



International OBE  
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# **Problem-Based and Project-Based Learning (PBL) for Engineering Education and its Impact on OBE**

**Presenter**

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# PRESENTATION OUTLINE

- PBL TEACHING LEARNING METHOD
- TRADITIONAL LEARNING VS PBL
- CHARACTERISTICS OF PBL
- TEACHING AND LEARNING PHILOSOPHY OF PBL
- HISTORICAL EVOLUTION OF PBL
- USE OF PBL IN DIFFERENT EDUCATION
- AALBORG PBL TEACHING MODEL
- KNOWLEDGE SHARING PLATFORM WITHIN PBL ACTIVITIES
- OUTCOME BASED EDUCATION AND GRADUATE'S ATTRIBUTES
- IMPACT OF PBL ON OBE
- CONCLUSIONS
- REFERENCES



# PBL METHOD

- Can be defined as an **inquiry process** undertaken **by students** that seeks to **resolve questions** and uncertainties about **complex life situations**.
- Students learn from and build upon each others' questions, are open to different points of view, listen to and **respect each others' ideas** and **work collaboratively** towards **problem resolution** and reasonable conclusions (Barell, J. 2007).



# PBL TEACHING AND LEARNING

- **Popularized by Barrows & Tamblyn (1980)**
- **PBL is an approach to learning that is driven by the process of inquiry**
- **Uses problem scenarios to encourage student engagement in the learning process**
- **The tutor selects the task and supports or facilitates the process but the students are expected to explore the task, claim their present understanding, examine their knowledge and skills gaps in order to decide what new information and skills they need to appropriately address the task and resolve the problem**



# TRADITIONAL LEARNING VS PBL

## Traditional Learning

Told what we need to know



Memorize it



Problem assigned to illustrate how to use it

## Problem Based Learning

Problem assigned



Identify what we need to know



Learn & Apply to solve the problem



# CHARACTERISTICS OF PBL

- Real life situations that have no 'right' answer are the organising focus for learning
- Students work in teams to confront the problem, identify learning gaps, develop viable solutions
- Students gain new information through self-directed learning
- Staff act as facilitators
- Problems lead to development of judgement based decision making, and problem-solving capabilities (Savin-Baden & Howell Major, 2004)



# CHARACTERISTICS OF PBL (CONT...)

**Acknowledgement of learners' experience base**

- **Students take responsibility for own learning**
- **Intertwining of theory and practice**
- **Focus on process rather than product of knowledge acquisition**
- **Change of tutor's role from that of instructor to that of facilitator**
- **Change of focus from assessment of outcomes to self assessment and peer assessment**
- **Focus on communication and interpersonal skills so that students understand the importance of being able to relate their knowledge (Boud 1985)**







# TEACHING MODE OF PBL

- **Helping students to become self-directed learners**
- **Facilitating the learning process**
- **Providing an opportunity to explore knowledge and understanding**
- **Learning from experience**
- **Providing formative and summative feedback**



# LEARNING MODE OF PBL

- **The learner actively constructs new knowledge on the basis of current knowledge and understanding.**
- **It is a constructive rather than a receptive process.**
- **It is an active process of finding out in which learning occurs by doing.**



# TEACHING AND LEARNING PHILOSOPHY



**'I cannot teach anybody anything, I can only make them think' (Socrates)**



# HISTORICAL EVOLUTION OF PBL

**First In 1960s – In North American medical schools**

**End of 1960s-**

- **At McMaster University in Canada**
- **At University of Limberg in Netherlands**
- **Harvard University in USA**

**Later on-**

- **Roskilde and Aalborg University in Denmark**
- **Bremen University in Germany**
- **Newcastle University in Australia**

**At present- Many Universities all over the World**

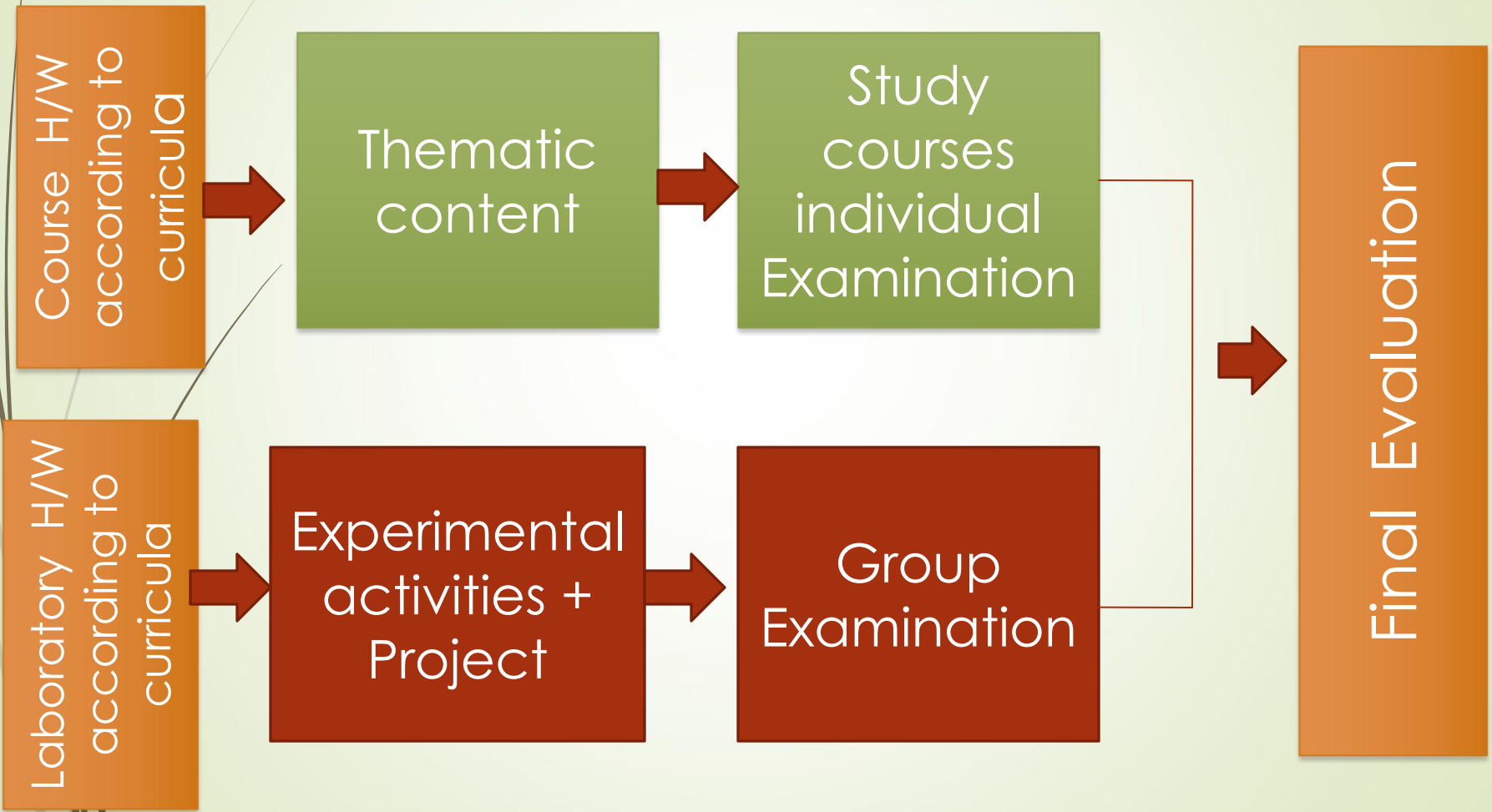


# PBL PRACTICING EDUCATION DOMAINS

- Higher education (Ahlfeldt et al., 2005),
- Medicine (Albanese & Mitchell, 1993),
- Teacher education (Albion & Gibson, 2000),
- Nursing (Baker, 2000),
- K-12 settings (Fosnot, 1988),
- Engineering (Jayasuriya & Evans, 2007),
- Doctoral education (Candela et al., 2009)
- Economics (Son & VanSickle, 2000).
- In Basic science, like Chemistry, Biology, Physics etc.
- Marine, and Management
- Trainee doctors (Koh, 2008),----- Many more



# AALBORG PBL TEACHING MODEL FOR ENGINEERING EDUCATION





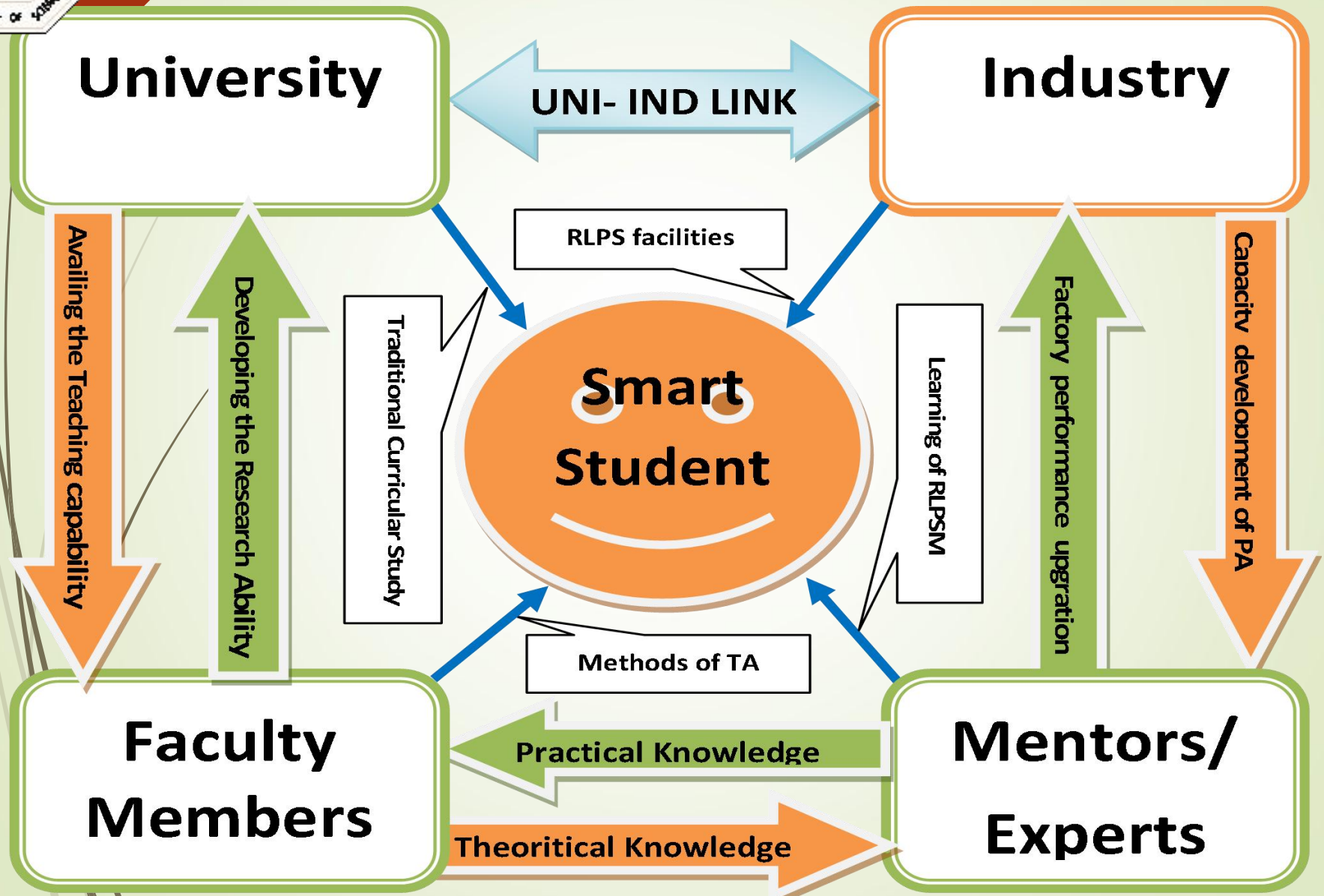
# PROJECT IMPLEMENTATION ACTIVITIES

**Key Activities are:**

- **Team building with students by an Instructor/Facilitator.**
- **Identify the course related problem from practical field.**
- **Detail the parameters necessary to solve the problem.**
- **Encourage students to brainstorm with teammates.**
- **Develop an action plan to achieve the time-line for the project.**
- **Implement the action plan.**
- **Summarizing the result both in written and oral reports.**



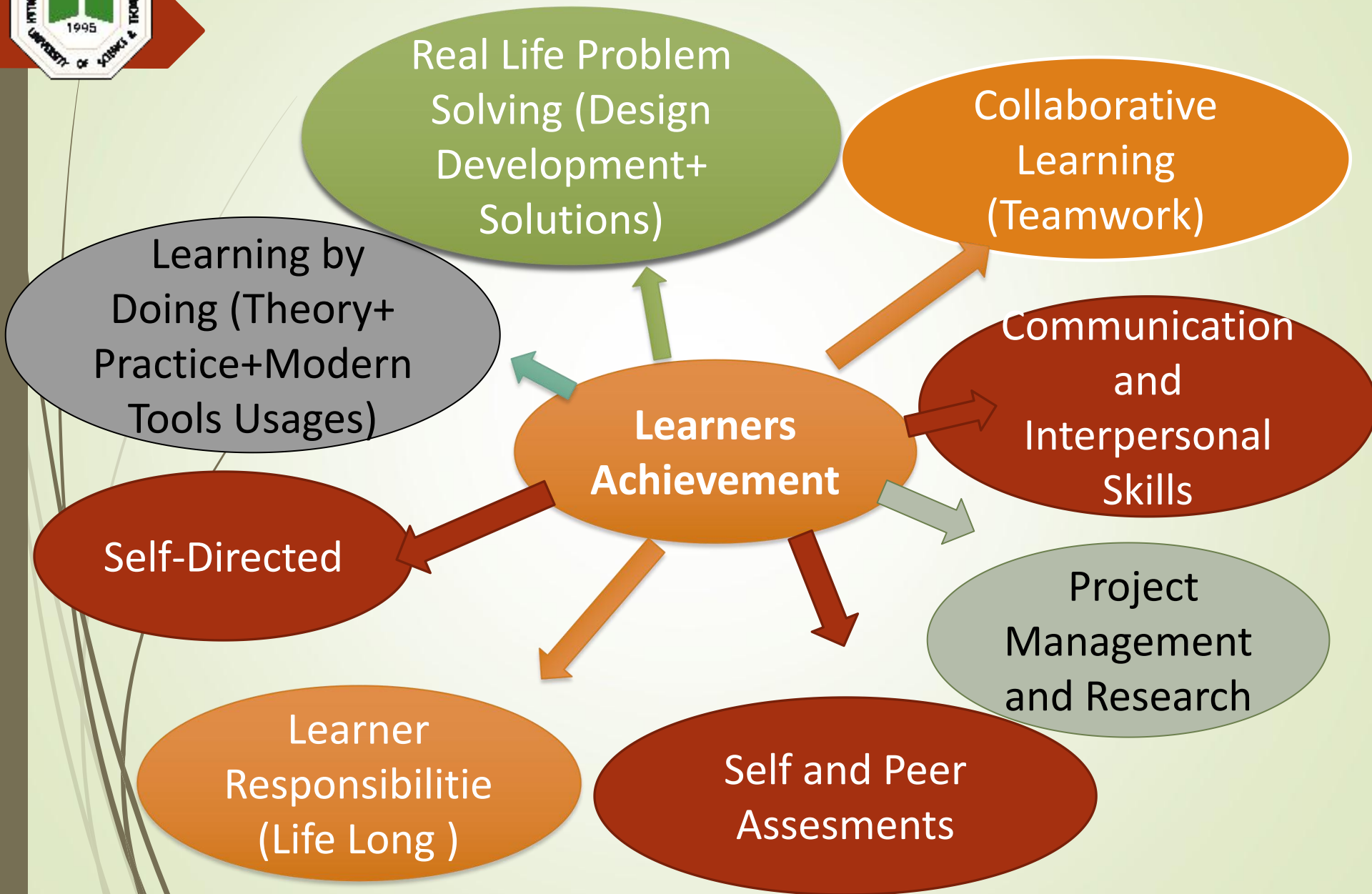
# KNOWLEDGE SHARING PLATFORM WITHIN PBL ACTIVITIES







# LEARNERS ACHIEVEMENT FROM PBL





# OUTCOME BASED EDUCATION (OBE)

**"An educational theory that bases each part of an educational system on goals (outcomes)" (BAETE, 2019)**

**"In OBE, the faculty of a program reaches consensus on a set of program learning outcomes - **knowledge, skills,** and **attitudes** that the students are supposed to acquire by the time they graduate." [Felder et. al., 2016]**



# OUTCOME BASED EDUCATION (OBE)

## *The Main Parameters of OBE-based Systems*

### **Program Educational Objectives (PEOs)**

Determined by the Program

### **Program Learning Outcomes (POs)**

Graduate Attributes Determined by the Accreditation Agency (i.e. BAETE)

### **Course Learning Outcomes (COs)**

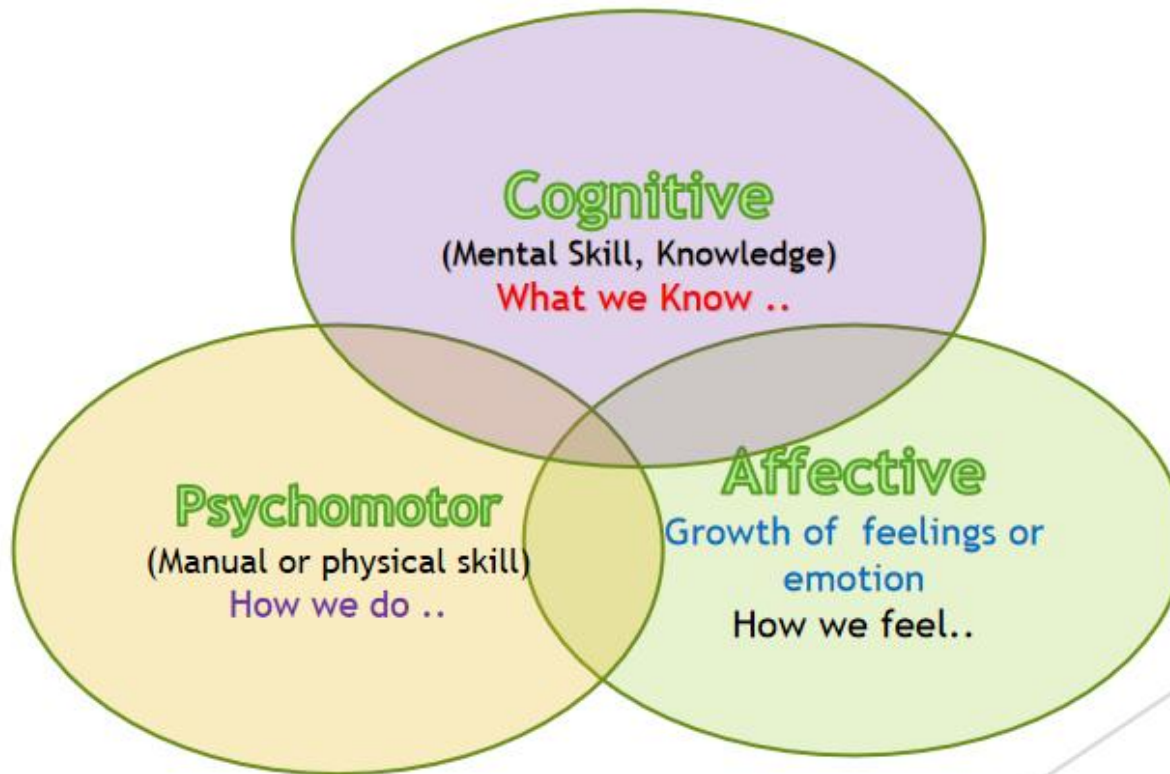
Determined by the Course instructor considering Bloom's Taxonomy

### **Continuous Quality Improvement (CQI)**

Mechanisms used for monitoring and improving the curriculum and the attainments of COs, POs & PEOs

# OUTCOME BASED EDUCATION (OBE)

## Bloom's Taxonomy: Three Major Domains





# OUTCOME BASED EDUCATION (OBE)

## *POs related to "Analysis of Problems & Synthesis of Solutions"* (12)

*PO1 - Engineering knowledge*  
*PO2 - Problem analysis*  
*PO3 - Design/development of solutions*  
*PO4 - Investigation*  
*PO5 - Modern tool usage*

CORE ENGINEERING SCIENCE

*PO6 - The engineer and society*  
*PO7 - Environment and sustainability*  
*PO8 - Ethics*

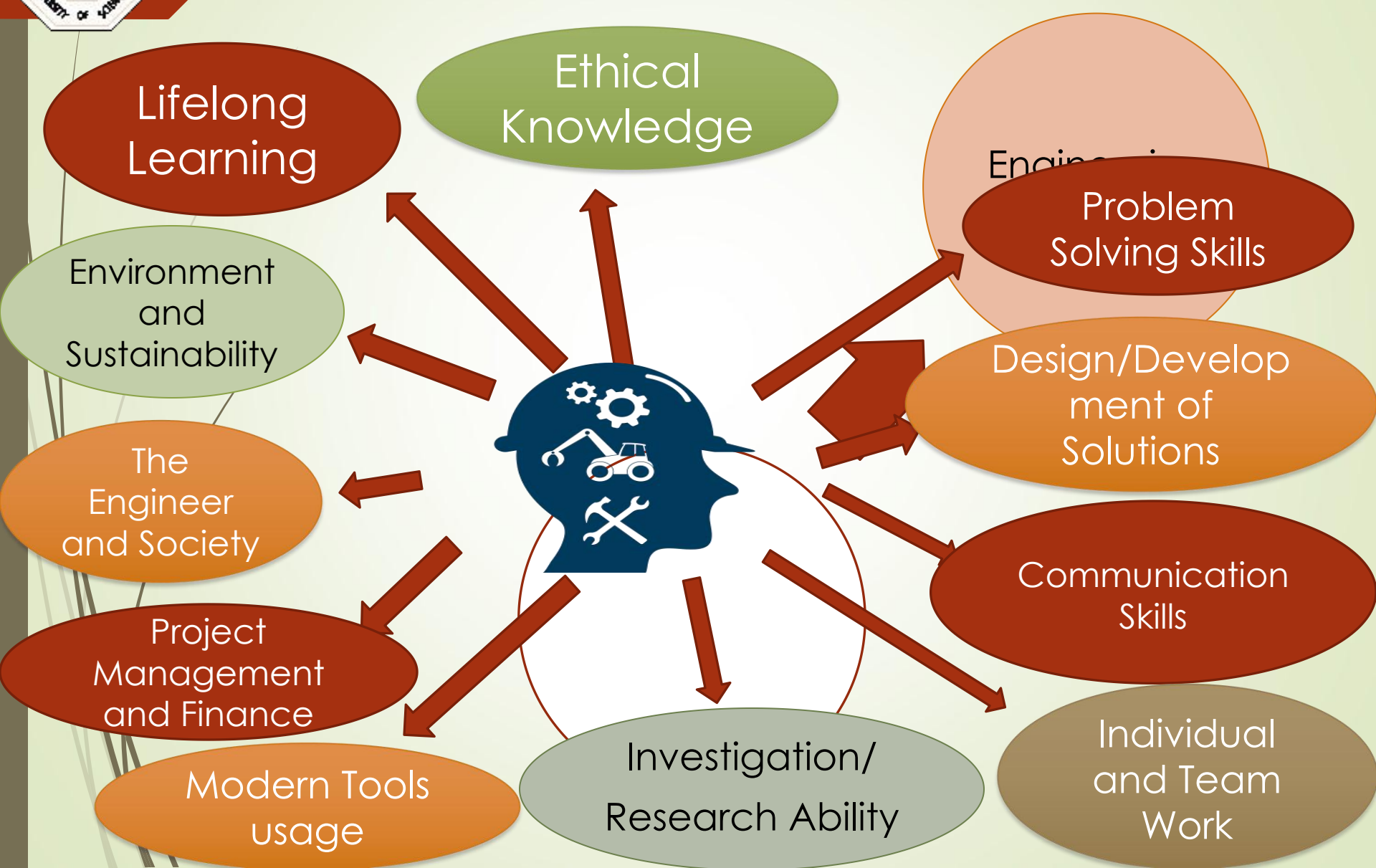
PROFESSIONAL DUE DILIGENCE

*PO9 - Individual work and teamwork*  
*PO10 - Communication*  
*PO11 - Project management and finance*  
*PO12 - Life-long learning*

PROFESSIONAL ENGINEERING PRACTICES



# ENGINEERING GRADUATE'S ATTRIBUTES ACCORDING TO WASHINGTON ACORD





# PROJECT BASED AND PROBLEM BASED COURSES IN OBE

- ***Industry-Based Integrated Design Project***
- ***Final Year Design Project***
- ***Capstone Project***
- ***Industry Training or Work-Based Learning***
- ***Laboratory Experiments***



# CONCLUSIONS

- **PBL has the positive impact for enhancing the quality of Engineering Education.**
- **PBL has also the positive impact to implement OBE**
- **PBL can help to achieve the required attributes of a Graduate specified by WASHINGTON ACORD**



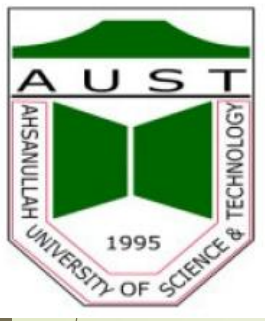


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