



## Towards a New Generation of Engaged Universities: *The Need to Act, Adapt and Transform*

16<sup>th</sup>– 18<sup>th</sup> April, 2024 | Kempinski Central Avenue  
(Formerly the Address Dubai Mall), Dubai, UAE

# Adapting Project Based Learning (PBL) Approach as Educational Tool for Engineering Programs (AU as a Case Study).

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## About the Australian University- Kuwait

[www.au.edu.kw](http://www.au.edu.kw)

- The Australian University (AU) was established in 2004 under the name of “Australian College of Kuwait” as one of the first private universities operated in the State of Kuwait. AU offers world-class higher education on home ground through international learning partnerships.
- AU offers diploma and bachelor academic programs in different disciplines such as Engineering, Business, Aviation, and Maritime studies.
- AU is a student-centered University that implements experiential models as the **Project Based Learning (PBL)** and Conceive, Design, Implement and Operate (CDIO)
- At AU, we believe that our diversity, excellent learning and research, and commitment to collaborations allow to create positive change and build a more innovative and sustainable realm. The various pages in this website provide a summary of our study programs and University life.





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## About the PBL model at AU

- Implementation of PBL was by the CoE in 2011 Partially in collaboration with CQU - Australia.
- Inauguration of PBL Center in 2015, to Develop AU model of PBL.
- Currently:
  - One course using PBL in diploma Sem. 4 in all engineering disciplines
  - One course using PBL in degree, each semester, in all engineering disciplines
  - Graduation Projects





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## PBL model at AU

- PBL is a systematic approach of teaching and learning facilitation that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks.
- This definition encompasses a spectrum ranging from brief projects of one to two weeks based on a single course in one room to yearlong, interdisciplinary projects that involve industry participation.





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## PBL Learning Principles

PBL model is based on the following learning principles:

- Project oriented
- Student self-directed
- Activity-based
- Real life context (inclusion of “industry practice” is essential)
- Analytical thinking required
- Team-based



## PBL Courses

- PBL courses have comprised of several learning outcomes (L.Os) such as any other course. Students need to satisfy all L.Os.
- The way the students satisfy the L.Os and the way of evaluation is different from traditional courses

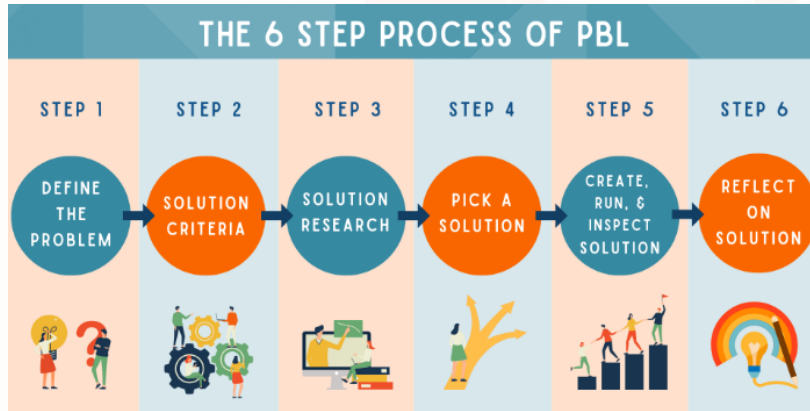


Fig. 1: The 6-Step Process of PBL, [1]



Fig. 2: Pick a Solution, [1]



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## PBL Environment

- The PBL project tasks will be accomplished by teamwork and individually.
- PBL courses have students from the same major or mixed groups (different majors). The number of groups is specified by the number/major of registered students
- PBL Tasks/activities will not be limited to a **classroom**. It could be achieved in the special PBL classroom/workshop/Lab/computer labs. This depends on the nature of the Project(s).





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## PBL Special Classrooms

- PBL courses are delivered in special classrooms that equipped with computers, closets, ...etc. and tables that allow the students to set as group, Fig. 3.
- There are also meeting rooms for the students to meet at any time. These rooms are equipped suchlike any room in real life workplace that can be accessed at any time by the students during the working hours of the university. Fig. 4.



Fig. 3: AU-PBL classroom





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## PBL Special Classrooms

- Tasks/activities will not be limited to a **classroom**. It could be achieved in the special PBL classroom/workshop/Lab/computer labs. This depends on the nature of the Project(s), Fig. 4-6.



Fig. 4: Students meet during their free time in PBL meeting room



Fig. 5: Workshop activities for one of PBL courses



Fig. 6: PBL projects implemented in computer labs





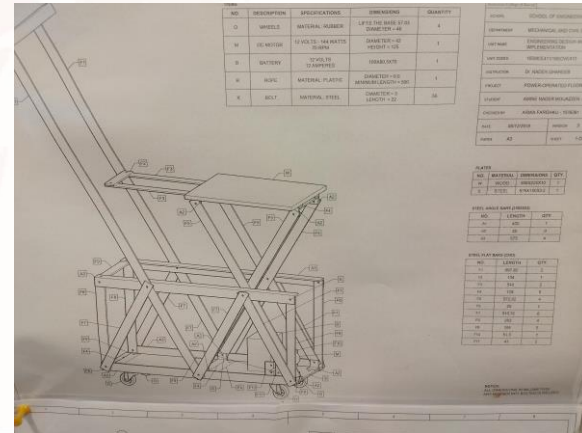
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## Student's Submissions

- Students submit several assessment items within a prespecified time frame to satisfy the L.Os. All assessment items together need to cover each LO at least one time.
- The submitted items could be presentation, conceptual project design, portfolio, technical report, progress report(s), reflective workbook, reflective paper, deliverables such as prototype, or meeting agendas / minutes. Depends on the nature of project(s). Fig. 7.

Fig. 7: Example of student's submission CAD drawings





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## Evaluation of Student's Submissions

- PBL Instructor needs to ensure that all L.Os are covered by the assessment items. By checking the mapping matrix, in addition to the underlying mapping of LOs to Graduate Attributes and grading rubric.

Assessment item	Learning Outcomes-(Engineering Skills)									
	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
Technical Drawing (Project 1)		X		X		X	X	X		
Midterm Portfolio (Project 1, 2)	X	X	X		X	X	X	X	X	
Presentation (Project 3)				X				X	X	X
Final Portfolio (Project 3, 4)	X	X	X		X	X	X	X	X	X

Fig. 8: Example of Mapping Learning Outcomes to Assessment Items





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## Evaluation of Student's Submissions, ...continued

- PBL Instructor will check the student submission against Grading rubric to evaluate the final mark.
- Viva Voce –(verbal exam) is used at the end of the evaluation stage.
- Viva voce could be attended by people from industry.

Portfolio Assessment Criteria – Midterm Portfolio (1 and 2)

2ISMCE113 /2ISMCE114 Engineering Design / Management Implementation

Student Name: \_\_\_\_\_ Assessed by: \_\_\_\_\_ Provisional Grade: \_\_\_\_\_

Evidence provided of achievement of Course Learning Outcomes is to be based primarily on work undertaken individually and in project teams within this course. An Excellent means 10 marks, a Good means 8 marks and an Acceptable means 6 marks. An Unacceptable will mean 2 marks.

Learning Outcome	Unacceptable	Acceptable	Good (Acceptable +)	Excellent (Good +)
<b>1. Apply the techniques of project management (PM) to design and implementation phases for hands-on and practical engineering projects.</b>  <b>(TEAM TASK – Final Group Design)</b>  <b>a. Work Breakdown Structure (WBS) (Implementation phase)</b>  <b>b. Gantt Chart begins by week 6 and ends before final portfolio submission date with 2 hours work weekly (Implementation Phase)</b>  <b>c. Risk Assessment (RA) (Planning, implementation and operation phases- minimum 3 different hazards for each phase)</b>	No evidence of project planning	Use of project management software in project planning	Must meet requirements for Acceptable plus:	Must meet requirements for Good plus:
	Inability to use project management software to plan project and monitor progress	Ability to provide all necessary PM documents as requested by client regardless of quality	WBS contains all necessary tasks to manufacture the design	Completely error free project management documents (no spelling/technical mistakes ...etc.)
	Incomplete PM items are submitted	Tasks in Gantt Chart match with those in WBS for production phase	Tasks inside the Gantt Chart are listed properly, and they can be followed to produce the designed model	All forms and templates are filled and signed if required
	At least one project item is missing	Tasks in Gantt chart are linked together	Gantt Chart begins on week 6 and ends before portfolio submission deadline	
		Few mistakes in the project management tools of any type	Only one mistake in any of the project management tools	
			Demonstrated ability to make informed project management decisions	
			The right RA template is used	

Fig. 9: Grading rubric





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## Some examples of PBL projects

- Design of pedestrian bridge- mechanical and civil engineering
- SCADA Systems- electrical and electronic engineering
- Advanced process simulation-Petroleum Engineering

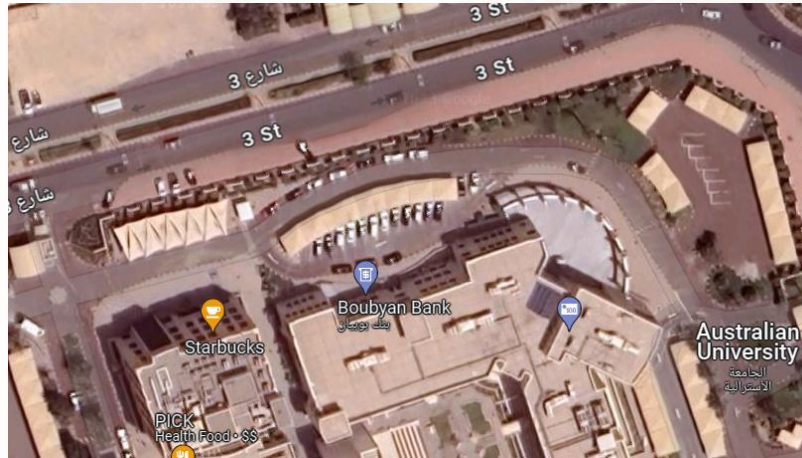


Fig. 10: Pedestrian bridge representation

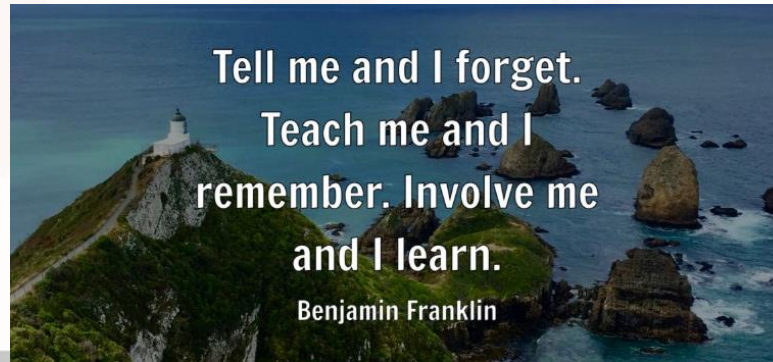


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## Advantages of PBL approach

- Simulate the real industrial life. Students are ready for internship programs, workplace environment for example Health and Safety procedures, and work ethics: professional behavior, responsibility, quality, discipline, and teamwork.
- PBL approach is flexible where new technologies and knowledge can be delivered
- Provide the students the chance to meet with practitioners, attend seminars, hands-on experience, participate in research activities





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## PBL approach outcomes – Research Papers

Home > Journals > Journal of Porous Media > Volume 19, 2016 Issue 11 > APPLICATIONS OF POROUS MATERIALS AND NANOPARTICLES IN IMPROVING SOLAR DESALINATION SYSTEMS

**Journal of Porous Media**  
Editor-in-Chief: Kambiz Vafai  
Associate Editors: Ali J. Chamkha, Kamel Hooman, Andrey V. Kuznetsov, Oronzio Manca, Maria Laura Martins-Costa, TRI NGUYEN-QUANG, Krishna Pillai, Giuseppe Pontrelli, Marc Prat, Michel Quintard, Muhammad Sahimi, M. Wang, Gongnan Xie, Huijin Xu

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### APPLICATIONS OF POROUS MATERIALS AND NANOPARTICLES IN IMPROVING SOLAR DESALINATION SYSTEMS

Volume 19, Issue 11, 2016, pp. 993-999  
DOI: 10.1615/JPorMedia.v19i11.50

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### Application of PBL in the Course Fluid and Electrical Drive Systems, Case Study: Manufacturing an Automated Punch Machine

Ahmad Sedaghat, Mohammad AlJundub, Armin Eilaghi, Ehab Bani-Hani, Farhad Sabri, Raouf Mbarki, M. El Haj Assad \*



Fig. 11: Research paper where students participated and apply new technologies



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## PBL approach outcomes – New skills and technologies

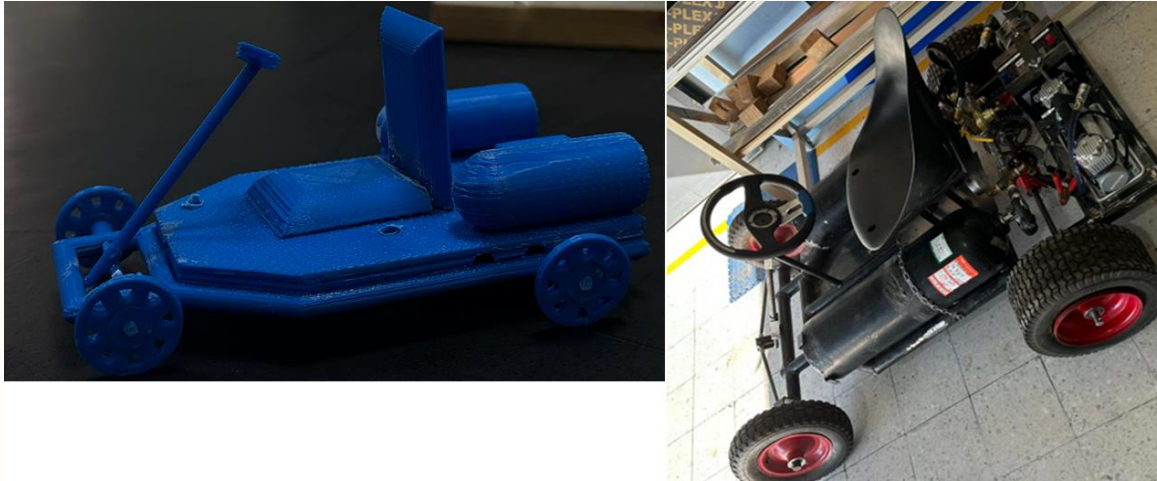


Fig. 12: 3D printing of a real vehicle model to be tested in lab equipment, 2023





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## PBL approach outcomes – New skills and technologies



Fig. 13: 3D printing of a boat to be tested in one of PBL courses in mechanical engineering department, 2023



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## PBL approach outcomes – Feedback

- “...now I’m working at the ... company as a cost estimate engineer ... this is all thanks to you ... I’ve really learnt a lot from you and from PBL classes in general”  
(Nadeen A., alumna – AU student)
- “...after I’ve graduated, I discovered that PBL courses were the real and great knowledge I gained...These courses prepared me well to work in any area of specialty as well as working in difficult environments such as time pressure, limited provided materials, and random teams...”  
(Amal K., alumna-AU student)
- The level of technical knowledge that ... students demonstrated tied in seamlessly and practically with our operations. Their PBL training enabled students to work well with our staff of all cultures. The ... Industries Company observed good people skills and a passion to learn...”  
(Eng. Nemer A., Internship Supervisor at company)





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## Conclusions

### Conclusions about PBL Approach:

- Successful based on most of the feedback received from industrial sector and students.
- Insightful and enriching experience for the students as a future engineer to explore new horizons and gain valuable insights into innovation and personal development.
- Providing the students with the opportunity to work with students from different majors and practitioners from many industrial experiences.
- Flexible in terms of working and studying in nontraditional university classrooms such as labs and workshops.
- Providing the students with the feeling of an engineer by having the opportunity to work freely in PBL rooms that simulates the real offices in real life workplace





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## References

1. Source: [www.magnifylearningin.org/the-6-step-process-of-project-based-learning](http://www.magnifylearningin.org/the-6-step-process-of-project-based-learning), Jan, 2024



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