

Departamento de Ingeniería Eléctrica Universidad Zaragoza



QUALITY AND EVALUATION IN HIGHER EDUCATION

Dr. D. Francisco Javier ARCEGA SOLSONA Catedrático de Escuela Universitaria Department of Electrical Engineering University of Zaragoza ((Spain)





CONTENT

- Introduction
- Quality and Continuous improvement
- Acreditation
- My experience in accreditation
- Activities and good practices for teachers
 - Activities
 - Time of study
- Conclusions
- Some references





Presentation

- Teaching at University of Zaragoza (Spain) in Electrical Engineering
- Former Director of the School of Engineering at University of Zaragoza
- Director of the Electrical Measurements Lab. (LME)
- Codirector of EduQTech research group
- Program Evaluator of ANECA
 - VERIFICA
 - ACREDITA
- Program Evaluator of ABET
- Former Chair of the Spanish Education Society of the IEEE





Introduction

- One of the meanings of Quality is doing things well.
- Quality is important in Engineering
- Quality started in car industry, later expanded to other production companies.
- Finally, service industries were included in the Quality and continuous improvement philosophy
- In particular, Education is one service more to the Society but is one of the most important because the future of our Society depends on Education.





Short history about industrial quality

- Control of the Quality
 - Inspection
- Assurance of the Quality
 - To maintain a minimum
- Continuous improvement
 - Improving always
 - PDCA cicle (Plan, Do, Check and Act-Correct if needed)







Some comments in Education

- For the Society and our European countries, we must to do as best as possible with the resources we have received. Not the excellence. Excellence is a must.
- How to measure the quality? By the evaluation, but this is not an absolute measurement but a level that must be overpassed. Ranking is not the objective of the quality.
- Quality in companies (tipically ISO 9001) and Quality in universities (Criteria)





Where we are going?

- Similar to the introduction of Quality (ISO 9001) in companies in the 80 –ties
 - Accreditation of the fabrication process before the certification of the product
 - Now all degrees are accredited but in a short future only degrees/universities working with continuous improvement will survive
- Internationalisation (European or World)
- Skills and competencies oriented to the enterprise (client)
- Based on the Bologna Process





Objectives of Bologna Process

- Movility
- Transparency
- Employability
- Competitiveness of the students
- Improve the quality of the EHEA





Advantages of the Quality Systems in Education

- More control and repetibility of the teaching actions
- Academic work is measurable
- Horizontal and vertical coordination
- Oriented to the results





What is accreditation

- Accredditation is:
 - Certification (of a school, college, diploma, or the like) as meeting all formal official requirements of academic, curriculum, facilities, etc.
 - So a certification of his quality





Where is based

- Accreditation is based on three foots
 - Personnel
 - Facilities
 - Procedures





Who accredit?

- Independent organisations as third party
- With some dependence of the Administration
- Following rules or international standards





How accredit?

- By evaluation
- Evaluation is the verification process where the accreditation body confirms the quality of the diploma by means of
 - Internal evaluation
 - External evaluation
 - Documentation study
 - Visit to the university
 - Evaluation of reports by a Committee





Spanish Accreditation agencies

- ANECA (National)
- Regional agencies
 - ACPUA (Aragón)
 - ACSUG (Galicia)
 - AQU (Cataluña)
 - Madri+D (Madrid)
 -

Spanish Regional Accreditation agencies







Activities of the Agencies

- REACU, Spanish Network of Quality University Agencies
- ACPUA mainly develops technical QA activities, such as evaluation, assessment, certification and accreditation tasks.
- Madrid+D is related with quality accreditation but as well with other activities in R+D





International Accreditation agencies

- ABET (Acreditation Board for Engineering and Technology) USA
- ASIIN Germany
- CTI (France)
- HCERES (Haute Conseil pour l'Evaluation de la Recherche et l'Education Superieure)





Accreditation (1)

- Spanish Accreditation (compulsory)
 - 7 criteria
- European Accreditation (volunteer)
 - EUR-ACE or EUR-INF
 - 9 criteria (Engineering and institutional support)
- ABET Accreditation (volunteer)
 - 8 criteria





Accreditation (2)

- Verification at the beginning
 - 6 years later accreditation for degrees
 - 4 years later accreditation for masters
 - In 2014 masters started the process of accreditation
 - In 2015 degrees started the process of accreditation
 - More and more universities have an Internal Quality System implemented
- Lots of the Universities have another program implemented for the quality of teachers (Docentia)
- Lots of the Universities have another program implemented for the quality of the Management System (Audit)
- In a short future, universities with a certified Audit Program will not need to accredit all the diplomas





Accreditation (3)

- Others programs of ANECA
 - PEP
 - Evaluation of teachers (non tenured)
 - ACADEMIA
 - Evaluation of teachers (tenured)
 - MENCION
 - Evaluation of the Quality of Doctorate Programs
 - MONITOR
 - Follow-up of the diplomas





Accreditation: Seven criteria

- Organization & curriculum implementation.
- Public information & transparency.
- SGIC, Internal Quality System
- Academic staff
- Support staff, resources, services
- Learning outcomes
- Satisfaction and performance indicators





ABET Criteria

- General Criteria
 - Students
 - Program Educational Objectives
 - Student Outcomes
 - Continuous Improvement
 - Curriculum
 - Faculty
 - Facilities
 - Institutional Support
- Program Criteria
 - Particular requirements in function of the diploma





ABET criteria (1)

- Students Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.
- The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution.
- Program Educational Objectives Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies





ABET criteria (2)

- Student Outcomes The program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented and effective process for the periodic review and revision of these student outcomes.
- Continuous Improvement The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.





ABET criteria (3)

- Curriculum The curriculum must effectively develop the following subject areas in support of student outcomes and program educational objectives
 - Mathematics
 - Physics
 - Technical content
- Faculty Each faculty member teaching in the program must have expertise and educational background consistent with the contributions to the program expected from the faculty member. The competence of faculty members must be demonstrated by such factors as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills.





ABET criteria (4)

- Facilities Classrooms, offices, laboratories, and associated equipment must be adequate to support attainment of the student outcomes and to provide an atmosphere conducive to learning. Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available, accessible, and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs.
- Institutional Support Institutional support and leadership must be adequate to ensure the quality and continuity of the program.





Some comments (1)

- Both programs ABET and European are quite similars but focus is stronger in students and in institutional support in ABET.
- ABET focus on POE's, results and knowledge of the students several years after finishing the diploma.
- EUR ACE program is more similar to ABET including more focus on institutional support and in engineering and technology





Some comments (2)

- Students take part in the evaluation panels (teams) for the accreditation in Europe, but not in the ABET system
- In ABET panels the Team chair is the link with the Agency in Spain the link is the Secretary.
- Team members in Spain evaluate all diplomas asigned. In ABET only one diploma by team member





Aspects to be taken into account in HEI

- Continuous improvement
- Procedures, documented processes
- Information based on surveys





EUROPEAN ACCREDITATION

- ENQA
 - European Association for Quality Assurance in Higher Education
- EQAR
 - European Quality Assurance Register
- ESG
 - European Standard Guidelines 2015





Accreditation of diplomas

- Initial evaluation (VERIFICA)
- Follow up (MONITOR)
 - Every year
- Accreditation (ACCREDITA)
 - Between 4 (masters) to 6 years (degrees) after initial evaluation





My impression in Spain

- Slow changes
 - Names (and significance) are difficult to modify (PFC to TFG)
 - Introduction of Quality concepts in Education
 - Oriented to the profession and to the needs of companies (in degrees)
- Fast changes
 - Oriented to innovation in education
 - From teaching to learning





My experience

- Teachers are not involved in the quality aspects neither procedures
- Students are not involved in the committees for improving
- Support staff are not involved in the system
- Difficult to work with skills and abilities
- Industries not involved in Committees
- There is some feeling between staff that quality means bureaucracy





QUALITY ASPECTS

- Quality of Higher Education Institutions
 - Internal Quality Systems
 Voluntary
- Quality of University Diplomas
 - Verification (Initial)
 - Monitoring (Follow up)
 - Acccreditation (Renewal)
- Quality of Academics
 - Teaching

Voluntary

Compulsory

• Researching



- Coordination with other peers
- Systematic activities
- Take different data every day
- Store some material of the daily activity





Our activities

- Software for management of the daily activity
 - Give the teachers tools for facilitating his academic and management work.
 - Processes based on accreditation criteria and in quality standards
- Time of study
 - Measure the time that one average student devotes to learning one subject





Processes

- Applicable to
 - Subjects of degree
 - Subjects of master
 - Subjects of other kind of courses
- Based on quality criteria
- Guide for applying quality concepts in academic activity





Processes (1)

- Basic processes
 - Planification
 - Teaching
 - Evaluation, exams
 - End of the academic year
- Estrategic processes
 - Management
 - Programming of the courses
 - Improvement





Processes (2)

- Support processes
 - Resources
 - Documentation
 - Problem solving
 - Quality





Processes map







Time of study: The survey

- During three academic years (2005-08)
- Every week (16+2) during the two semesters
- Through internet (special web page)
- Allowing access only to registered students
- With systems for autodetecting errors
- Collecting all kind of activity in the classroom and at home
- 20% of all registered students had good and full answers
- For having the number of credits the total hours of study were divided by 25





Time evolution of the activities of Circuit Theory in the classroom





Departamento de Ingeniería Eléctrica Universidad Zaragoza Time evolution of the activities of Circuit Theory at home



1542





Time evolution of the activities of Electrical Tests in the









1542





Some comments on Electrical Tests

- The duration of the work in the laboratory is lower than expected. The students finish before of the two hours expected.
- They use only an average of half an hour for reading the notes and theoretical information.
- The time for writing the reports of the laboratory work is about 1 hour per report
- The time for writing the final report is about 7.5 hours





Time of study: Some Conclusions

- This work has allowed obtaining information of the time devoted by the average student to learn a subject, but as well other information has been obtained.
- It has been possible to check the evolution of the effort of the students in every subject in function of the number of the week.
- The correspondence of the time devoted by the students with reports that student need to fill and present to the teacher is clearly seen.
- The correlation between time of study and difficulty for passing an exam has been shown too





In conclusion

- Development of the Quality in Higher Education follows Industrial experience
- As products are global, engineers and degree holders must travel and work into a global market
- Universities are changing but there are some questions that need to move faster
 - Introduction of Quality concepts to all levels of partners in the teaching learning process
 - Orientation to the needs of the Society (Companies in the case of Engineers)





References

- ENQA 2015, Standards and Guidelines
- ANECA 2013, Report about the external evaluation of the Spanish Universities





References-Links

- http://www.abet.org
- http://www.asiin.de/
- <u>http://www.feani.org/ESOEPE/HomePage.htm</u>
- <u>http://www.engc.org.uk/</u>
- http://www.commission-cti.fr/
- http://www.disg.uniroma1.it/
- <u>http://www.ordeng.pt/html/servicos/servicos.html</u>
- <u>http://www.ing.unifi.it/tne4</u>
- http://www.ntb.ch/SEFI/
- http://www.cesaer.org/





References-Papers

- F. Jurado, F. Arcega et all. "A review of the accreditation bodies and processes in Europe. A vision from the engineering" 35th ASEE/IEEE Frontiers in education Conference. 2005
- E. Tovar, F. Arcega et all. "Modeling the best practices towards the adaptation to the european credita trasnfer system in technical degrees within the IEEE ES Chapter" 37th ASEE/IEEE Frontiers in education Conference. 2007
- F. Arcega et all. "Measurement of the time of study Evaluation of the ECTS really devoted to study "FINTDI conference. 2011