Innovations

Innovative Practices using Different Pedagogies in Assessment and Evaluation

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Abstract *–The Covid-19 pandemic changed the world totally including the education sector. Though the Corona kept everything standstill, but human beings found out ways to overcome the health calamity. As a result, the education sector also evolved with number of innovations for teaching, learning and assessment and evaluation of learners. This paper shows the research habits of the students can be improved through assessment and examination processes. Research instudents learning depends on two main sources: knowledge gaining and problem-solving approaches to learning (PAL). If learners have a creative skill of study, learning will be inclined towards the research mindset and will adopt the way they learn with a perspective of the application. An innovative approach for assessing learning skills has been represented here as a part of an innovative examination (IE) system. The innovative approach starts with a learning-to-understand problem statement followed by interaction with subject guide and peer discussions about learning strategies to inculcate self-innovative learning. This study shows the Research-based evaluation (RBE),that aims to promote and develop student competencies related to research practice and to nurture their skills through creative thinking and problem-solving approach. This assessment implies the application of learning strategies that link research with teaching. Comparison of teaching - traditional and online both are done through the survey of the students and come up with the positive as well as negative outcomes. Survey questionnaires were used in this study to determine the perspectives of various students of Thakur College of Engineering and Technology (TCET), Mumbai. The results showed that the participants experienced IE beneficial primarily for promoting research, connecting the learners to the global community, and getting a huge and authentic resource of knowledge.*

Keywords – *Pedagogy, Innovative Practices, Innovative Examination (IE), Research-based evaluation, Skills, Assessments, Evaluation*

1. Introduction

The present trend for higher and technical engineering education proposes to establish an examination and assessment process by using pedagogies at three

levels which is based on skills, knowledge, aptitude and attitude of the students along with research activities for deeper, more interactive, and project-based learning by students. In this context, various methodologies have been proposed for research-based learning (RBL) on the critical skills (inquiry-based learning) such as problem-based learning (PBL), project-based learning (POL), challenge-based learning(CBL), and active collaborative learning (ACL), among others. In all these methodologies the student interacts actively with their classmates in a small group, and with their mentors, exchanging ideas and discussing progress in the solution or proposed solution to a specific problem statement. The challenge should address a situation or problem as real as possible that better motivate students. In this sense, the examination system assesses their RBL which broadens students' learning horizon and can also be implemented seeking to have that active participation of students with their peers and teachers, discussing and analysing scientific advances or proposing their contributions to the specific disciplines. This assessment should be enriched with the proper rubrics interaction between teachers giving similar courses, thus promoting a fertile community of RBL, constituting an ideal community for the best learning of students and their preparation as future researchers.Innovative practices in examination and assessment are increasingly shifting towards a more holistic approach that evaluates not just knowledge, but also attitude, aptitude, mindset, and competency. Traditional assessments, which primarily focus on routine memorization and theoretical understanding, are being complemented by new schemes that incorporate subjects like Attitude and Aptitude Development (AAD), professional skills, and presentation skills. These practices enhance students' competitive mindset and capture a diverse range of capabilities. One such practice includes project-based assessments, where students apply their knowledge to real-world scenarios, demonstrating their creativity, understanding, and problem-solving abilities. AAD fosters a student's learning with a competitive mindset, often through peer reviews, in-house project exhibitions, and activities that encourage collaboration and critical thinking. Aptitude is tested through adaptive assessments that tailor questions to a student's skill level, providing a more accurate measure of their proficiencies. Mindset, increasingly recognized as crucial for lifelong learning, is assessed through self-assessments and assessor observations. Finally, competency-based assessments ensure that students have mastered the necessary skills and knowledge to perform effectively in real-life situations. These may include simulations, practical exams, or participation in various project competitions that showcase their abilities. This comprehensive approach fosters well-rounded individuals who are not only knowledgeable but also capable of adapting and thriving in diverse environments. The participants in this study believe that IE had a positive impact on developing their research skills. This is supported by the survey data and students' descriptive feedback from the online survey.

However, students also raised concerns about time management and internet connectivity issues during the process.

A comprehensive review of educational research reveals significant insights into various trends and challenges in modern education. Mathende and Beach explore the integration of Information Communication Technology (ICT) in highlighting policy and practical challenges in these regions [1]. Alharbi compares the implementation of Education 5.0 in developed and developing countries, emphasizing the disparities and opportunities in adapting this technology-driven model [2]. The Assessment Reform Group and Bakerboth address the evolving landscape of assessment in education, with a focus on the limitations of current policies and the need for aligning curriculum, standards, and assessments to improve outcomes [3-4]. Quainoo et al.examine the dual impact of globalization on education, debating its positive and negative effects [5]. Agarwal, Verma, and Ferrignodiscuss the intersection of Education 5.0 and sustainable development goals in emerging economies, highlighting the challenges of integrating advanced technologies into education systems [6]. Black provides a historical perspective on educational assessment strategies[7-8], while Mutanga, Nezandonyi, and Bhukuvhani focus on enhancing engineering education through the Technological Pedagogical and Content Knowledge (TPACK) framework, advocating for a more integrated approach to teaching [9].Ngwenya and Pelser analyze the attitudes towards ICT adoption in Zimbabwe, noting the significant barriers to effective diffusion [10]. Bloom offers a foundational framework for classifying educational goals [11]. Finally, Ruston and Lahlafi investigate the impact of active and reflective learning on improving web-searching skills among business students, suggesting that interactive learning methods can boost critical thinking and problem-solving abilities [12]. These studies collectively reflect the ongoing transformation in education through technology, policy reforms, and global trends.

A. Limitations of Current Examination System:

Current examination system tests only memory learning skills. Demands from profession requirestudents not just to possess information but an individual application to every situation eitherroutine or complex. This necessitates pressure on students to perform to the best of theircapabilities . Memory learning may be required but not adequate to performs in the challengingenvironment that currently prevails. There is a need to assess skills of higherability like analysis, creation, evaluation etc.Standardisation of assessment has its flaws as every student differs in terms of intellect and abilityand as such one tool of measurement is akin to ‘‘one size fits all’’, which fails to identify genuineabilities and potential of students.

B. Need of Innovative approach in Education:

Innovation in education encourages teachers and students toexplore, research and use all the tools to uncover something new. It involves a different way of looking at problems and solving them. The thinking process that goes into it will help students develop their creativity and their problem-solving skills.Innovation in education is also increases the communication skills and leadership skills as well as enhances the capabilities to work in a group if that work is allotted in group. Students need to think out of box or the higher level of thinking has to be used while finding the solution of the problems. Assessment is vital to the process of innovation. Those implementing innovative projects need to assess their effectiveness and to make necessary adaptations. Evidence on the impact of new approaches is also essential for successful dissemination. Getting assessment right will be one of the most important priorities for education systems. Assessment is important not only for purposes of accountability, but also for building the evidence base on ‘‘what works in innovation’’. Those systems that best support diversity and complexity, and that have effective ways to evaluate learning will have the richest opportunities to deepen knowledge.

C. Terms related to Assessment and Evaluation:

i. **Formative assessment** refers to the frequent, interactive assessment of student understanding and progress to identify learning needs and adapt teaching. Formative assessment differs from summative assessment in that the information gathered is used to shape improvements, rather than serve as a summary of student achievement.

ii. **Summative assessments** include tests and examinations that seek to provide summary statements of student achievements and capabilities. Summary assessments may be conducted at the end of a unit of study, to determine student readiness for promotion from one grade to the next.

iii. **Continuous Assessment:** This means you're being evaluated throughout the whole course, not just at the end. It could be through quizzes, assignments, projects, or anything else that shows how you're doing over time.

iv. **Formative Assessment:** This is like feedback to help you improve as you go. It’s less about grades and more about giving you pointers while you're learning, so you can adjust and do better.

v. **Course Survey:** This is a survey you fill out at the end (or sometimes during) a course to give feedback on how it went—what worked well and what could be improved. It helps instructors make the course better next time!

vi. **Formal Examination:** These exams tend to cover the entire course content, and the results often have a significant impact on your final grade.

vii. **In-Semester Examination:** It happens during the middle of the semester, before the final exams. It’s meant to check your progress so far in the course and give you a chance to demonstrate what you've learned up to that point.

D. Need of Innovative Examination: The Innovative Examination is crucial for several reasons, particularly in today's rapidly evolving educational landscape:

i. **Encourages Research Skills Early On:** By incorporating research-focused tasks from the first year, students start building critical research skills early in their academic journey. This habit of inquiry is essential for higher education and future careers, especially in fields like Engineering where innovation and problem-solving are key.

ii. **Promotes Group-Based Learning: The** group format fosters collaboration, encouraging students to work together, share knowledge, and learn from one another. This not only enhances their understanding of the subject but also builds essential teamwork and communication skills—critical in most professional environments.

iii. **Improves Problem-Solving Abilities**: Through research and discussions, students are exposed to real-world challenges that require creative solutions. The examination method focuses on practical applications and critical thinking rather than rote memorization, which helps develop better problem-solving skills.

iv. **Enhances Leadership and Responsibility:** Working in groups gives students the opportunity to take on leadership roles, manage tasks, and navigate group dynamics. These experiences are invaluable in building confidence, accountability, and leadership capabilities that are necessary in both academic and professional settings.

v. **Bridges the Gap Between Theory and Practice:** Traditional exams often focus on theoretical knowledge, but innovative exams allow students to apply their learning to real-world scenarios. This practical approach deepens understanding and helps students connect what they learn in the classroom to real-life challenges.

vi. **Adapts to Changing Industry Needs:** Engineering and technology fields evolve rapidly, and the traditional examination model may not always reflect current trends or skills needed in the industry. The innovative exam approach allows students to engage with the latest research, tools, and technologies, preparing them for the demands of modern careers.

vii. **Encourages Lifelong Learning:** The emphasis on independent research and group-based work instils habits of lifelong learning. Students learn how to seek information, evaluate sources, and collaborate with others—skills that are useful throughout their professional careers, especially as industries continue to change.

The Innovative Examination model aligns education with the practical skills needed in the real world, ensuring that students are not just memorizing content but actively engaging in the learning process, preparing them to be more effective and adaptable professionals.

2. Implementation of IEin TCET

The place of study was Thakur college of Engineering and Technology (TCET), Mumbai City, State of Maharashtra, India. Since 2019, the Engineering curriculum at TCET has incorporated an IE component as part of the internal assessment, starting from the first year. The aim of this initiative is to foster research habits early on, while also enhancing group-based learning and leadership skills among students. Fig.1. illustrates the process flow for the IE in TCET. Initially, the subject teacher presents the course content along with research opportunities related to the subject. Following this, students are divided into groups of three or four, and assigned specific topics. The groups are provided with a brief introduction to their topics before they begin their research.Students are encouraged to explore reputable research papers or relevant websites (especially in subjects related to programming languages). In addition to individual research, they engage in group discussions to share insights and ideas. The groups then work on writing the abstract and conducting a literature survey, which is compiled into the Innovative Examination report provided by the subject teacher.This practice not only strengthens students' research skills but also promotes collaboration and group learning. If a group encounters difficulties with their assigned topic, they can consult with the teacher to either adjust the topic or receive guidance. Based on the group's progress, teachers may recommend updates or improvements to their work. Finally, the groups are evaluated through a presentation and submissionof their report.This approach helps students develop essential research and teamwork skills, which are valuable in their academic and professional journeys.

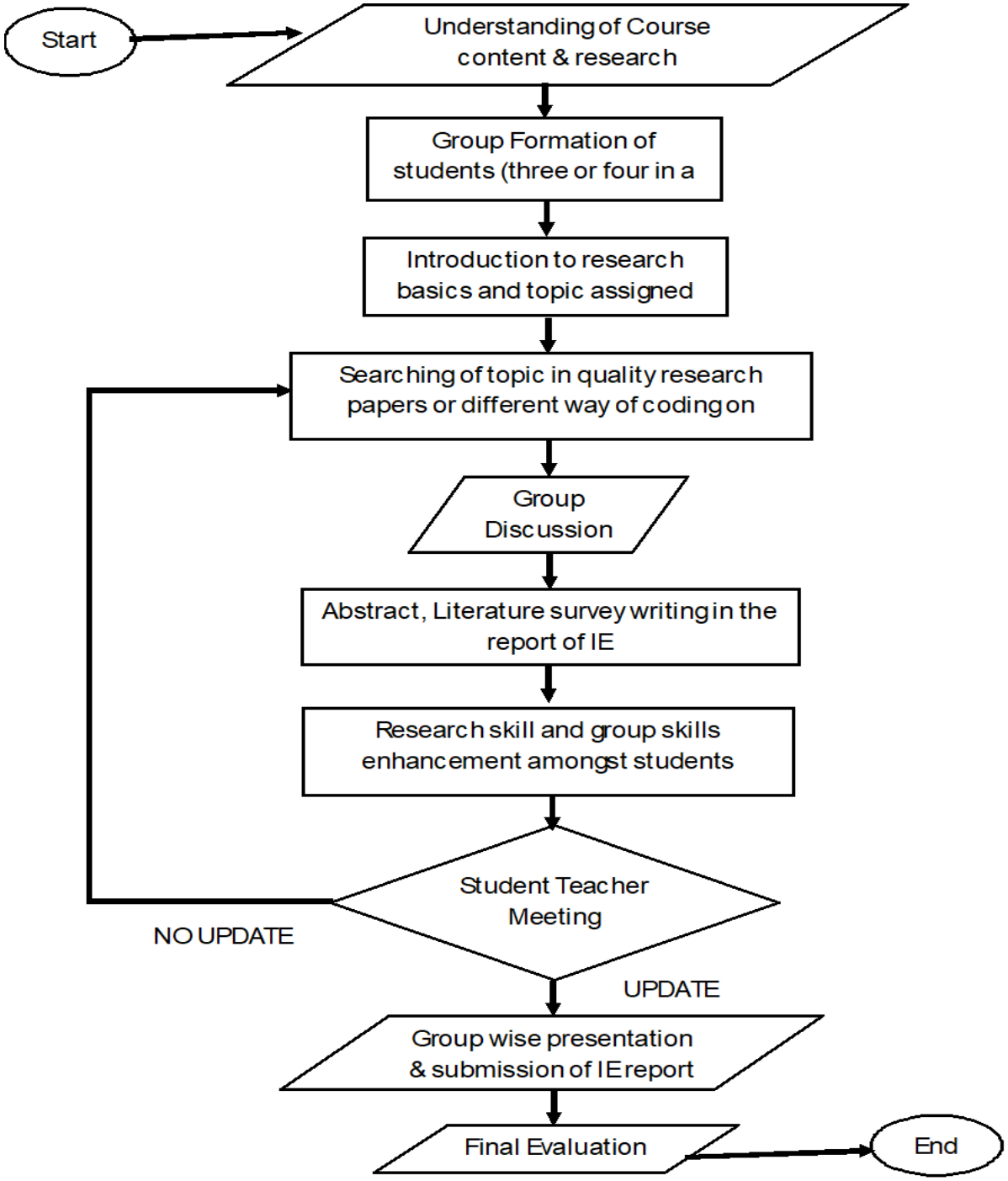

Figure. 1. Flow chart for Innovative examination process

3. Conduction of IE

Depending on the nature of subject and availability of resources it can be conducted in 2 categories:

1. For basic sciences subject such as Physics, Chemistry and Mathematics
   a) Content enrichment by assigning each lecture topic to a group of 4 students

b) Latest research in particular topic in context with enhancing their knowledge and skill
c) Application of concepts in addressing the problems and providing the probable solution

2. For Engineering sciences subject such as Basic Electrical Engineering, Programming Skill, and Workshop Manufacturing Practice.
   a) Assigning the project related with topics
   b) Preparation of kit used in practical
   c) Designing of article by using principles of workshops and carpentry learning

Assessment of IE is done based on specific rubrics. Based on the subject need the faculty members can make necessary changes in it. Here, in fig. 2 the one of the suggested rubrics evaluations is given. Students have to present the presentation in agroup of four and the IE Report also needs to be submitted together in a prescribe format which is provided to them.

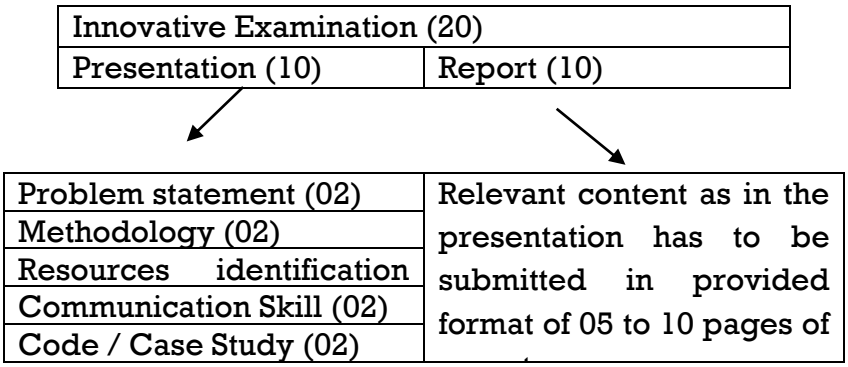

Figure 2. Rubrics for Assessment

4. Sample and Data Collection

A brief scale based survey was conducted at the beginning of this study to gather insights into students' perceptions on the IE refer questions in appendix). Since this was the first time TCET, as an Autonomous Institute, introduced this component as part of the curriculum, it was important to assess both the outcome and the process, and determine if any modifications were necessary. The survey aimed to evaluate students' research skills through the assessment and examination process. For this study, the researcher selected first-year engineering studentsfrom all branchesusing a non-probability purposive sampling method. A total of 103 students participated, and all students present on the days of data collection were included in the study as shown in table 1.

Table 1. Range of Feedback to Questions

Range	Que - 1	Que - 2	Que - 3	Que - 4	Que - 5	Que - 6	Que - 7	Que - 8	Que - 9
Strongly Disagree	5	5	3	5	5	5	2	2	3
Disagree	5	9	7	11	11	12	12	11	13
Partially Agree	29	27	25	19	23	20	27	31	27
Agree	16	24	26	32	24	28	20	23	30
Strongly Agree	48	38	42	36	40	38	42	36	30

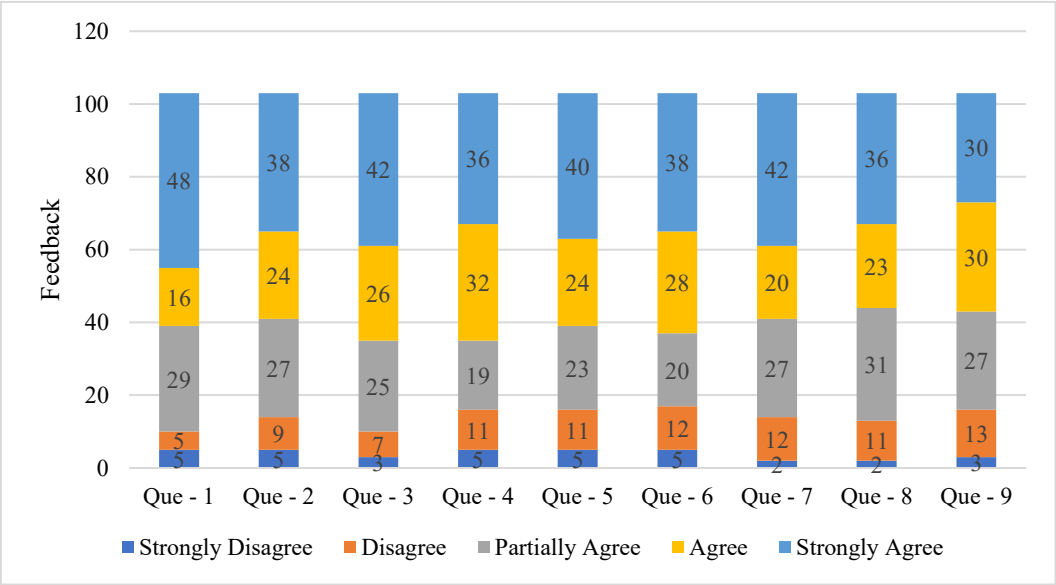

Figure.3.Feedback of IE through survey Questions (refer appendix for questions)

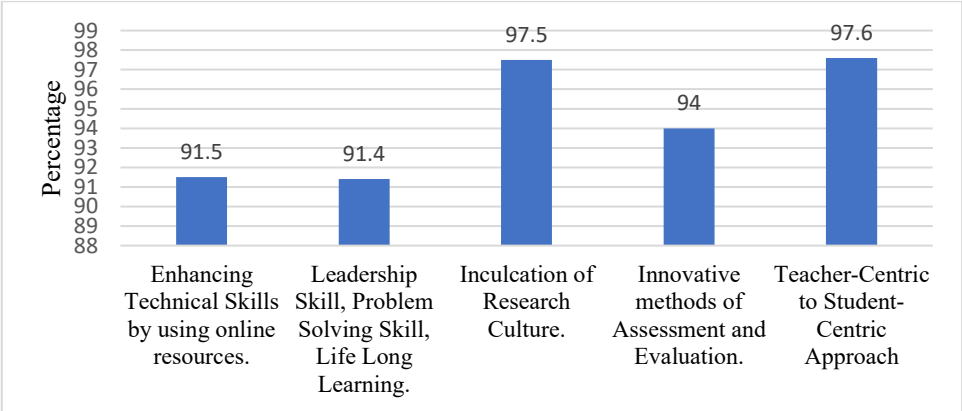

Figure.4. Survey Result on IE

5. Feedback and Survey Result

Measures from the survey confirmed that almost 45% of the students are strongly agree and rest 50% of students are agreefor implementation of IEto enhance various skill as shown in figure 4. When asked that is the "IE helps you to enhance your research quality? "Almost 95% of the students agree that it really helps them in the research development. Hardly 5% of the students are not satisfied with the IE implementation.When the descriptive question asked related to any problem or improvement in the IE implementation then students were highlighting the time management problem as well as the individual assessment of the students.Also, participants highlighted the issue related to internet connectivity as now a days because of the pandemic the teaching is online so they need good connectivity at home. But sometimes through the one or the other reason they faced lots of issues and challenges. Students are also giving positive feedback in the survey that IE can also help the students to improve the result because they are working in a group so they can get the help from others too. Because of group formation, one can enable his/her communication skills, leadership skills and team skills also. Education systems in TCET have made two particularly significant changes in present examination system. The first is the focus on "problem analysis.". which focuses on students' ability to think and utilize their knowledge and skill to get outcome. The second is the focus on Lifelong learning with instilling in students a desire to learn, and developing their skills and capacities for "learning-to-learn". But the focus on improving fairness of outcomes – that is, helping all students to achieve to higher levels – is relatively new. The shift is, in part, a response to the need for more students with higher skills in knowledge economies. There is also a growing recognition that education has a positive impact on the well-being of communities, families and individuals.Assessment is crucial to the process of innovation. Those implementing innovative projects need to assess their effectiveness and to make necessary modifications. Evidence on the impact of new approaches is also essential for successful propagation. At the examination policy level, assessment ensures that institutes, while implementing academic autonomy, are still meeting centrally defined standards.

6. Roadmap For Research Through Examination & Assessment

As first year students learn basics of engineering, they got the idea that how to start searching and then how that can be converted to research in the academies. Slowly after implementation of IE in second year, students can be encouraged to write a research paper in the local symposium to get the experience and the knowledge from the outside world. Even in third year also with IE students can make minor projects as well as present research papers in some well-known conferences. Finally,in final year of engineering students can make the major projects based on past three years of IE experience and can publish the research

paper in the good quality journals. This is the way how IE can contribute to enhance the research quality of students starting from the first year itself

Table 2. Roadmap to Research

S.N	Year	Process of Innovative examination	Impact
1	First Year Engineering (F.E)	• Awareness about Research • Select topic • Familiarization with research in the form of Innovative examination and IEEE Research paper structure	• Introduction to research methods • Understanding of academic writing structure
2	Second Year Engineering (S.E)	• Domain/ Branch Specific Research • Project based learning • Proposed Methodology • Use relevant source of information for research paper writing	• Focus on specialized knowledge • Development of research writing and methodology skills
3	Third Year Engineering (T.E)	• Testing of Hypothesis • Project Based Learning&Research Based Learning	• Application of theoretical knowledge to real-world problems • Strengthening of research and testing skills
4	Fourth Year Engineering (B.E)	• Be analytical with data interpretation • Project • Customization and commercialization	• Advanced analytical skills • Real-world project experience • Focus on practical application and marketability of ideas

7. Proposed Evaluation Reforms

The table presents several proposed evaluation reforms aimed at enhancing the assessment process in higher education institutions. These reforms include a variety of assessment types, each with its own limitations and suggested frequency of implementation:Overall, the table emphasizes diverse evaluation techniques to enhance student engagement and learning, while also considering the potential limitations and the need for appropriate frequency of use.

Table 3. Diverse Evaluation Techniques

S.N	Assessment Type	Limitations	Suggested Frequency
1.	Group Tasks Group Discussion/ Fishbowl Technique / Role Play	It can be difficult to evaluate individual contributions and ideas..	Once every semester with one make-up and one term-end in certain courses.
2.	Seminar/Paper Presentations	Reliability of content can be difficult to assess in some cases.	Once per semester in all major courses.
3.	Rapid Fire Questions	Introverted students may find it challenging to participate effectively.	Can be embedded into classroom teaching as needed.
4.	Poster Presentations	Posters may demonstrate limited knowledge or superficial understanding of concepts.	Once per semester in all major courses.

8. Conclusion

This paper highlights the impact of high-stakes assessments and examinations on educational innovation. It finds significant evidence that such assessments may undermine innovation, as teachers may teach to the test rather than focusing on the goals of innovative programs. In countries with highly competitive examinations for university entrance, the so-called "shadow curriculum" is shaped by these high-stakes tests, which often leads to a misalignment with the goals of innovative education programs. These problems are exacerbated when tests are poorly designed or misaligned with the goals of innovation. Moreover, high-stakes tests often promote student anxiety, particularly among underachieving students, which undermines the objective of motivating students to engage in lifelong learning. Some studies have found that students in classrooms emphasizing higher-order skills, like those in innovative programs, may perform as well or better than their peers in traditional classrooms on external tests. IE and assessments provide effective ways to measure complex skills and reasoning processes on a large scale. There are also successful approaches using practitioner panels to score open-ended student performances, which help align assessments with curriculum goals. This rethinking of assessment methods supports the alignment of tests with standards, offering opportunities for evaluating students' open-ended performances. In conclusion, the implementation of IE starting from the first year of engineering prepares

students for their major projects in the final year and equips them with the skills necessary to publish research papers in quality journals.

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Appendix 1:

Questions related to inculcating research / Knowledge, skill and attitude (KSA) through the process of examination and assessment.

Q1. How would you evaluate your research and entire learning in the process of IE?
Q2. How did IE contribute to your knowledge, skills, and personal development in different research areas?
Q3. Do you think that IE helps in your research development?
Q4. Does Problem statement of IE encourage you to research beyond curriculum?
Q5. How does examination and assessment help to get updated and authentic knowledge and provide incremental results?
Q6. What is the role of examinations and assessment to improve work ethics and prepare a learner to be focused and goal oriented towards research?
Q7. State the importance of Group formation in IEin terms of enhancement of soft skills like leadership, communication, team skills and presentations skills.
Q8. What do you think about relative assessment in improving the learning of the students?
Q9. What advice would you give to an instructor who is planning to set-up the problem statement for IE which can lead to develop your research habits? (Please give your thoughts in few words)
Q10. Does IE through online education need
Q11. integration of face-to-face interaction for more
Q12. effective assessment results?