

LEARNING PROCESS IMPROVEMENT THROUGH FORMAL SYSTEMS OF TEACHING QUALITY EVALUATION

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Human resources are considered a crucial economic asset in an era of constant technological change. Education has become a major issue in advanced societies - in particular lifelong education, mass education and unemployment of university graduates. The authors have been involved in processes of quality evaluation of initial and continuing education both for accreditation and improvement/control purposes. In the present paper a review of evaluation systems is carried out and its impact on improvement of learning capabilities for life is appraised. Reference is made to current exercises of appraisal of graduate programs and a project for continuing engineering education quality evaluation and accreditation is described.

1. Generalities

Human resources are considered a crucial economic asset in an era of constant technological change. The fast growing demand for industrial and consumer products increases the demand for highly skilled and well-educated labour force, severely increasing competition.

The rate of change makes it impossible for the formal school based education to supply the required human resources. Furthermore, most of the companies and in particular SMEs lack the resources necessary to provide adequate training. Thus it is generally recognised and accepted nowadays that lifelong learning and education will be in the future major issues both in advanced and developing societies.

Lifelong learning in its broadest sense is the continuation of any form of learning throughout ones life at different levels. Discussion in the present paper will be focused on higher education.

Higher education presents many different dimensions, probably as many as the different stakeholders involved. There is no single definition of quality in higher education: what is available is to look for parameters that measure aspects of quality in the input, process and outcomes. A suitable mix of assessment criteria should be used, together with benchmarking.

The current interest on the subject of quality assessment in European higher education is also felt in Portugal. Three systems have been identified as important examples: those in operation in the United Kingdom, France and the Netherlands. The Portuguese universities, through the *CRUP* (Council of Rectors of the Portuguese Universities), adopted a system broadly based on the Dutch procedure. This was also the basis for a bylaw that was subsequently voted in Parliament.

The organisation of engineering studies in Portugal is briefly presented. Reference is made to the role of the Portuguese Association of Engineers - the *Ordem dos Engenheiros* - in awarding the professional title of *Engenheiro* (Engineer). The accreditation of engineering degrees by the *Ordem dos Engenheiros* is then presented.

In continental Europe there is a common tradition of great state intervention in higher education.

Governments were the usual source of funding, they also prescribed the courses and

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even the *curricula*; frequently universities were the object of *ex ante* regulations, and dependent on central controls. Current motivation for universities' assessment is found in

- (i) the increase in number of students,
- (ii) the transformation of higher education system, from an elite system into a mass education system,
- (iii) its diversification (including, in Portugal, the emergence of a growing private sector),
- (iv) a tendency towards greater institutional autonomy, with a reduction of the *ex ante* controls.
- (v) the dynamics of European integration, with a growing mobility of professionals and student exchanges through programmes such as SOCRATES, and
- (vi) the fact that the society has become more interested in higher education, and on how public money is spent.

In Europe, some pioneering efforts on systematic international comparative programme analyses have already been carried out ¹. In the case of the Electrical Engineering exercise ² topics dealt with included data on students (level of attainment on entry, entrance selection, drop-out rates, completion rates, student workload), staff (numbers, teaching load, publications), programme (philosophy, goals, aims, structure, thesis, assessment, quality assurance mechanisms), and data for every single course or discipline (including workload, short description, literature used, examinations). As a result of the experience obtained, Vroeijenstijn ¹ suggests that a European wide integral system for higher education quality assurance/assessment is unlikely; instead, a multilevel approach will evolve, based on

- (i) a good functioning system of internal quality assessment at faculty and institutional level,
- (ii) a good functioning system of external programme reviews of quality assessment at national level, and
- (iii) occasional external programme reviews conducted internationally.

In Portugal, these three types of procedures are being implemented. Items (i) and (ii) are now dealt with in a more or less systematic way, after the adoption by the portuguese universities of a system broadly based on the dutch procedure, and the subsequent bylaw voted in Parliament concerning a national system (law 38/94, of the 21 November 1994). In the Engineering field two exercises on Electrical and Mechanical Engineering were carried out by the Portuguese Universities Foundation. Type (iii) approach takes place on a case by case basis, according to some particular circumstances.

Examples of reviews conducted internationally are the review of the Mechanical Engineering programme of the *Instituto Superior Técnico* of Lisboa, which took place in 1995 in the context of an European Union exercise, ^{3,4}, and CRE's (CRE - Association of European Universities, ex Standing Conference of Rectors, Presidents and Vice-Chancellors of the European Universities) pilot programme of institutional evaluation, where Porto, Utrecht and Göteborg universities were evaluated, ^{5,6}. Whereas the first is an example of a review concerned with a discipline - Mechanical Engineering -, the second is an example of an external supportive review concerned with institutional aspects only. CRE is primarily interested in the university as an institution, from the standpoint of (i) the organisation of institutional autonomy, (ii) the governance procedures inside the institution, (iii) the strategic capacity for change, and (iv) the monitoring system for quality evaluation.

2. Engineering and the *Ordem dos Engenheiros*

Engineering education in Portugal is carried out at two levels:

- (i) in universities, which award the academic degree of *licenciado em engenharia* (licentiate) after successful completion of a 5 years programme of full time study, and
- (ii) in polytechnics, which run courses leading to the *bacharel* (bachelor) academic degree, which is awarded after successful completion of a 3 years programme of full time study.

During the last decades the professional titles corresponded to these different types of higher education graduates as follows: licentiates were automatically known as *engenheiros* (engineers), whereas bachelors were known as *engenheiros técnicos* (technical engineers).

In order to become a member of the professional association of engineers in Portugal - the *Ordem dos Engenheiros* - a licentiate degree is required. According to recent law, now only members of the *Ordem dos Engenheiros* are entitled to the use of the professional title of Engineer, which is therefore a professional title protected by law in this country. This means that the possibility of using the professional title of Engineer is no longer automatically recognised to the holder of a licentiate degree. In order to use that professional title, the licentiate must first become a member of the *Ordem dos Engenheiros*.

Regarding the graduates of the shorter courses (the 3 years degree obtained in polytechnics), those are not entitled to become members of the *Ordem dos Engenheiros*, unless they obtain the licentiate degree, which they can obtain through successful completion of a special 2 years programme of further study, either at the universities or, in some special cases, in polytechnics.

From the legal point of view, membership of the *Ordem dos Engenheiros* is required to become an Engineer. A licentiate is not automatically admitted as a member. First, the *Ordem dos Engenheiros* will check whether or not his or her degree is already accredited by the *Ordem dos Engenheiros*. If that is the case, the candidate will be accepted as a member in training, and the training period, carried out at his or her employer, is no longer than two years. In case the degree is not accredited, then the *Ordem dos Engenheiros* may require an admission examination, before the candidate is admitted as a member in training.

The practical relevance of holding the professional title of Engineer concerns the several activities that can only be carried out by those who hold that title. Just to mention the most common situation, designs for buildings will only be accepted and eventually approved by the appropriate municipal authorities in case the design is signed by a professional engineer.

Accreditation is a voluntary process through which higher education institutions demonstrate that '*they are accountable to some credible body for the quality of their work*'⁷. In Portugal, the academic institutions apply to the *Ordem dos Engenheiros* for accreditation of their engineering degrees. The accreditation process⁸ has the objective of evaluating the conformity of the education with the technical and professional model of engineer represented by *Ordem dos Engenheiros*. However, as already mentioned, any holder of a licentiate degree (or legal equivalent) may be a candidate to membership of *Ordem dos Engenheiros*, even if his/her degree is not accredited, but then must pass an admission examination.

The accreditation process begins with the preparation of a dossier including information on the degree: (i) academic staff, students workload, numbers of students, (ii) the objectives of the degree, (iii) curriculum, including optional courses and areas, (iv) teaching policy and matters related to teaching, (v) provisions for the supervision of

students, (vi) data on library facilities and their use, (vii) short individual cv's of the academic staff, and time they spend in the institution (viii) for each course: contents, textbooks, provisions for students' assessment, examples of examinations, (ix) laboratories, workshops, and computer facilities used by the students. Information on the institution is also included: (i) management structure, budget, degrees awarded, (ii) presentation of the institution including facilities available, (iii) interaction with other organisations in Portugal and abroad.

After study of this dossier by the accreditation board for the relevant discipline, the institution is visited during one or two days, and discussions are held with (i) the management, (ii) the academic staff, and (iii) the students. A report is then drafted by the visiting committee, and checked by the institution for possible errors. The visiting committee - accreditation board for the discipline - then evaluates the several parameters examined. These are related to the management of the institution, academic staff, organisation of the degree, *curriculum* (basic subjects, engineering sciences, technical subjects), provisions for students selection and supervision, facilities and institutional culture. The full list of items to be examined numbers 119, of which 43 are considered particularly important. The board then drafts a decision proposal, and the final decision is reached by the *Ordem dos Engenheiros*. For further details, contact with the *Ordem dos Engenheiros* in Lisboa (Av. António Augusto de Aguiar, 3D, 1097 Lisboa, Portugal) is recommended.

3. Lifelong Learning

Lifelong learning is ⁹ *the continuation of any and all forms of learning throughout one's life. It encompasses adult education, vocational skills acquisition and other less formal activities that contribute to the social well-being and personal development of an individual.*

According to ref. 9, two groups of factors affect the provision of learning opportunities for adults: (i), the first relates to the influence of the changing environment on the provision of learning opportunities; (ii) the second focuses on the characteristics of adults, recognising that these characteristics have a significant influence on the learning process.

Ten key strategies for lifelong learning were identified in ref. 9. The first set of strategies seeks to maximise support from the environment. The second set reflects the extrinsic motivating factors faced by adult learners. The third set addresses the intrinsic factors that can increase the self motivation of adults to learn and to continue learning.

3.1. Strategies to Address Environmental Factors

- 1 : Active tripartite partnership An effective lifelong learning system is not an end but a means to an end. The beneficiaries of such a system include individual learners, businesses and the society as a whole. The system is a means to enhance the competitive edge of an economy and it must be clear that the government, employers and trade unions are all stakeholders in the system.
- 2 : Appraisal and evaluation.

3.2. Strategies to Address Extrinsic Motivating Factors

- 3 : Accessibility.
- 4 : Affordability.
- 5 : Trained teachers.
- 6 : Application to work.
- 7 : Attractive incentives.

3.3. Strategies to Address Intrinsic Motivating Factors

- 8 : Accreditation.
- 9 : Avenues for progression.
- 10 : Appeal promotion.

Reference 9 presents a validation of this lifelong learning framework, based upon these ten key strategies, which are significant characteristics of lifelong learning systems.

Appraisal, evaluation and accreditation are important issues in the context of continuing education. Regular assessment of learning systems is mandatory in an environment marked by rapid changes if the system is to remain relevant and effective.

On the other hand it is generally accepted that recognition of skills and competencies by means of accreditation schemes is an important motivation of lifelong learning and at the same time avoids fraudulent provision of training as in the case of Internet distance learning reported in ref. 10. This issue is under discussion in Portugal.

The current situation is described below.

4. The INAFE Project

Addressing the issue of accreditation and quality of Continuing Engineering Education (CEE) the creation of an Institute was proposed under the leadership of Prof. Antonio Carvalho Fernandes¹¹. This non-profit organisation is called INAFE (Institute for the Accreditation of Advanced Training in Engineering). The objectives of this institute are to contribute to

- a) structure a national system for credit evaluation of CEE;
- b) increase the offer of trainers;
- c) enhance the traditional and classical Engineering Education;
- d) facilitate credit transfer at an international level;
- e) improve the cooperation between University and Industry.

The proposed members are organisations from the academy, from the industry and from the professional bodies and their participation is proportional to the number of shares distributed in accordance with the statutes of INAFE. All members can take part in the general assembly, the social bodies and executive board; extraordinary members may be accepted under dedicated protocols.

The Executive Council elected for two years has the task of accrediting training courses with a quality certification and award of CEE units. The evaluation criteria of these CEE initiatives are based on accepted international standards for quality and on the regulations established by INAFE. The financial background of INAFE is member fees, contributions from private or public sectors and the income from the services.

The creation of this project is currently under public discussion among the potential members and especially with the related professional bodies¹². The current initiative is one of example of what has been happening around the world, and reflects the concern about the need to face quality control of CEE¹³.

5. Conclusions

Lifelong learning as a prerequisite to enhance human resources capabilities to compete successfully in a global economy was addressed.

The importance of appraisal, evaluation, and accreditation as a mean of system improvement and validation was stressed. A parallel was drawn to formal higher education systems where these concepts are being applied and tested.

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