

Quality Assurance of Global Engineering Education through Outcomes-Based Accreditation

Kai Sang Lock

President Emeritus & Past Chairman of Engineering Accreditation Board, Institution of Engineers, Singapore

Adjunct Professor, Singapore University of Technology and Design

Fellow, Academy of Engineering, Singapore

E-mail: lockks@singnet.com.sg

KEY POINTS

- Outcomes-based accreditation framework has widely been adopted as the benchmark for accreditation globally.
- Setting the appropriate measurable outcomes for objective assessment is crucial for differentiating various levels of technical education and for improving and assuring the quality and relevance of engineering education.
- Benchmarking outcomes-based accreditation system through international accords or agreements, such as the Washington Accord, facilitates multi-lateral recognition of substantial equivalency of programs accredited by participating accreditation bodies.
- Presenting the perspectives from a Washington Accord Signatory, WA mentor, reviewer and program evaluator.

ACCREDITATION CRITERIA

Typical Criteria include:

- Mission & Programme Educational Objectives
- Student Learning Outcomes
- Curriculum and Teaching-Learning Processes
- Continuous quality improvement
- Students
- Faculty members
- Facilities & learning environment
- Institutional support & financial resources
- Governance
- Interaction between institution & industry
- Research & development
- Specific Programme criteria.

Outcome-Based Education

William Spady:

- Defining, designing, building, focusing and organizing everything in an education system on the things of lasting significant that we ultimately want every learner to demonstrate successfully as the result of their learning experiences in that system.

Outcomes – Spady

- Outcome is “a culminating demonstration of learning”
- “Demonstration” meant that learners would actually DO something tangible, visible, and observable – e.g., describe, explain, design, construct, produce, negotiate, operate, etc. – with the concepts and content embodied in the typical curriculum
- Doing required skill and competence, not just knowledge and understanding
- Competence and its demonstration are equally important in an Outcome Statement

Outcome-based Accreditation

- OBA system does not require the institutions or the programs to fully embrace the outcome-based education.
- Evidences that the set of graduate attributes or student learning outcomes stipulated by the accreditation body are achieved by the students at the time of graduation.
- Free to design programs with different detailed structure, learning pathways and modes of delivery.
- Outcome-based assessment and evaluation systems must be put in place to verify the achievement of defined program education objectives and graduate attributes.
- Focus on “Outcomes of Significance” - WA graduate attributes

Learning Outcomes

Knowledge and competencies profiles

Graduate attributes (WA) which form the student learning outcomes:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Investigation
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communications

- Project management and finance
- Life-long learning

Accreditation – Quality Assurance

- Accreditation provides periodic external review in support of the program's continuous improvement process.
- Assurance that a program meets established quality standards.
- Accreditation requirements should not stifle innovative curriculum and pedagogy whilst upholding the high standard and core competency for the practice of professional engineering, both locally and internationally.
- Setting high standards to differentiate graduate attributes (learning outcomes) between engineering degree programs and engineering technology programs
- Aligning required knowledge profile and graduate attributes to international benchmarks, such as those of WA
- Communicating clearly to education providers of the standards and requirements of OBA
- Instituting a system of continuous quality improvement mechanism

Outcomes-Focused Accreditation Criteria

- Mission & Programme Educational Objectives
- Student Learning Outcomes
- Curriculum and Teaching-Learning Processes
- Continuous quality improvement
- Students
- Faculty members
- Facilities & learning environment
- Institutional support & financial resources
- Governance
- Interaction between institution & industry
- Research & development
- Specific Programme criteria.

Enabling Resources & Facilities

- Mission & Programme Educational Objectives
- Student Learning Outcomes
- Curriculum and Teaching-Learning Processes
- Continuous quality improvement
- Students
- Faculty members
- Facilities & learning environment

- Institutional support & financial resources
- Governance
- Interaction between institution & industry
- Research & development.

Quality Assurance – Engineering Programs

- Paradigm shift in focusing on outcomes that matter & relevant
- Setting appropriate PEO and SLO which are relevant, measurable and meeting OBA requirements
- Securing commitments from faculty to implement the continuous quality improvement mechanism, particularly at individual course module
- Obtaining resources and support to institute outcomes-based teaching and learning
- Requirements for professional engineering practices set stringent requirements on program outcomes, e.g. project management & finance, ethics, environment & sustainability,
- Requirements of core subjects in traditional engineering disciplines
- Training faculty on assessment and evaluation methods which support OBA
- Obtaining support and feedbacks from the stakeholders.

Success of Washington Accord

- Well-established and internationally recognized
- High standard set for Graduate Attributes and Professional Competencies
- Unanimous agreement in admission of new signatories – after provisional membership and rigorous review
- Periodic monitoring/review by fellow signatories
- 4-year engineering programs

SUMMARY

- Independent accreditation important in quality assurance of engineering programs
- Outcomes-based accreditation framework enables programs to focus on outcomes which really matter
- Outcomes-based assessment and evaluation systems must be put in place at the universities to implement CQI
- Washington Accord, facilitates substantial equivalency of programmes by defining clearly the requirements of Graduate Attributes.

Dr. Kai Sang Lock

President Emeritus & Past Chairman of Engineering Accreditation Board, Institution of Engineers, Singapore

Adjunct Professor, Singapore University of Technology and Design

Fellow, Academy of Engineering, Singapore



Dr. Kai Sang Lock is a Past President of the Institution of Engineers, Singapore. He takes a leading role in accreditation activities, being the Chairman of the Engineering Accreditation Board from 2002 to 2009. He serves as Washington Accord mentor and reviewer to several countries. He also gained hands-on experience as program evaluator and team chair. He was Chairman of Singapore Standards Council from 2001 to 2006, taking a leadership position in setting and promoting standards and code of practices. He served many years as a Board Member of the Professional Engineers Board, Singapore, and chaired its examination committee that put together the examination system for qualifying professional engineers. He is a Founding Fellow and a Vice-President of ASEAN Academy of Engineering and Technology.

He has been a practicing professional engineer for the past 15 years, and was previously a faculty in the National University of Singapore for 17 years. He also acts as arbitrator and adjudicator. He has been assigned as a mentor of India by ABET to facilitate India to become a member of Washington Accord.