QUALITY CIRCLE: A Best Practice at RIT

A quality circle is a volunteer group composed of faculty members, who are trained to identify, analyze and solve work-related problems and present their solutions to the management in order to improve performance of the organization.

Rajarambapu Institute of Technology (R.I.T.), Islampur, Maharashtra, India is successfully implementing this activity. As a part of quality circle, all the departments in the institute participate in this activity. The activity starts in the month of August with group formation and ends in May with final presentations and evaluation of the groups. Faculty members identify work related problem, solve the problem as per 12 step quality circle methodology and develop as well as implement the solutions in order to contribute to the academic empowerment.

Theme for 2022-23 was 'Student Development'as there is a growing need to equip engineering students' growth and success not just with technical knowledge but also to develop a holistic set of skills equipping them to face the real world. The efforts are taken in the direction to develop an overall personality of students to make them an efficient engineer for employment and self-employment.

Student Development activity under Quality Circle for the academic year 2022-23 listed below in Table No.1

Table 1:
Student Development activity under Quality Circle for the academic year 2022-23

Sr. No.	Title of the Problem
1	Inculcating Basic Civil Engineering Skills Through Comprehensive Training Model
2	Holistic Student Development
3	Empowering students to redefine and transform their professional and personal lives
4	Industry ready graduate through comprehensive training
5	Promote holistic development among engineering students
6	Enhancing Student employability and entreprenship development
7	Performance Improvement in Technical Competitive Examination
8	Active learning strategies for better learning of basic science courses

Achievements of Quality Circle

The institute is a regular member of Quality Circle Forum of India (QCFI), Secunderabad and takes part in competitions organized by it at chapter and national level every year. The following Table No 2 shows the awards received in various conventions for the academic year 2022-23.

Table 2
Achievements of Quality Circle

Name of Department/ Team	Awards received at Chapter and National Convention on Quality Circle
Quality Circle Team from Computer Science and Information Technology Department	Published a research paper on, "Effective Conduction of Laboratory Courses in Online Learning using Virtual Lab",Journal of Engineering Education Transformations, Volume No 36, January 2023, Special issue, eISSN2394-1707, Vol 36, No SP (2023), DOI:10.16920/jeet/2023/v36is2/23016
Quality Circle Team from Electrical Engineering Department	Published a research paper on, "Virtual Lab Development to Enhance Student Learning: A Quality Circle Approach", Journal of Engineering Education Transformations, Volume No 36, January 2023, Special issue, eISSN2394-1707, Vol 36, No SP (2023), DOI: 10.16920/jeet/2023/v36is2/23039
Quality Circle Team from Civil Engineering Department	Published a research paper on, "Improving of Placements, Higher Studies and Entrepreneurships of Civil Engineering Students through Quality Circle Activity", Journal of Engineering Education Transformations, Volume No 36, January 2023, Special issue, eISSN 2394-1707 DOI: 10.16920/jeet/2023/v36is2/23002
Quality Circle Team "Enthuse" from Electrical Engineering Department	EXCELLENCE AWARD in the 36th National Convention on Quality Concepts (NCQC 2022), hosted by QCFI Aurangabad Chapter in association with MGM University, Aurangabad from 27th to 30th December, 2022. "Integrated Quality Concepts - The Gateway to Global Leadership" was the theme for this year's Convention.
Quality Circle Team "ABHINAV" from Computer Science and Information Technology Department	EXCELLENCE AWARD in the 36th National Convention on Quality Concepts (NCQC 2022), hosted by QCFI Aurangabad Chapter in association with MGM University, Aurangabad from 27th to 30th December, 2022. "Integrated Quality Concepts - The Gateway to Global Leadership" was the theme for this year's Convention.
Quality Circle Team "ELITE" from Mechanical Engineering Department (Diploma Wing)	EXCELLENCE AWARD in the 36th National Convention on Quality Concepts (NCQC 2022), hosted by QCFI Aurangabad Chapter in association with MGM University, Aurangabad from 27th to 30th December, 2022. "Integrated Quality Concepts - The Gateway to Global Leadership" was the theme for this year's Convention.
Quality Circle Team "M-CAD" from Mechanical Engineering Department	First Prize in 35th Quality Circle Competition-Maharashtra State Level held in Kolhapur on 08/10/2022. The QC Competition was organized by Confederation Indian Industry.

Quality Circle Team "Enthuse" from Electrical Engineering Department	GOLD Award in the 37th Chapter Convention on Quality Circle (CCQC) 2022, at Quality Circle Forum of India, Pune chapter which was held on 24th September 2022.
Quality Circle Team "ABHINAV" from Computer Science and Information Technology Department	GOLD Award in the 37th Chapter Convention on Quality Circle (CCQC) 2022, at Quality Circle Forum of India, Pune chapter which was held on 24th September 2022.
Quality Circle Team "ELITE" from Mechanical Engineering Department (Diploma Wing)	GOLD Award in the 37th Chapter Convention on Quality Circle (CCQC) 2022, at Quality Circle Forum of India, Pune chapter which was held on 24th September 2022.

Outcomes Achieved:

- This kind of activity gives the faculty members an opportunity to work together, work collaboratively towards a common goal and understand systematic methodology for problem solving.
- Be recognized at institute; state, national and international levels organized by Quality Circle Forum of India (QCFI) and gives them a chance to experience joy of learning.
- Increased success of students in technical competitive examination.
- Enhanced employability skills of students.

Mrs. S.N. Patil	**Dr. S.K. Patil**	**Dr. P.V. Kadole**
Coordinator	**Dean Academics**	**Director**

QUALITY CIRCLE: A Best Practice at RIT

Photos =2022-23

Photo no. 1 Final Presentation, 17th August 2023

Photo no.2 Team Presenting case study, 17th August 2023

Photo no.3 GOLD Award for Abhinav, Enthuse and Elite team in the 37th Chapter Convention on Quality Circle (CCQC) 2022, at Quality Circle Forum of India, Pune chapter which was held on 24th September 2022.

Photo no.4 EXCELLENCE AWARD for Abhinav, Enthuse and Elite team in the 36th National Convention on Quality Concepts (NCQC 2022), hosted by QCFI Aurangabad Chapter in association with MGM University, Aurangabad from 27th to 30th December, 2022. "Integrated Quality Concepts - The Gateway to Global Leadership" was the theme for this year's Convention.

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Improving of Placements, Higher Studies and Entrepreneurships of Civil Engineering Students through Quality Circle Activity

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Abstract—Outcome Based Education (OBE) system is playing a vital role in engineering education as per New Education Policy 2020. In OBE, different types of active learning tools, varying from a simple, class room assessment tools like one-minute paper, think-pair-share, flipped classroom, to a more complex technique like problem based learning, cooperative learning, peer supported independent study are used so that the engineering graduates get equipped with required skill sets to make them industry ready. In India, nowadays the quality of education provided by the institutions and the programs run by these institutions is evaluated by two major bodies namely NBA and NAAC. Accreditation of the programs and institutions by NBA and NAAC is based on some criteria and it has become an essential requirement to ensure the quality technical education. In NBA and NAAC, students' placements, higher education, entrepreneurship, industry internship and connect with industry are considered to be the key indicators for ensuring quality technical education and a higher weightage has been provided in the evaluation process. In this paper, an attempt has been done to improve students' placement index (i.e. placements, higher studies and entrepreneurships) by implementing the concept of Quality Circle (QC) activity for the students of civil engineering department of Rajarambapu Institute of Technology, Rajaramnagar. The results indicate that implementation of QC concept could improve placement index by 10% for last two batches and could maintain progress even during COVID pandemic. Thus, study concludes that implementation of QC concept helps in enhancing placement index of department.

***Keywords*— NAAC; NBA; Outcome Base Education; Placement Index; Quality Circle;**

***JEET Category*—Research**

I. INTRODUCTION

The engineering education is an important field for achieving full human potential, developing an equitable and just society, and promoting national development. Universal high-quality education is the best way forward for developing and maximizing our country's rich talent and resources for the growth of the individual, the society, the country, and the world. India will have the highest population of young people in the world over the next decade, and our ability to provide high-quality educational opportunities to them will determine the future of our country. The global education development agenda reflected in the 4th sustainable development goal (SDG4) for sustainable development adopted by India in 2015 which seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030.

The world is undergoing rapid changes in the knowledge background. With various dramatic scientific and technological advances, such as the rise of big data, machine learning, many unskilled jobs worldwide may be taken over by machines, while the need for a skilled workforce, particularly involving mathematics, computer science, and data science, in conjunction with multidisciplinary abilities across the sciences, and humanities, will be increasingly in greater demand. The growing emergence of epidemics and pandemics will also call for collaborative research in infectious disease management and development of vaccines and the resultant social issues heightens the need for multidisciplinary learning.

With the quickly changing employment background and global ecosystem, it is becoming increasingly critical that engineering students not only learn, but more importantly learn how to learn. The Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values, in addition to science and mathematics, to develop all aspects and capabilities of learners; and make education more well-rounded, useful, and fulfilling to the learner. All these abilities are possible to be achieved in the presently adopted OBE system. The NBA and NAAC are the two major bodies at the national level which play a great role in evaluating the performance of programs run by

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Photo no.5 Research paper on, "Improving of Placements, Higher Studies and Entrepreneurships of Civil Engineering Students through Quality Circle Activity", Journal of Engineering Education Transformations, Volume No 36, January 2023, Special issue, eISSN 2394-1707

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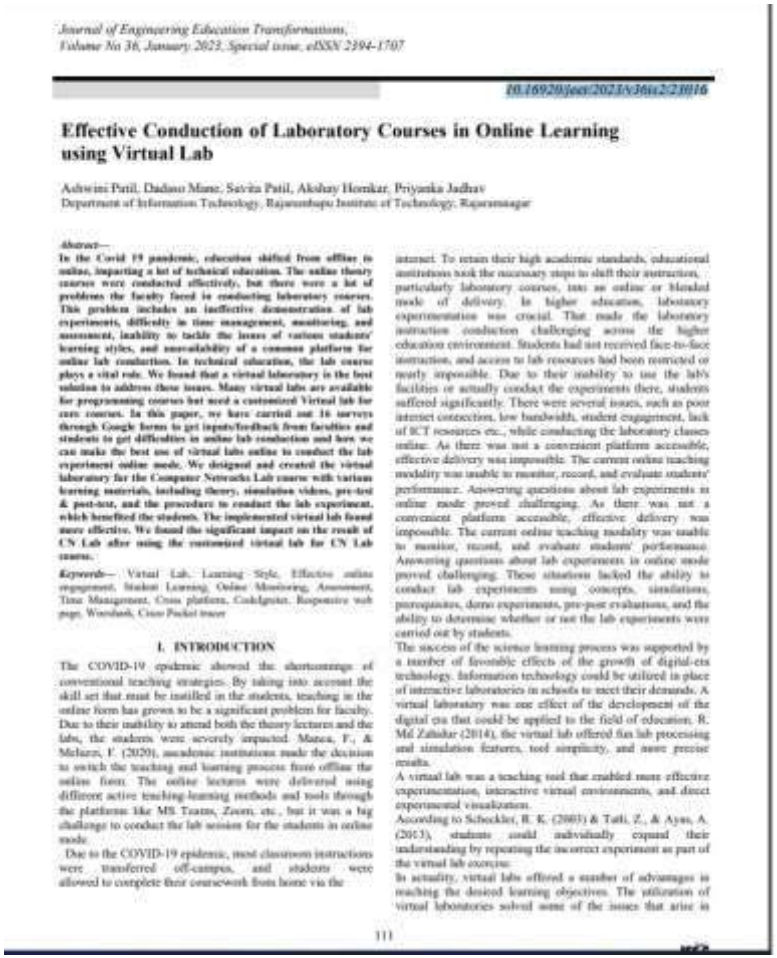

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Effective Conduction of Laboratory Courses in Online Learning using Virtual Lab

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***Abstract*—**
In the Covid 19 pandemic, education shifted from offline to online, impacting a lot of technical education. The online theory courses were conducted effectively, but there were a lot of problems the faculty faced in conducting laboratory courses. This problem includes an ineffective demonstration of lab experiments, difficulty in time management, monitoring, and assessment, inability to tackle the issues of various students' learning styles, and non-availability of a common platform for online lab conduction. In technical education, the lab course plays a vital role. We found that a virtual laboratory is the best solution to address these issues. Many virtual labs are available for programming courses but need a customized Virtual lab for core courses. In this paper, we have carried out 16 surveys through Google forms to get inputs/feedback from faculties and students to get difficulties in online lab conduction and how we can make the best use of virtual labs online to conduct the lab experiment online mode. We designed and created the virtual laboratory for the Computer Networks Lab course with various learning materials, including theory, simulation videos, pre-test & post-test, and the procedure to conduct the lab experiment, which benefited the students. The implemented virtual lab found more effective. We found the significant impact on the result of CN Lab after using the customized virtual lab for CN Lab course.

***Keywords*—** Virtual Lab, Learning Style, Effective online engagement, Student Learning, Online Monitoring, Assessment, Time Management, Cross platform, CodeIgniter, Responsive web page, Wireshark, Cisco Packet tracer

I. INTRODUCTION

The COVID-19 epidemic showed the shortcomings of conventional teaching strategies. By taking into account the skill set that must be instilled in the students, teaching in the online form has grown to be a significant problem for faculty. Due to their inability to attend both the theory lectures and the labs, the students were severely impacted. Manca, F., & Meluzzi, F. (2020), academic institutions made the decision to switch the teaching and learning process from offline the online form. The online lectures were delivered using different active teaching-learning methods and tools through the platforms like MS Teams, Zoom, etc., but it was a big challenge to conduct the lab session for the students in online mode.

Due to the COVID-19 epidemic, most classroom instructions were transferred off-campus, and students were allowed to complete their coursework from home via the internet. To retain their high academic standards, educational institutions took the necessary steps to shift their instruction, particularly laboratory courses, into an online or blended mode of delivery. In higher education, laboratory experimentation was crucial. That made the laboratory instruction conduction challenging across the higher education environment. Students had not received face-to-face instruction, and access to lab resources had been restricted or nearly impossible. Due to their inability to use the lab's facilities or actually conduct the experiments there, students suffered significantly. There were several issues, such as poor internet connection, low bandwidth, student engagement, lack of ICT resources etc., while conducting the laboratory classes online. As there was not a convenient platform accessible, effective delivery was impossible. The current online teaching modality was unable to monitor, record, and evaluate students' performance. Answering questions about lab experiments in online mode proved challenging. As there was not a convenient platform accessible, effective delivery was impossible. The current online teaching modality was unable to monitor, record, and evaluate students' performance. Answering questions about lab experiments in online mode proved challenging. These situations lacked the ability to conduct lab experiments using concepts, simulations, prerequisites, demo experiments, pre-post evaluations, and the ability to determine whether or not the lab experiments were carried out by students.

The success of the science learning process was supported by a number of favorable effects of the growth of digital-era technology. Information technology could be utilized in place of interactive laboratories in schools to meet their demands. A virtual laboratory was one effect of the development of the digital era that could be applied to the field of education. R. Md Zahidur (2014), the virtual lab offered fun lab processing and simulation features, tool simplicity, and more precise results.

A virtual lab was a teaching tool that enabled more effective experimentation, interactive virtual environments, and direct experimental visualization.

According to Scheckler, R. K. (2003) & Tatli, Z., & Ayas, A. (2013), students could individually expand their understanding by repeating the incorrect experiment as part of the virtual lab exercise.

In actuality, virtual labs offered a number of advantages in reaching the desired learning objectives. The utilization of virtual laboratories solved some of the issues that arise in

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Virtual Lab Development to Enhance Student Learning: A Quality Circle Approach

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Abstract—The COVID-19 pandemic has affected the student fraternity to physically access the laboratory and conduct experiments offline. Across the world, new platforms have been designed with ICT tools for the smooth conduction of academics specifically for laboratory courses. This article aims to provide quality circle-based guidance to the community to develop a Virtual Laboratory. The virtual lab is developed through an emphasis on Quality Circle methodology. The Quality Circle team has developed an instructional methodology known as the virtual laboratory (VL). It incorporates pedagogical techniques that help students to better understand the theoretical concepts in an effective and joyful way.

***Keywords*— Virtual Lab, Virtual Lab Mobile App, Virtual Lab Website, Engineering Education, Quality Circle.**

***JEET Category*—Choose one: Research, Practice, or Op-Ed. (Please note, Op-Eds are by invite only. Refer to the Paper Submission and Review Guidelines for more details.)**

I. INTRODUCTION

The beginning of Quality Circle was in 1940 to survive in the industrial world. Prof. Ishikawa, who was supposed to utilize the creative potential of workers, resulted in the invention of the Quality Circle movement which helped the Japanese industry to achieve milestones in creativity. A quality circle is a small group of employees who meet consistently and discuss, analyze and find solutions to work-related problems.

This activity not only enhances the performance of the organization but also improves the work culture of the employees. The concept of building people turned into the philosophy of quality circle. At regular intervals, presentations are given to the management by the Quality Circle team. Based on the presentation the management decides either to accept, modify or reject the proposal (JayakumarRKrishnaraj, 2015).

Due to the Covid-19 pandemic, students could not physically access the laboratory and conduct experiments, which has led to academic loss to students. Thus, it has been decided to take up this as a problem for the quality circle (QC) and find a viable solution. A good lab facility and updated lab experiments are critical for any engineering college since the practical knowledge of the students directly impacts student placements. So, it is very important to provide the access to the lab for the students all the time without any space and time constraints (Bedni & Kaggermann 2018). The virtual lab is one of the options during situations like the COVID-19 pandemic to facilitate lab access and improve the skills of the students (Tayuur 2019).

The Virtual Labs needs lack good lab facilities and well-trained teachers, to provide access to virtual labs in engineering Steadmon, Lowther and Russel (2002). They should also fulfill the curiosity and knowledge requirements of students Bose (2013). The virtual labs need to be student-centric. The virtual labs also permit the use of web resources, online video lectures, animations, self-learning and self-evaluation Kathane, Dahikar and Sharma, (2013). The virtual labs(VLs) can be available to students from all locations and at their convenience and at any time Reglitz (2020). This development is a paradigm shift in student-centric, online education. The coronavirus (COVID-19) disease has caused difficulties in all fields, including academics and research. The inability of undergraduate and graduate students to utilize laboratories and conduct studies has had a considerable negative impact. Because of the COVID-19 pandemic and other unanticipated events, students can conduct experiments at home and lab sessions can still normally go, thanks to the powerful instructional tool known as the virtual laboratory. The creation of a virtual lab is intended to allow students to conduct experiments using the internet and visual aids without having access to the necessary equipment. Ilic (2011). Through cost-effective outreach and remote learning activities, the Virtual Lab Program offers a singular chance to improve the standard of engineering education, deepen knowledge, and give young minds the required practical skills. Wannawas, Nakassi & Nagai (2011). These VLs give users access to experiment video instructors, experiment-related

Photo no.7 Published a research paper on, “Virtual Lab Development to Enhance Student Learning: A Quality Circle Approach”, Journal of Engineering Education Transformations, Volume No 36, January 2023, Special issue, eISSN2394-1707, Vol 36, No SP (2023), DOI: 10.16920/jeet/2023/v36is2/23039

Photo no 8 First Prize to Mechanical Engineering Team in 35th Quality Circle Competition- Maharashtra State Level held in Kolhapur on 08/10/2022. The QC Competition was organized by Confederation Indian Industry.