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Review and Implementation of Project Based Learning

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Abstract -This paper refers to the reform of project based learning for all specialized programs in Engineering education.It helps teachers with microscopy based teaching materials, to help in the classroom and online resources. But today in technical education, students are found to be more passive by theoretical contents rather than practical work .Hence in today's scenario in education students are made to follow micro-projects at the early stage, especially when they are in lower class in a limited time-frame. Studies have shown that the necessary skills of collaboration work was less. It also indicated that the required facilities and shifting to project based learning was not offered by some schools because of some constraints such as time, noise and lack of financial support. Hence this paper deals with facilitating the process of project base learning.

***Key Words*:**cooperative project based learning, framework, integration , micro-project, .

1.INTRODUCTION

We know that, a project has many definitions. This can be related as follows as summarized in[1]. According to W.H. Kilpatrick "A project is a whole-hearted purposeful activity proceeding in a social environment". According to Ballord "A project is a bit of real life that has been imparted into school/college". According to Thomas and Long "A project is a voluntary undertaking which involves constructive effort or thought into objective results".

But today, in any technical institute the students are opted for a major project only in final year where they become passive in nature by the theoretical contents. But some follow mini-project during their third year of education which is not sufficient for personality development. Therefore, it is necessary to conduct small projects at the early stage, rather than the major project. Projects were classified as major (large), mini(medium) and micro(small). Large projects were called major projects, medium project were called mini-projects and small projects were called micro-projects. A micro-project is a small project at lower level in which the estimation work may be approximately 8 to 40 hours of work, or during their semester period of 3 to 4 months. A mini-project is around 40 and 120 hours of work and a major project is larger than that having no time bound. Thus a mini project is a small practical work assigned at the third year of their semester, especially in engineering to strengthen the basic fundamentals through project based learning systems, while a micro-project is a small project that is executed in a limited time-frame consisting of no more than a sprint(execute in a short span).

2. Literature Review

The earlier criteria used for selecting studies, on project based learning include all articles related to primary research studies, Project-based learning stresses education that give odds on the learning system based on learners, collaboratively and integrate the real issues and practical, effective teaching in building knowledge and creativity. In this case, Analysis of the 15 reviewed studies revealed the following theme: issues project based learning as innovation instructional. The review Through project-based learning, learners will work within a team, find the skills to plan, organize, negotiate, and make a consensus about issues of tasks that will be done, who is responsible for each task, and how the information will be collected and presented scientifically.[2]

The conventional Project-Based Learning (PBL) pedagogy consists of five stages: Preparation, Implementation, Presentation, Evaluation, and Revision. When applied to an application domain, PBL lacks in two features, namely creative thinking and design process. This work tries to bridge the gap by proposing an innovative PBL (iPBL), which integrates two frameworks, namely creative learning and Conceive-Design-Implement-operate(CDIO). CDIO associates a proven design process with problem solving so that results are more convergent. iPBL consists of 7 stages including Preparation (P), Conception (C),Design (D), Implementation (I), Operation (O), Evaluation (E), and Revision(R). iPBL has been implemented on an instructional platform for a class of 85 junior students taking the capstone course in our computer science department.

There were 46 experiment groups and 39 control groups. For creative thinking, brainstorming and 6-3-5 were applied in the conception phase, SCAMPER in the design phase, and TRIZ in the implementation phase. The application of iPBL to a capstone course demonstrated not only significantly increased creativity, but also a more systematic record and analysis of all creativity tasks. Creativity at this stage is introduced by training the students in TRIZ (Theory of Inventive Problem Solving), where the students are presented with challenging problems that need inventive solutions. Two contradictory elements are presented and the students are asked to resolve the contradiction using a contradiction matrix based on the 40 principles of TRIZ. The deliverables at this stage consists of TRIZ solutions to design contradictions and system design and testing documents. The application of iPBL to the course demonstrated not only significantly increased creativity, but also a more systematic record and analysis of all creativity tasks..[3]

In this study, we explored the feasibility of incorporating the ARCS model (Attention-Relevance-Confidence-Satisfaction) of motivation into project based learning in a college engineering course. In conclusion, some characteristics of PBL were naturally related to the ARCS strategies such as to explore possible project topics (Attention; A2 inquiry arousal), to identify their own topic (Relevance; R2 motive

matching), and to make a plan for implementing the project (Confidence; C3 personal control).Intentionally incorporating ARCS with PBL was relatively easy. The instructor monitored students' work, evaluated it using the framework announced in advance, or provided immediate feedback (Satisfaction;S2 positive consequences, S3 equity).[4]This study sought to investigate the possibility of applying PBL in some Bahraini primary Schools and to see if there were any challenges existing during the implementation. Analysis of the data revealed that less than one third of the participants were able to apply PBL whereas the rest failed to do so because of the following reasons: some of them were reluctant and not confident enough to use PBL. Most pre-service teachers found it difficult to manage their classroom time appropriately because projects took more than the expected time. There is an evidence demonstrated by this study that PBL was challenging for students as well. It showed that students lacked the necessary skills of collaborative work. As a result, some students dominated the work and imposed their ideas on their classmates. The study indicated that some schools did not offer the required facilities and were not ready to shift to PBL because of various constraints such as time, noise and lack of financial support. Lastly, the findings of this study offered good opportunity for the researcher to come up with some valuable suggestions that could help in facilitating the process of applying PBL based learning.[5]

This study aims to see the comparison of the create skills of the students in the learning activities with the implementation of Project Based Learning (PjBL) and Cooperative-Project Based Learning (C-PjBL) model. This study carried out an experimental method by comparing the two research groups. Based on the results of an analysis of the assessment of project proposals and products of project task students, it can be concluded that there is a significant difference in the ability of students between the implement of the C-PjBL and PjBL models. The results of observations that have been made on the PjBL class also found student motivation decreases when the problems found cannot be solved, whereas in the C-PjBL class, when students find problems in carrying out project tasks, they do not experience difficulties, because they have learned first how rare- steps in solving problems. Students with the application of the C-PjBL model are able to achieve better learning outcomes because they have high motivation to learn. From the results of this study, it can be concluded that the C-PjBL model is effective in developing the create skills students.[6]

A. Specific objectives:

The specific objective of the methodology proposed in this paper is to nurture the students and motivate towards their project. Some of the specific objectives for project based learning are:

1. To build practical skills among students with the help of academic training that can be delivered by industry and research experts.
2. Students can apply theoretical concepts to the project and have brain storming session in the class with remaining students.
3. Motivating the students to collaborate with international experts/scientists etc.
4. Stimulating the use of ICTs among the students for new techniques, skills, teleworking etc.
5. Provide excellence about the current manufacturing technologies readily available.
6. Capacity building and networking in transnational cooperation projects.

B. Frame work of project based learning

To implement a project based learning among students, it is necessary to carry out the project work in their second year in the form of groups which can be challenging task in their regular laboratory. Hence it is necessary to set up the required layout of project in the lab so that the students find easy way to tackle challenges. This format can be set as a framework mentioned below.

I. Planning.
II. Implementation.
III.Integration.
IV.Next Steps (Wrap of the project).

1) Planning:

Students can be grouped into 4 or 5 as per the project idea with the consent of the faculty. Depending on the nature of the project in their respective labs a planning process should be developed as:

a.Ask the group to pick an action, activity, or goal to work on with the proposed idea.

b.Find the right resources for your project i.e. people, tools, software's/hardware, etc.

c.Build a schedule with a timeline, budget, outcomes, and other relevant milestones.

2) Implementation:

To implement the project, there are a number of steps for successfully completion. As these types of projects are new to the group of students, a bit of flexibility and guidance is necessary.

a.Since this project is new to the group, there is likely a starting point (guidance) for implementing the project. Check for various resources available.

b.Keep to your schedule as per the lab hours and your resources allocations. The key-deciding factor for projects during regular laboratory is of success and positive impact. So make sure you manage your schedule and your resources consistently.

c.In implementing your project, keep the lines of communication with your team and your stakeholders open. Communication is key on any project.

3).Integration

The next frame work is to integrate into operation as soon as the project is built off for the starting point of the next step in a larger project. The key things about closing out a project is that you want to make sure that the processes and procedures are in place to make it sustainable if it is part of operations or as a jumping off point to the next step of a bigger project. This will likely require keeping a record of steps to take, actions that are necessary, maintenance, and any kind of regularly scheduled check-ins.

4)Next step(Wrap of the project)

Once the process through planning, implementation and integration is completed, it's time for closing out. Create positive outcomes, innovations etc. during wrapping of the project for success of the work. Once the work is appreciated by the institute, think of marketing for the business

C.Methodology

As per the definition, a methodology is a system of practices, techniques, procedures and rules to be followed. The methodology is based on the Project based learning system and problem solving from the real world. The methodology adopted for undertaking the project during lab work should be fully explained. The report should contain the details such as location of the project work, sample size ,technologies involved/ schedules/ experiments, details of analysis (if any) for interpretation of the data, time frame of project activities, small budget and other details based on the nature of the project. The students can be grouped in 4 or 5 as per the guide during second year of engineering. It is expected to follow a plan template for your project. A simple template for conducting projects is short and low-cost that can be developed which require few weeks, to complete by the group that act as a thinking tool. Finally a report will be submitted with details as per the format. The following is the methodology adopted for successful completion of the project from start to wrap.

Prepare the physical model/software model.

•Determine the requirement or idea of any small project of the respective laboratory.

•The group can choose the right domain based on their interest of the respective laboratory.

•Discuss with your team mates by often meeting them for further analysis.

•Validate your idea with your friends. This will help you understand the loop holes if any which will boost self-confidence on your project.

•After validation, create an abstract/summary (Project short description/Idea expansion).

•Conduct literature survey (Refer other IEEE/Conference/Research papers which is related to your idea).

•Determine resources required as per available in the lab.

•List down the necessary main components involved for the project and start budgeting the whole cost involved in the project.

•Sketch the block diagram/circuit diagram /CAD/Matlab tools. Make the physical model / Software model which ever is feasible in the respective lab.

•Use the project template for smooth completion of the project which is the fundamental document containing all scheduled activities, tasks ,duration, budgets, resources, etc.

D. Advantages and disadvantages

I.Common pitfalls for project based learning: There arise common stumbling blocks with project such as:

a. Inadequate of estimation and scarcity.
b. Deprivation of planning and training
c. Lack of communication skills
d. Lack of impact of each change evaluated.
e. Lack of human resource planning.
f. Build a frame work structure using templates.
g. Ability to think and draw conclusions of project documentation

II Benefits of project based learning

According to the survey conducted on projects, several countries reveal many advantages:

a.project fosters cooperation and creativity,
b.We can stimulate regulation and control activities through transformative learning.
c.Provide problem-solving skills, memory retention, thinking skills, etc.
d.Convert your lab into factory by creating projects.
e.Find the advantage when a team works together.
f.Provide new method of work in a short span.
g.Find resources that might help the project move forward available in the lab

III. CONCLUSION

The paper deals with the process of facilitating the method of project based learning to schools in Engineering education. One of the main characteristics of this proposed practice paper is using SCRAMPER in the design phase and TRIZ in the implementation phase. The methodology explained herein is adopted for problem solving from the real world with a plan template for project based learning from the start process to the wrap of the project.

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