Project Based Learning: A Software Engineering Approach

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Abstract : Project based learning is a concept where students can learn the theoretical concepts with practical aspects. Project based learning helps in overall development of the students. Students are able to analyze how any theory is applicable to real world in practical. Software engineering provides systematic approach to real world problems. Software engineering is a step by step procedure to study the known or unknown. This paper studies the impact of software engineering approach on the student's ability to understand and work on projects if they have prior knowledge of software engineering concepts and what if they don't have prior knowledge of software engineering concepts. It also discusses whether software engineering approach helps in project development stages or not.

Keywords: **Project Based Learning, Software Engineering, Systematic Approach, Real world problems.**

1. Introduction

According to Jolanta et al, Learning in a higher education institution is defined as a process of active understanding and building up of meanings and skills, what fully complies with the essential idea of project-based learning [1]. Project based learning is student centric approach. Project based learning imparts time management, organizational behavior, collaboration skills, self-direction, constant state of leaning and end to end problem solving skills into the students. The key features of the PBL aim at fostering student-centeredness, teamwork, interdisciplinary, development of critical thinking and competencies related to interpersonal communication and project management [2]. It also gives the opportunity to simulate real world problems. By doing projects students develop creativity. It improves the interpersonal skills of a student because they are interacting with all the stakeholders of the project. Students are able to evaluate themselves on the basis that whatever they have studies whether they are able to incorporate that in real world problem or not. They can demonstrate their capabilities directly through their projects. Visits to field sites during their project work will let them understand the real working which will help them in future. Students will understand the techniques to include technology in their work. Student assessment in PBL is based on two main components: a) specific assessment tasks, work assignments, written tests, which the lecturer of each course is exclusively responsible for; b) and specific elements related to the project, such as oral presentations, project reports, prototypes, peer assessment, written test on the project, which all the coordination team members are responsible for preparing and assessing [2].
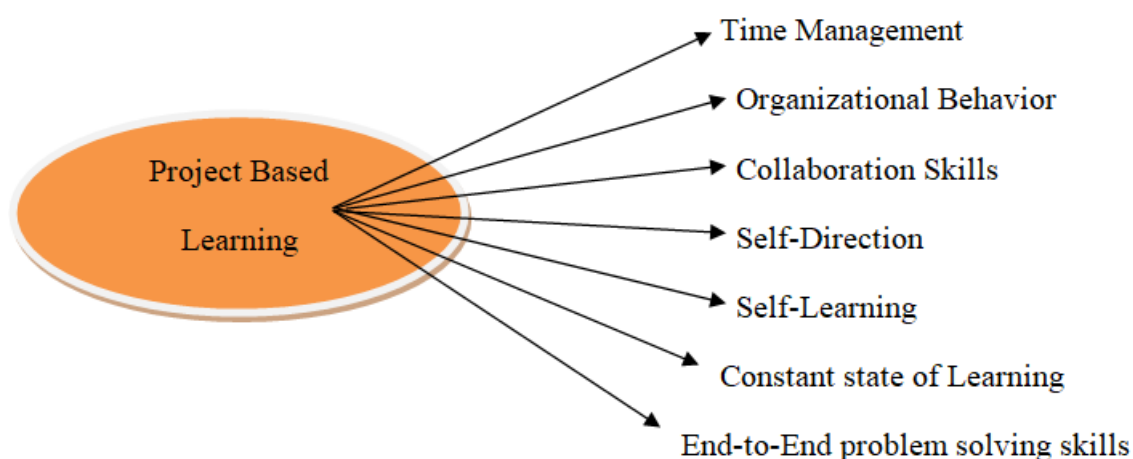

Fig. 1 Project Based Learning

Software engineering approach helps in improving problem solving skills. Software engineering basically focuses on communication, planning, implementation and delivery. It depends upon students to efficiently use these for their project. There are various ways in which students can communicate to the stakeholders to find the requirements. Some of them are Questionnaires, Interviews and observation. While engaged in the inquiry process, learners use abilities and technologies that help them participate in activities normally beyond their ability [3]. Planning plays an important role to understand the project first and then complete it on time with necessary requirements. Incorporating what is the necessity of stakeholder is implementation. Handing over what was required by stakeholder is delivery. Software engineering disseminates problem solving skills into the students. Students can learn how to find the information from various sources for the project. They will understand the milestones of the project and scope of the project. With limited time period they will find the ways to clear backlogs and will track the progress of the project for timely delivery. In simple words Software Engineering works on stages. Stages include speculation, designing the project activities, conducting the project activities and evaluation [4].
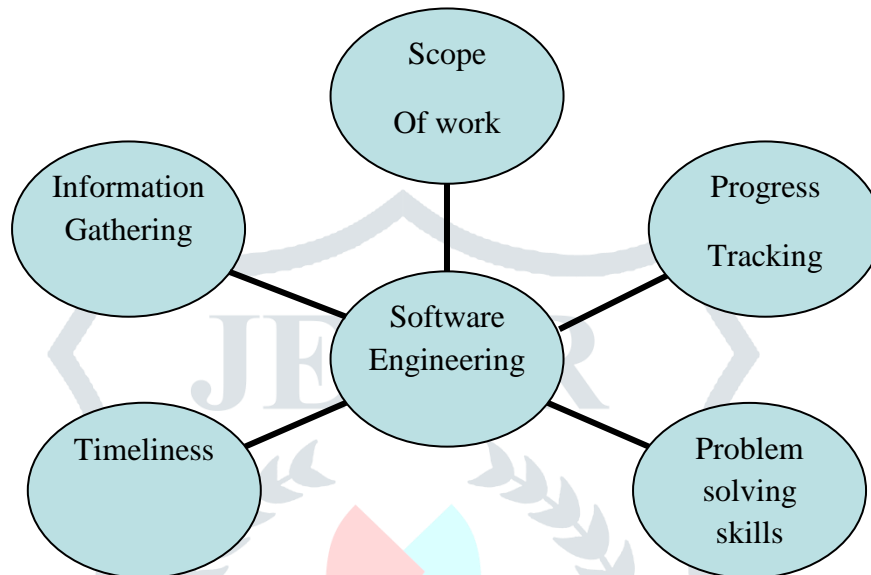

Fig. 2 Software Engineering

2. Methodology

In this case study undergraduate students of B.Sc. Computer Science, B. Sc. Computer Application, B.A. Computer Application, B. Com. Computer Application and Bachelor of Computer Application as well as post graduate students of M.Sc. Computer Science and Master of Computer Application were selected as a population for study. There are various ways in which population can be selected, represented and used in study. Sampling is one way to make maximum use of population. Probability sampling gives equal chance to entire population to participate in study. As per the need of this case study Stratified sampling found to be the best suitable research methodology. Stratified Sampling is type of probability sampling. There are mainly four reasons for selecting stratified sampling. The very first reason is that, here population is sub grouped into B. Sc. (CS/CA), B.Com. (CA), B.A. (CA), M.C.A. and M.Sc. (CS) and all these possess a similar characteristic that is they have to develop project in their final year. The second is ensuring representation from all the sub groups. The third reason is variation in sample size. And fourth reason is, it improves the representativeness of population and accuracy by minimizing biasness.

3. Analysis Work

All under graduate and post graduate students of Computer Science and Computer Application were selected for participation who have to develop project for completion of their degree in final year. Total approximately 500 students participated in this case study. Students were given questionnaire to fill. The form of questions were yes/no type and descriptive. Questionnaire mainly covered following questions to be answered:

1. Do you know Software Engineering-yes/no

2. If Yes-whether it is in curriculum-yes/no

3. If yes-Software engineering is useful for?

4. How it is helping you in your project development?

5. Do you know any friend who has studied Software Engineering-yes/no

6. If your friend has studied Software Engineering then how it is helping them in their project development?

7. If you don't know Software Engineering approach-

    1. Whether you are facing any difficulties in understanding the concept of project-yes/no

    2. If yes-have you received any assistance from project guide or referred any Software Engineering textbook-yes/no

    3. Were you able to identify what are the necessities of stakeholder?

    4. Were you able to fulfill all the requirements within given time duration?

8. Do you think that students who had prior knowledge of Software Engineering were at advantage-yes/no

9. If yes-What were the advantages?

10. If no-give your suggestion to other students who have to develop project but don't know anything about Software Engineering.


Fig. 3 Questionnaire Format

Out of 500 students, approximately 300 students have studied Software Engineering in their curriculum and approximately 200 students didn't know anything about the Software Engineering. The questionnaire filled by students were categorized into 3 categories that is a) Prior knowledge of Software Engineering helps b) Prior knowledge of Software Engineering does not helps c) Does not matter whether you know Software Engineering or not.

S.N.	Category	Population
1.	Prior knowledge of Software Engineering helps	405
2.	Prior knowledge of Software Engineering does not helps	57
3.	Does not matter whether you know Software Engineering or not	38
4.	**Total**	500
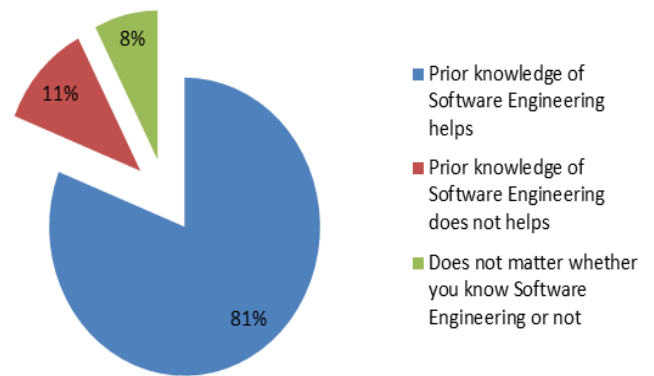
Table 1 Case study tabulation   **Fig. 4 Analysis chart**

According to the data collected 81% of the students think that prior knowledge of software engineering helps in project development. 11% think that prior knowledge of software engineering does not help while rest 8% think that it does not matter whether they know software engineering or they don't know software engineering it does not matter. According to the students who have studied software engineering in their curriculum responded that during the project development they thought critically to link theory into practicality. The other responses they gave are:

- Learning through experience

- Ability to identify the scope of work which can be fulfilled within given time duration

- Improved creativity

- Sensible approach to problem solving

- Self-evaluation

4. Conclusion

The main motivation for this case study was to find out whether the students get benefitted in their project development if they have Software Engineering in their curriculum or they have prior knowledge of Software Engineering. The case study reports that students do get benefitted if they have some knowledge of Software Engineering. If they know Software engineering they know how to start project, what questions to be asked to take the requirements, what are the methods of getting requirements from user, how to document the project(SRS) and so on.

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