

Applying of Community Based Learning (CBL) in Engineering Courses at Palestine Polytechnic University

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Abstract—Community Based Learning (CBL) is a modern, interactive and experiential learning method where students and lecturers cooperate with community to address problems and issues. CBL allows students to gain practical knowledge and skills and at the same time helps communities in finding scientific-based solutions for their selected problems. That means there is an equal emphasis on helping community and at the same time providing students with valid experiential learning.

This paper will present our experience in applying CBL in three engineering programs at college of engineering at Palestine Polytechnic University (PPU) and give recommendations based on this experience .

Keywords—Community Based Learning; CBL; Engineering Education; PPU.

I. INTRODUCTION

With increasing trend for off-by-heart learning observed by students, modern academic institutions should focus more on **Learning** rather than **Teaching**.

According to the learning pyramid designed by National Training Laboratories shown in Fig.1 [1], practice by doing has the second highest retention rate among the different learning methods. Therefore, CBL promises to be efficient and retentive learning method hence it is based on experiential learning practices.

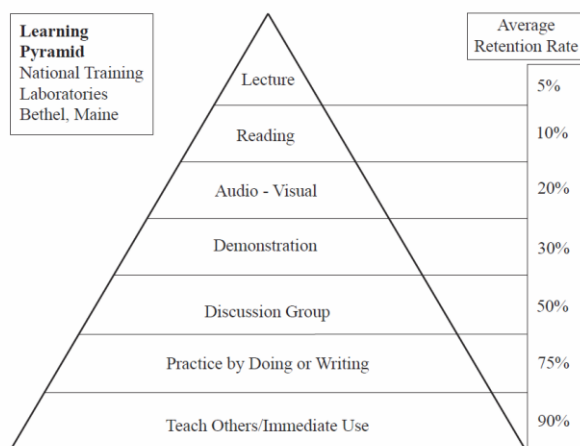


Fig.1: Learning Pyramid

The idea of CBL is based on involving students and lecturers in addressing and solving community issues and problems using in the lectures learned theoretical skills and knowledge. That means there is an equal emphasis on helping community and at the same time providing students with valid experiential learning.

CBL has the following goals [2], [3],[4]:

- To enhance student learning by joining theory with experience and thought with action.
- To fill unmet needs in the community through direct service which is meaningful and necessary.
- To assist students to see the relevance of the academic module to the real world.
- To enhance the self-esteem and self-confidence of students.
- To develop an environment of collegial participation among students, lecturers, and the community.
- To increase the civic and citizenship skills of students.

The inspiration of applying CBL and knowing its pedagogical definition, objectives and strategy were obtained by relevant workshops organized by Center of Excellence in Teaching and Learning (CETL) which was established by Palestine Polytechnic University (PPU) in 2013 and in cooperation with AMIDEAST. CETL aims to achieve excellence in teaching and learning in the university through various educational activities and programs. The center seeks to improve the teaching skills and to build educational capacity of PPU staff to accomplish educational excellence through training, consultations, introducing new teaching methodologies and learning communities [5].

This paper presents our experience in applying CBL in advanced engineering courses for the undergraduate programs Industrial Automation, Electrical Power Engineering Technology and Mechatronics.

II. WHAT IS COMMUNITY BASED LEARNING?

Community Based Learning or CBL is active, learner-centered and experiential learning where students and lecturers collaborate with communities to address problems and issues. CBL allows that both sides mainly students and community gaining knowledge and skills and enhancing development. There is an equal emphasis on helping communities and providing valid learning experience to students where lecturers have to facilitate this academic-community engagement.

While in standard class rooms learning is one-sided process in which teachers or lecturers are responsible for learning, CBL allows the transmission of knowledge from experts or acquisition of knowledge by learners by themselves.

There are mainly three types of CBL[2]:

1. **Direct service** where students are placed in direct contact with people.
2. **Indirect service** where students are engaged in performing service by providing goods or a product to a needy cause.
3. **Civic action or advocacy** where causes of social issues are addressed.

In our experiment we used type 1.

It is important to know that CBL is not a volunteer program or one-sided where either students or community benefit from it. The following table summarizes the main differences between CBL and other academic experiential learning methods [2].

TABLE I. COMPARASON BETWEEN CBL AND OTHER TYPES OF EXPERNTIAL LEARNING

Type of service	Community Service	Academic Learning	Civic Learning
Volunteering	YES	NO	NO
Internship	MAY BE	YES	NO
CBL	YES	YES	YES

III. STRATEGY

Since application of CBL was new at our college and because of uncertainty of students motivation and the awareness of the local community about the idea, we decided to offer CBL as an optional gate for the students to enhance their final grade in the respective courses.

The following table (TABLE II) shows the assessment (evaluation) system for both courses for the standard option and the CBL option with the maximum achievable grade in each method.

TABLE II. ASSESMENT SYSTEM FOR CBL AND STANDARD OPTION

	Standard Option	CBL-Option
First Exam.	20%	20%
Second Exam	20%	20%
Final Exam	40%	40%
Homework	10%	10%
Report	10%	-----
CBL- Project	-----	20%
Total	100%	110%

We can notice that students who have decided to follow the CBL option have the possibility to get 10 points as bonus.

The courses selected for applying CBL are:

1. **Programmable Logic Control (PLC)** for the undergraduate programs Industrial Automation, Electrical Power Engineering Technology.

This course has mainly the following Intended Learning Outcomes (ILOS):

- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Ability to design a system and processes to meet desired needs within realistic constraints.
- Ability to function on same- and multi disciplinary teams.
- Ability to use the technique, skills and modern engineering tools necessary for engineering practice

2. **Electrical Protection Systems 1** for the undergraduate program Electrical Power Engineering Technology.

This course has mainly the following Intended Learning Outcomes (ILOS):

- Ability to apply knowledge of engineering and science in protection engineering.
- Ability to design a system and processes to meet desired needs within realistic constraints.
- Ability to function on same- and multi disciplinary teams.
- Ability to identify, formulate and solve electrical protection problems and related fields.
- Understanding of professional and ethical responsibility.
- Ability to communicate effectively orally and in writing.
- Ability to use the technique, skills and modern engineering tools necessary for engineering practice.

At the begin of the semester and at the first lecture a presentation about CBL and its definition, goals, etc. was conducted for the students. After the presentation Students

have shown a clear enthusiasm for the idea. A survey was conducted directly after the introducing presentation with the clear question : **Will you choose the CBL or classical option?**. Survey has shown that 84 % of the students of the course Electrical Protection Systems 1 are intended to choose the CBL option. However at the end of the semester only 60% of them has indeed accomplished a CBL project. The survey of the PLC students has shown that 23% of them are intended to choose the CBL option but only 19% has chosen this option at the end of the semester which is relative close to the survey result.

Interested students were then asked to start contacting respective community institutions to find suitable CBL project. At this stage facilitation, networks of the lecturer was important to establish contact and relationships between students and community institutions and industrial sector.

Once students and their community partners have agreed about a CBL project the idea were then discussed with the lecturer and modified if needed. Furthermore an official letter from the community partner was requested to specify the frame and nature of the project.

Here are some selected examples for executed CBL projects related to both courses:

1. Automation of the filling process of water tanks: This project was executed by one student. A PLC program was developed and realized for filling the water tanks at the roof of the industrial school in Nablus. The PLC program has replaced the standard mechanical filling method which was combined with water losses.
2. Design and building of a safety system for pressing machine: Two students have designed and built a PLC-controlled protection system for a pressing machine at Royal factory for plastic products [6]. The system stops the machine once a light barrier is interrupted.
3. Testing of the electrical protection devices in schools: Several student groups of the course Electrical Protection Systems have selected schools in their area to test and evaluate the functionality of their low-voltage protection systems like Residual current devices (RCD), circuit breakers, etc. Some serious malfunctioning devices were detected and the respective schools were officially notified.

IV. EVALUATION OF OUR EXPERIMENT AND RECOMMENDATIONS

Applying CBL has clearly enhanced the practical skills of students. Realizing the applicability of learned theoretical material has increased their self-esteem and confidence and the enthusiasm to their study.

Additional to the known and previously mentioned advantages of CBL, further non-academical skills like principles of official correspondence and fund-raising possibilities could be developed.

Providing students bonus grades was observed to be a strong motivation for students to choose the CBL option.

Based on our experience in applying CBL we recommend the following:

- In case that the institution or lecturer is intended to apply CBL for the first time it is recommended to make it optional with bonus grades.
- It is recommended to organize visits, workshops, info-lectures etc. for the local community to introduce it the idea and advantages of CBL. This would ease establishing cooperation and networks between the academic institution and the community and would be very helpful in execution of planned large-scale application of CBL.
- The suggested projects should be moderate and fit with time frame of the course and the required efforts. CBL project is not a graduation project.

V. CONCLUSION

First evaluations of the results and of the achieved outputs of applying CBL in engineering courses at college of engineering at Palestine Polytechnic University show that CBL and additional to its known civic and academic advantages promises to be an efficient answer for the unfortunately increasing trend of off-by-heart learning observed by students and pupils even in scientific and mathematical courses. Convincing students that the theoretical material learned in the classroom has indeed a practical sense that they can explore through hands-on activities increases their self-esteem, confidence, critical thinking and surly their feeling to civic responsibilities.

It is recommended for new applier of CBL to start "carefully". That means CBL shouldn't be obligatory at begin. This is recommended because of firstly, the known concern and doubt of students about any new lecturing methods and materials, and secondly because of potential of unawareness of the local community of the idea and concept of the CBL. Academic institutions interested in applying CBL should organize info events about CBL for the community.

It is important for the lecturer to aware students and agree with them that students will not be graded based on the service hours they performed but they are given grades based on the learning that achieved.

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