept of Quality Circles was first conceived in Japan and evolved in three historical phases [2].

- Implementation of SQC techniques was started in Phase-2 (1950s). Japanese transformed the teaching of these experts into a new concept “Quality Circle”. QCs were thus conceived in Japan by 1961 under the leadership of Dr. Kaoru Ishikaw.
- In Phase-3 (1960s to present), many quality circles have been registered. The spirit of Ishikawand other pioneers continues in the quality circles of today.

Journey of QC concepts started in industries progressively extents over 35 organizations in the very first year. Followed by this, several countries have stated implementing the QC. As of 2015, QCs operate in most East Asian countries and it was recently claimed that there were more than 20 million quality circles in China. Even though, the concept of QCs first begun in the industries to ensure and improve the quality, some researchers have attempted to apply the same concepts in education field [3 – 5]. The momentum of implementing QCs has been started in educational sectors in India also, and QCFI (Quality Circle Forum of India) is promoting such activities. The first QC implementation in education sector was started in India by 1993 named as Student Quality Circle (SQC) and soon it gained currency across the globe [6]. Nahai et al. (2012) says SQCs have been very effective tools in bridging three important parameters: “Quality improvement, Student engagement and the Student learning experience” [7]. In this research, an objective was set to investigate the performance of slow learners in a class by implementing SQC concepts.

2. Literature Review

International communities are being attracted by Students’ Quality Circle (SQC) approach which improves the quality of teaching - learning experience. In contrast to the traditional top-down model of teaching-learning process, SQC is a bottom-up and self-managed approached by students with support and resources provided by faculty members and administrators. The idea of learning through students’ self-managed groups with the support of faculty members was started by Harvard Medical School since its independence and named it as problem-based learning. The focus on learning in small groups by discussion has been believed to be a very successful initiative and expected to grow in near future [8]. In order to create a difference in teaching –

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learning. City Montessori School in Lucknow, India has implemented QC concepts in primary and secondary education during 1993. Asian and African countries such as Nepal, Bangladesh, Sri Lanka, Pakistan, Turkey and Mauritius have also started implementing QC in junior and senior high schools [6]. The World Council for Total Quality and Excellence in Education was established in the year 1999 with its head office at Singapore and Corporate Office in Lucknow. Prof. Dinesh P. Chapagain, Nepal has written a book titled "A Guide Book on Students’ Quality Circle: An Approach to prepare Total Quality People". This book has brought out the concept, formation of QC, standard guidelines from inspection and implementation of SQC [9]. Students’ quality circle (SQC) is also gaining importance in higher education institutions and provides a platform for active learning against the conventional passive learning methods [10]. Although, QC activities have evolved as an important method of quality improvement in school education, its application in engineering education is limited. In this context, it is planned to implement SQC for slow learners in the Mechanical Engineering course and to evaluate the students’ performance. Slow learner would normally fall under the lower end of the “Bell Curve” and not perform at grade level. Slow learners need help but special education like intensive coaching class is not the answer at graduate level. It is challenge for all to make them succeed in their studies. The methodology adapted in the current investigation to improve the performance of slow learners is presented in the next chapter.

3. Methodology

This study involved slow learners of a particular year students enrolled in Mechanical Engineering course named as experimental group. The methodology of the study is illustrated in Figure 1 below. This methodology is developed based on SQC in the department of management at College of Business Administration, Salman bin Abdul-Aziz University, KSA.

![Fig. 1 Methodology](image)

Students identified for Quality Circle are in the semester December 2014 to April 2015. Students having arrears up to November 2014 were identified and named as slow learners. Students without arrear and inclined towards teaching were named as QC leaders. Slow learners were asked to form groups and choose their QC leader. It creates a student-centric environment where students are involved and encouraged to participate enthusiastically in their teaching-learning process. SQC acts like a catalyst in transforming a passive learning environment to an active learning environment and provides a strong academic experience with improved performance.

4. Experiments

Students were oriented in the beginning of the semester on the first day in the class with a detailed briefing about QC and benefits of QC such as learning through peers, pleasant relationship between faculty and students, and better academic performance. Experimental groups were formed based on the model shown in Fig. 1. Fifty students were identified as slow learners out of 141. Five students were selected as QC leaders from third year Mechanical Engineering course. Each group consists of 10 members and one QC leader. A faculty member from the Mechanical Engineering provided facilitation. Demographic profiles of students selected for the study are listed in Table 1.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Demographics</th>
<th>No. of Students</th>
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<tbody>
<tr>
<td>1</td>
<td>Age (in years)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤ 20</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>20 - 25</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>&gt; 30</td>
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</tbody>
</table>

Table 1 Demographic Profile
The circle members meet twice in a week for 45 minutes (Figure 2) and take up important titles of the subjects in which they are struggling to get through for discussion.

QC leaders guide them and explain the difficult topics in creative and easy ways. Pairing bright students with slow learners would help the slow learners to clarify the doubts without any hesitation. To evaluate the change in students’ perceptions regarding education, Facilitators get feedback from SQC members, take remedial measures and evaluate their performance based on end semester results.

5. Result And Discussion

A total of 25 meetings were held between December 2014 and April 2015. Outcome of the QC is evaluated based on the end semester examination and results are given below. The study results reveal that the academic performance of QC members has improved marginally. Out of 50 students in the experimental group, 16 students (32%) were cleared all arrears. The investigation results further show that percentage of students having 3 to 5 arrears were reduced by 20% students and percentage of students having more than five arrears also came down by 14%. Percentage of students having less than 3 arrears was increased by 2%.

The effort needed to keep the QC's functioning effectively requires strong support and commitment from the group members and management.

<table>
<thead>
<tr>
<th>Arrears</th>
<th>&lt;3</th>
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<tbody>
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<td>19</td>
</tr>
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<td></td>
<td>&gt;5</td>
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<td>Urban</td>
<td>12</td>
</tr>
<tr>
<td>Rural</td>
<td>38</td>
</tr>
</tbody>
</table>

Fig.2 SQC Meeting

Fig.3 Performance chart
6. Conclusion

The development of educational institutes lies in the students overall growth. QC is used as an innovative approach to improve the institution growth. Attempt made through this investigation to improve the performance of slow learners also shown good results. The results of this study revealed that implementation of quality circle concepts improved the involvement of students in the teaching-learning process, active learning and academic performance by 20 to 30%.

References