

Bahrain Polytechnic



بوليتكنك البحرين

Exploratory Problem Based Learning (EPBL) As A new Approach to Modify the Current Project-Based Learning (PBL) Inefficiencies and Problems; Based on case studies

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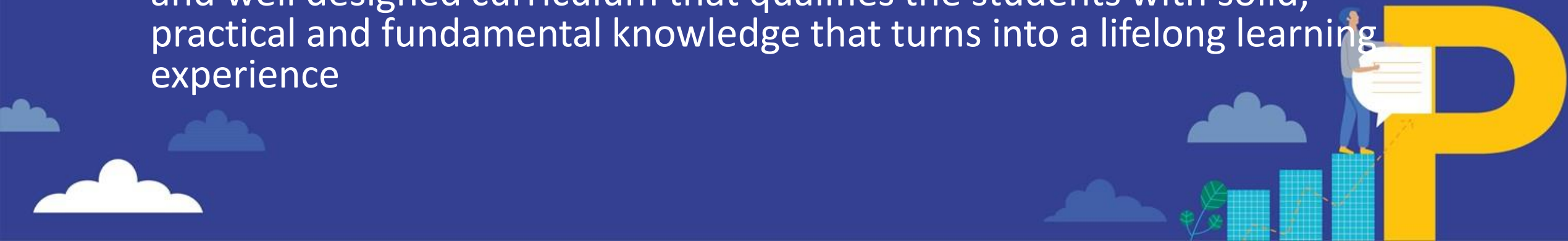
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Introduction

- The purpose of this conceptual proposal was to reflect on the current education process of problem based learning model as an educational tool in engineering majors
- This work was carried out to positively change students experience with current PBL model
- The main focus of this study is to come up with an innovative PBL model and well designed curriculum that qualifies the students with solid, practical and fundamental knowledge that turns into a lifelong learning experience



Educational Models

- There are two types of educational models that have been studied in this presentation:

1. Project-Based Learning (PBL)

2. Lecturer-Based Learning



What is PBL?

- It is a student-centered system that allows students to gain skills and knowledge by investigating and responding to an authentic problem, complex question or a challenge.



Differences between PBL model & lecturer-based model

PBL	Lecturer-Based
Student-centered	Teacher-centered
Provides students mostly with hands-on knowledge	Provides students mostly with theoretical knowledge
Students will be trained to find multiple scenarios for solving a problem	Students are mostly restricted by the solutions that are provided by the instructor
Students are free to gain as much knowledge as they can	Students are bounded with what is being taught by instructors
Sources of information are wide e.g. journals, books, PDF's	The sources of information are limited to what instructors provide e.g. notes, powerpoint slides
Students mostly practice social learning which improves their communication skills	Students mostly practice solitary learning which might weaken their communication skills
Develops students' autonomy and independency towards their projects that results in acquiring life-long learning skills	Might limits students' ability in questioning and directing their own thoughts while learning
Can equip students with life-long learning skills	Students might end up forgetting what they learned

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Lecturer-Based

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Inefficiencies of PBL model

- Culture counts: cultural relationship with PBL model
- Missing link between PBL courses and lecturer-based courses
- Poorly designed curriculum
- Improper way of selecting a PBL topic by instructors
- The current PBL model mostly can't prepare students to tailor their own topics that they are interested in
- There are problems associated with the execution of PBL projects e.g. facilitators, software, hardware

Methodology

- A case study method
- Interviews and observations were conducted to obtain qualitative data from students
- The participants selection was done by using purposive sampling method from a university

Case Study #1

- The students solved their project purely under current PBL model
- Students were given prepared project statement with defined problems which limited students' problem-exploring skills and critical thinking
- Students ended up with having less interest towards their project

Case Study #2

- Students were solving their project under current PBL model and then shifted to EPBL model
- Students started to solve their project with heavy calculations without true understanding of the problem
- The provided solution was restricted to a solid mechanism that had been taught in a lecturer-based class

Case Study #2 continued,

- After submitting the project the students discovered that their work was partially wrong, the reason for that was:
 1. The pre-requisite courses taken were not enough to qualify the students to handle a graduation project
 2. Students solved the project directly without full comprehension exploration of the problems prior to start the project
 3. The selected topic was based on a lecturer-based course which made the transition from handling theoretical information to practical application quite challenging
 4. Lack of critical thinking skills
- Students then decided to continue their senior project and here was the shifting point from PBL model to EPBL model

Case Study #3

- Students practiced some fundamental concepts of EPBL from the beginning of the project
- Students started to have analytical and critical thinking about their project statement
- They spent a prolonged time to understand their project from different aspects which resulted in coming up with a newly created project statement to work on that matched their interest
- Students were able to come up with multiple hypothesis and viable solutions to their project
- They gained the life-long learning experience that will prepare them for their future career

How to solve the inefficiencies of PBL?

- By introducing a novel which is Exploratory Problem-Based Learning (EPBL) which aims to enhance the current PBL model inefficiencies and problems and how to overcome them

What is Exploratory Problem-Based Learning (EPBL)

- It is a concept of constructing students' knowledge to identify and analyze the problem/project systematically in a new designed curriculum with full understanding of the topics before start solving it immediately, and to improve the students' critical thinking capabilities and questioning skills
- EPBL projects are focused on questions that drive the students to encounter the central concepts and principles of a discipline, give the student the opportunity to work autonomously over extended period of time

Objectives of EPBL

- To create the missing link between lecturer-based and PBL courses
- To re-establish the concept of designing an efficient curriculum suitable for PBL education
- To provide students with life-long learning skills and critical thinking skills
- Unlike PBL, EPBL aims to provide students with more chance to practice life-long learning skills and critical thinking skills
- To equip students with the ability of writing detailed research proposals from idea to execution
- To enhance the current PBL in terms of facilitators selection, inviting an expert from the industry, software, hardware,...etc

Pillars of EPBL model

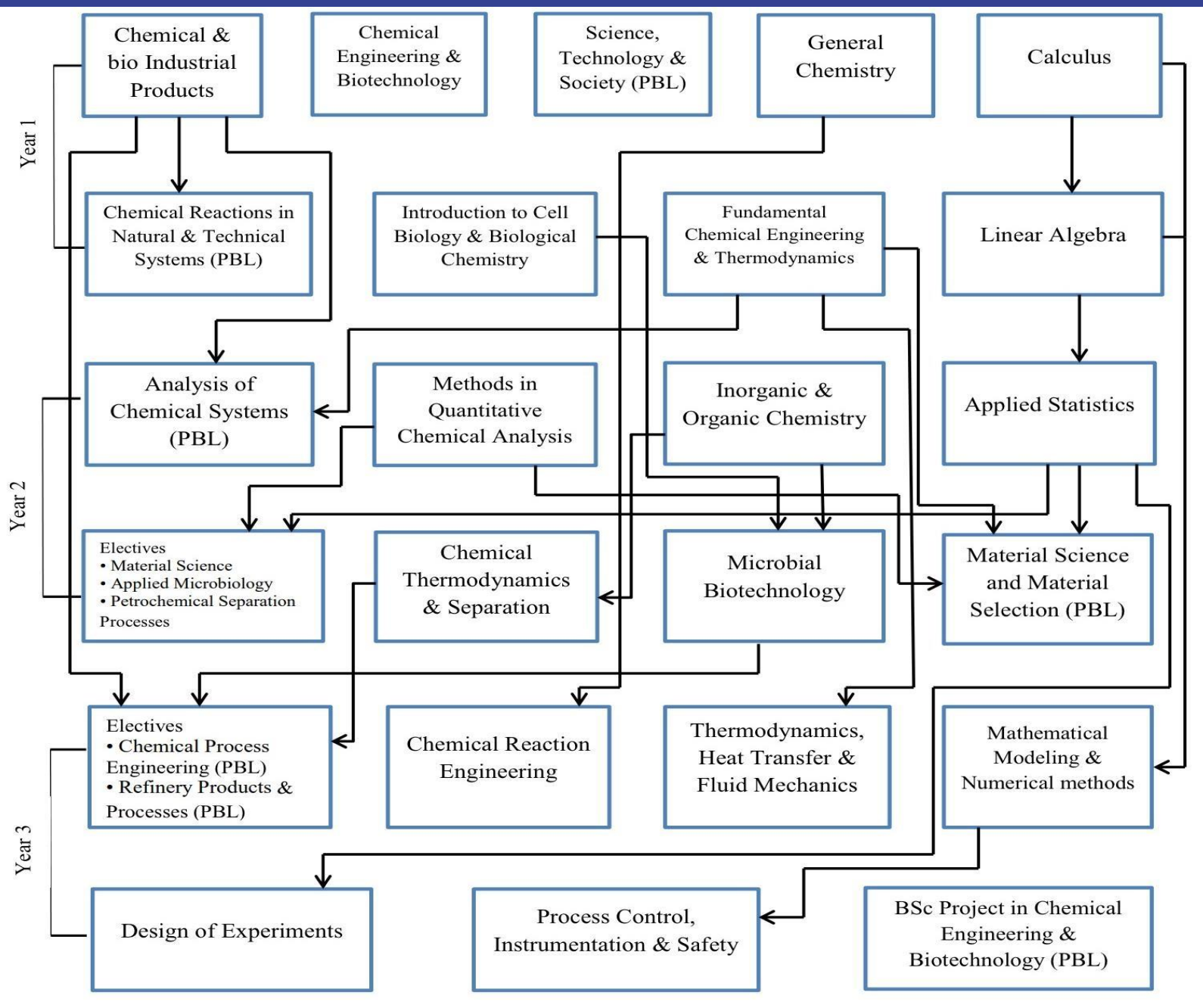


Results and discussion – Facilitator qualifications

- Initiate a suitable environment for EPBL by hiring qualified instructors with experience of performing project based teaching
- Facilitators should be able to use modeling, prompting, and coaching to teach strategies for thinking and problem solving; and gradually release responsibility to the learner" (Blumenfeld et al., 1991)
- Facilitators are responsible for keeping the learning process active by creating “driving questions” which are questions that encounter the complex contents and principles (Blumenfeld et al., 1991)
- Create an embedded coaching process that preserve students initiative yet allows instructors interpretations through effective communication

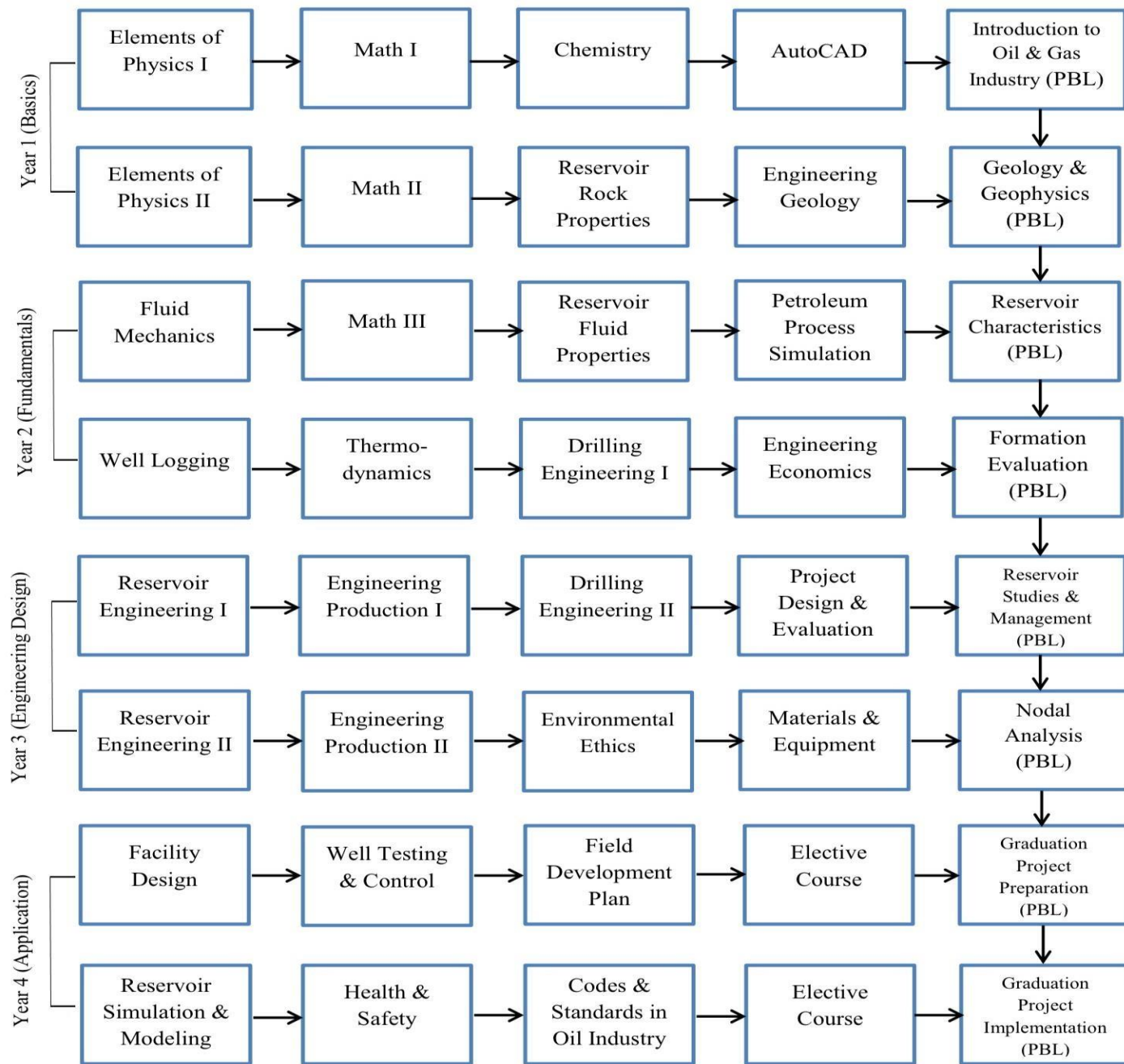
Results and discussion – Curriculum Design

- The figure is showing an arbitrary curriculum that has been designed based on the current PBL model
- The PBL courses and lecturer-based courses are poorly linked
- There is an immediate shift between the courses which shows the transition phase is missing



Results and discussion – Curriculum Design

- This figure shows a curriculum designed under EPBL model
- The PBL courses and lecturer-based courses are strongly linked
- The transitional phase between the courses had been created
- Courses are placed in a well-organized structure that leads to create a well-rounded engineers
- The critical elements had been considered in the curriculum
- EPBL emphasizes that designing an educational curriculum should be dealt by an expert



Results and discussion – Students' topic selection ability for PBL project

- For case study #1, Students systematically followed the selected proposal given to them which led to lose their interest to contribute creatively to their project
- Case study #2, students were able to breakout the PBL framework and started to explore the problem and to understand it more deeply by shifting to EPBL model, which resulted in having a successful complex application towards the problem
- Case study #3, students from the beginning decided to transform their proposal to something that matched their interest

Results and discussion – Project's life-long learning skills

- For case study #1, Students didn't have the chance to think critically about other possible solutions for their project which resulted in lacking life-long learning skills
- Case study #2, students understood and explored their project from its roots and basics which resulted in obtaining life-long learning skills which helped them to solve their project from different aspects
- Case study #3, students had full awareness of the project's multi aspects which helped them in gaining optimization skills that prepared them for their future work

Results and discussion – Students' ability to write their PBL project proposals

- For case study #1, Students lacked the critical thinking skills and were not able to come up with any other proposal besides the one provided to them
- Case study #2, students managed to come up with multiple problem statements and they had the ability to bring their project to a higher and advanced level
- Case study #3, students spent enough time to explore their project and then transformed their proposal into something that matched their interest

Conclusions

- The study has reviewed the main drawbacks of PBL execution through 3 case studies
- A new innovation in pedagogy and curricular activities has been introduced to overcome these inefficiencies through improving the facilitators teaching skills and strengthen the links between the courses in the curriculum
- The framework of EPBL carries a great potential in transforming the students into lifelong learners

Recommendations for further study

- The study may assist any institution that has willing of adapting project/ problem based learning into their educational system through the introducing a curriculum design that has both horizontal and vertical links between the courses
- The proposed model expected to have input on facilitators professional training
- Its recommended to incorporate a high-tech teaching and learning supportive system in the EPBL classes

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Thank you

