



## Selection, Execution, Evaluation and Monitoring of Student Projects at Undergraduate Level in Chemical Engineering

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**Abstract:** *The final year projects can be carried out in far better and disciplined manner and showcased accordingly. The outcome of the projects can be evaluated in terms of feedbacks from various industry experts and their performances in interviews. Creating awareness about future demands from the chemical engineers as nascent stage in first or second year of curriculum can make them much better equipped chemical engineers. This can help in catering the needs of the industries also. Many times projects are done as mere formality of the curriculum. These type of projects becomes irrelevant afterwards. Projects in final year should not lose their relevance. The expertise required for the projects should be made available to the students from industries and consultancies. Many times it is observed that ego of the teachers becomes biggest hurdle in communication of students with their guides. Students should be more and more aware of the fact that it is not only about marks but it is about gaining knowledge and academic excellence.*

**Keywords:** *Evaluation, experts, knowledge, monitoring, solutions, training, standards, syllabus.*

### I. INTRODUCTION

Chemical engineering education at undergraduate level needs very careful attention. Many times projects are done as mere formality of the curriculum. These type of projects becomes irrelevant afterwards. Projects in final year should not lose their relevance. The expertise required for the projects should be made available to the students from industries and consultancies. Many times it is observed that ego of the teachers becomes biggest hurdle in communication of students with their guides. Students should be more and more aware of the fact that it is not only about marks. Project can be made as highlight of certain department or curriculum if they are given due weightage. It may look little early, but research projects at undergraduate levels can develop the students in terms of patience, perseverance, intellectual ability and calmness. Also these types of projects such as design and manufacturing types needs to be carried out in accordance with the industrial requirements. The paper publication at undergraduate level should be encouraged. It helps in improving the language and arranging the results and their interpretation in sequential and effective manner. Author has worked with some undergraduate students as a guide. Paper publication has helped enormously to these students at their higher studies [1-3].



Chemical engineers are rarely exposed to the rigorous fields of work. Some departments have started courses at graduate level for this purpose which will expose the young engineers to get hands on experience of teaching [4]. Lack of clarity about chemical engineers' role is sometimes a hurdle in opting for the program [5]. There is need to grow awareness about chemical engineering discipline. Many educators have proposed standard exit examinations for testing outcomes [6]. It is necessary to learn and acknowledge the changes in the chemical and allied sectors and recent investigations in the chemical engineering before deciding a syllabus [7]. Chemical engineering teaching contents and teaching methods must be competent enough to overcome the problem of temporal, unstable, and scarce availability of employment [8]. The outcome can be evaluated by studying the metacognitive skillfulness of the learners [9]. Changing the ambition levels, strategies, teaching methods of the teaching community has the potential to bring about big transformation in chemical engineering teaching [10]. E-learning can be used as supporting tool to the classroom teaching for effective time management. It also helps to enhance reach of the knowledge and concepts in the subjects [11]. Many problems have multiple solutions. Normally students are encouraged to think convergent as the classroom problems have single solution. Practically many problems have divergent solutions [12]. It is important to develop this approach among the students based on their approach and abilities. As we are moving into next paradigm of chemical engineering education, it is important to set high standards for quality of innovations and research. External hands on training is required for chemical engineering minds [13]. It is necessary to increase professional commitments among professionals in the chemical engineering community [14]. Various professional bodies should look after welfare of the chemical engineering community. Modernization of teaching methods and adapting new approach can help in fulfilling the expectations of industries [15]. Also there is need to increase exposure of the learners to molecular level, sustainability and process intensification [16]. The paper is prepared assuming the chemical engineering curriculum of four years.

## II. PROJECTS- THE CORE OF CHEMICAL ENGINEERING EDUCATION

The undergraduate students of chemical engineering should be made aware of various opportunities in various chemical engineering fields and sectors in the first years itself. Also the scope and objectives of the curriculum should be emphasized to the students in first year itself. The subject with name "chemical engineering overview" in the first year can be handy in full filling these objectives. The students, thus, will be more aware of the opportunities and they can develop interest in certain domain or field of chemical engineering. From second year, the students can have clearer picture of what they are actually learning and what they are about to learn. This will help students to choose project according to their interest. In the third year, project groups should be formed and guides should be allotted. Students should be made to carry out literature review of their project work topics. This includes finalization of project area. By the end of third year, literature review and equipment fabrication (if any) will be completed. Thus entire last year can be utilized for carrying out actual experimental work. Generally, students carry out manufacturing projects in industry. In these projects, it is observed by the author that, students develop the same flow sheets as available in industry. This exercise can be completed by the



end of third year along with or instead of literature review, which is more significant for research projects. For manufacturing projects final year should be devoted to trouble shooting, energy audit, energy saving alternative, solving environmental problems in industry, optimization and exploring alternatives of green energy. The process intensification possibilities should be explored.

### III. EVALUATION AND MONITORING OF PROJECTS

The institute should appoint the expert panel containing the project guide and one industry expert for evaluation of the project. From almost twenty years' experience of the author, the project quality in private engineering colleges has fallen drastically because of improper and irrational evaluations of the projects. Many times personal relations and appeasements become hurdle in evaluation and monitoring. Appointment of industry experts will help curb these practices. Good relation between guide and students is very much essential but it should not become criteria for project evaluation and mark allotments. Generally, industry experts are co-guide for only outhouse projects for in house and out house projects. Author advocate the need to have these co-guides onboard as the part of continuous project evaluation process. These experts should allocate half of the internal marks. Currently in many universities, students doing outhouse projects are also evaluated by the internal guides for internal marks. Many times internal guides are not aware of the outhouse project and its technical background. The teaching community needs to welcome the industry experts in monitoring and evaluation of projects.

### IV. ELECTIVES AND PROJECTS

It is always helpful to select elective subject, which will complement the project. Students can use the elective subject to enhance their knowledge and project will help to explore the application of this knowledge.

### V. PROJECT ORALS AND PRESENTATION

Sufficient time should be given to prepare and carry out oral presentation or viva of the project. It should be carried out after the theory examinations. The submission and other work keeps student busy. Because of all these engagements, student complete the project report hurriedly. The project report submission and oral should be the last part of the curriculum as is the case with master's program in almost all the universities in India. Within one month from the theory examination, this evaluation should be done. If needed final year theory examinations should be arranged accordingly.

### VI. FORMATS AND FREQUENCY OF REPORTING

Project students should meet their guides regularly on weekly basis. The weekly report should include date and time of reporting. Title of the project, signature of students, guide and expert preceded by topics discussed and outcome of discussion should be included in weekly evaluation. The regular reporting and monitoring should count for twenty percent of internal marks. Another eighty percent of internal marks should be decided by panel



of experts including internal guides and at least one industrial expert. The basis for evaluation should be quality of project work, report presentation, preparation, originality and sincerity. Panel for external oral examination should contain at least one industrial expert other than external guide.

## VII. CONCLUSION

The final year projects can be carried out in far better and disciplined manner and showcased accordingly. The outcome of the project can be evaluated in terms of feedbacks from various industry experts and their performances in interviews. Creating awareness about future demands from the chemical engineers at nascent stage in first or second year can make them much better equipped chemical engineers. This can help in catering the needs of the industries also.

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