Title: Internal quality assurance processes at IST - towards a manual of best practices in teaching

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Resumo

Os últimos 3 anos têm sido marcados por uma profunda reflexão no Ensino Superior Português, que obrigou à avaliação, revisão e reformulação de muitos processos de garantia da qualidade interna. Esta reflexão foi ainda estimulada pela publicação de um novo enquadramento legal relativo à avaliação da qualidade no Ensino Superior, e da criação da Agência de Avaliação e Acreditação do Ensino Superior. Num processo contínuo de adaptação aos desafios que estão a ocorrer neste contexto, e no âmbito da cultura de qualidade desenvolvida pela Escola ao longo da última década, iniciou-se a construção de um Sistema Integrado de Garantia da Qualidade para o IST (SIQuIST). O objectivo deste sistema é articular a garantia de qualidade de alguns processos com os principais campos de actuação da Escola, considerando não apenas os desafios do novo enquadramento legal, mas adoptando também as melhores práticas europeias nesta área.

O primeiro passo na direcção deste objectivo foi o desenvolvimento de um subsistema de garantia da qualidade das unidades curriculares dos cursos ministrados no IST (QUC). O

segundo passo foi a implementação do QUC, esperando-se que esta permita o inventário e a descrição das melhores práticas pedagógicas identificadas pelos docentes. A categorização e validação das práticas inovadoras identificadas neste inventário constituem um objectivo, bem como a sua disseminação na comunidade académica do IST.

Palavras-Chave: ensino superior, sistemas de garantia da qualidade, unidades curriculares, boas práticas, práticas pedagógicas

Abstract

The last 3 years have been marked by a deep reflection in the Portuguese Higher Education System, leading to an evaluation, revision and reformulation of many processes related to internal quality assurance processes. Within this area, a new legal framework on quality assessment of Higher Education System was published and an Assessment and Accreditation Agency was created. In a continuous process of adaptation to the challenges that are taking place in this context, and in the scope of the quality culture developed in the School throughout the last decade, the development of an Integrated Quality Assurance System for IST (SIQuIST) was initiated. The purpose of this system is to articulate the quality assurance of some processes with the main School's fields of action, addressing not only the challenges of the new legal framework, but also adopting the best European practices in this area.

The first step towards this aim, was the development of a (sub)system to ensure the quality of the curricular units taught at IST programmes (QUC). The second step was the implementation of QUC, within which the inventory and description of best practices reported by teachers is an expected outcome. After this inventory, criteria were defined in order to categorize and validate innovative best practices later to be disseminated inside IST.

Keywords: higher education, quality assurance systems, curricular units, best practices, teaching in higher education

1. INTRODUCTION

Over the last years, the European Higher Education systems have undergone significant changes, particularly in terms of requirements in the area of quality. Today, quality assurance systems are a reality and an imperative in European universities. They are aimed at ensuring

quality in institutions, transparency and comparability of their teaching programmes at international level and, therefore enhancing mobility of their teachers and students.

To achieve these goals, it is necessary to incorporate directives established in each country, which must be made compatible with the best international practices. These systems must be in line with and follow the institution's strategy, involve the entire academic community and produce indicators which allow for a systematic and systemic review of their lines of action, 'using multidimensional metrics' and taking 'the lead in gaining widespread acceptance of metrics for evaluating teaching effectiveness in engineering' (King, Ambrose, Arreola & Watson, 2009).

By staying aware of these critical aspects, and in tune with the current trends within the context of Higher Education, IST has carried out an internal reflection process on its quality policy, with a view to adapting the best European quality practices and implementing the directives set out for quality in the Portuguese Higher Education system. As a corollary of this process, the cornerstones of an Integrated System for Quality for IST (SIQuIST) were launched. The first module - Subsystem for Quality Assurance of IST Curricular Units (QUC) is strongly oriented to identifying extreme situations in academic activities, without forgetting its formative role in the development of teachers themselves. The QUC particularly consists in collecting and surveying good teaching, learning and evaluation practices which are likely to be disclosed to the whole academic community.

2. IST's INTEGRATED QUALITY SYSTEM (SIQUIST)

Since 1993 IST promotes assessment initiatives on the teaching activity performance and makes efforts so that these initiatives have an effective impact on the improvement of processes, course outcomes and teachers' performance.

The practices and the procedures developed over time materialised into an array of institutionalised procedures, which reflect the development of a quality culture, in particular at academic level. The figure below (Figure 1) reflects the path towards quality in the context of IST and anticipates future objectives: the creation of an Integrated Quality System for IST (SIQuIST).
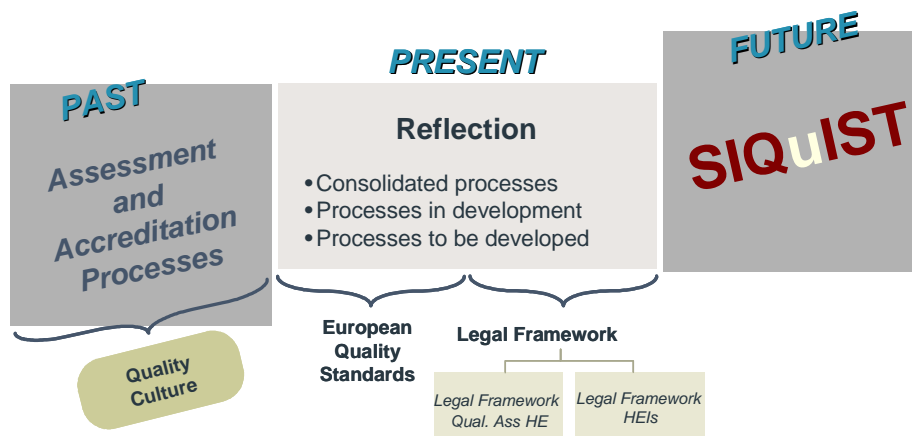
Figure 1: The Path of Quality at IST

This system intends on applying a continuous quality assurance process, rather than a static, single-application model. This process should feature a cyclic review of the outcomes, not only in terms of the teaching/learning process, which is the main focus of the initiatives that have been developed to date, but also of the institution as a whole, in order to determine whether its mission and objectives are fully accomplished.

The purpose of this project is to create a reliable and effective system, which stimulates the continuous improvement and readjustment, on a real-time basis, of the internal procedures. Simultaneously, the development of such system is fundamental for the Assessment and Accreditation of IST in the Portuguese Higher Education System, as well as for the similar processes of its study cycles, as set forth in the legislation through the promotion of a global and integrated quality culture, which allows for the intertwining of its strategic objectives with its operating objectives.

3.   (SUB)SYSTEM OF QUALITY ASSURANCE OF CURRICULAR UNITS (QUC)

The first big step of IST towards the development of a quality culture was the creation of the assessment system of its courses and programmes. Having been systematically applied since 1993 to IST undergraduate programmes, this system essentially emphasized the summative function of the process, providing, above all, warning indicators for problematical situations.

The change of paradigm in teaching that has been introduced by the adaptation to the Bologna process, alongside the new legal framework regarding the quality of teaching in tertiary

education, led to a review and assessment of the teaching and learning process, which made the reformulation of this system of fundamental importance. By introducing this reformulation, the purpose was to privilege the formative function, namely the acquisition of skills by the students and the improvement of the teaching body itself, thereby giving hints on how to innovate in the teaching and learning processes and promote greater mobilization of the outcomes obtained when defining action plans.

With this perspective in mind, a set of directives was developed in order to create a new Quality Assurance System for IST curricular units (QUC), integrated in a wider-ranging one, known as SIQuIST. With this new system, more than responding to external requirements, the purpose is to guarantee the existence and dissemination of updated information that promotes the assessment of teaching at IST and create feedback mechanisms, which, in turn, allow for an improvement of the working and performance conditions of all stakeholders in the education system. Generally, this system is compatible with the overall mission, goals, and structure of IST, aims at reflecting the complexity of teaching, includes both formative feedback to assist individual improvement and summative evaluation to measure progress toward IST's goals, is flexible enough to encompass different teaching activities, tries not to be too burdensome to the faculty members and is evaluated periodically to determine if it is effective (King, Ambrose, Arreola & Watson, 2009).

3.1 Objectives, methodology, sources and outcomes

Under the scope of a quality policy (as set forth the new legislation on teaching quality assessment – Law 38/2007) aiming to stimulate pedagogical innovation, innovation in teaching practices and (self) training of teachers, the QUC (Figure 2) foresees a half-yearly evaluation of each curricular unit of IST courses, aiming at:

- monitoring the way each curricular unit is run in relation to the objectives set out in the curricular plans of the courses offered at IST;

- promoting the improvement of the teaching, learning and assessment of students and their involvement in them.

The assessment of the way curricular units are run is under the Pedagogical Council's responsibility involving all the stakeholders in the teaching and learning process: students, teachers, class representatives and academic management staff. Considering that any

evaluation scheme shall include diversified assessment sources and tools, which allow for cross-checking different information, the system does not limit itself to an appreciation of the performance of the teaching body by the students.

Other indicators are considered such as a self assessment of teachers themselves on adopted knowledge transmission models or on the level of technical and scientific skills acquired by the student.
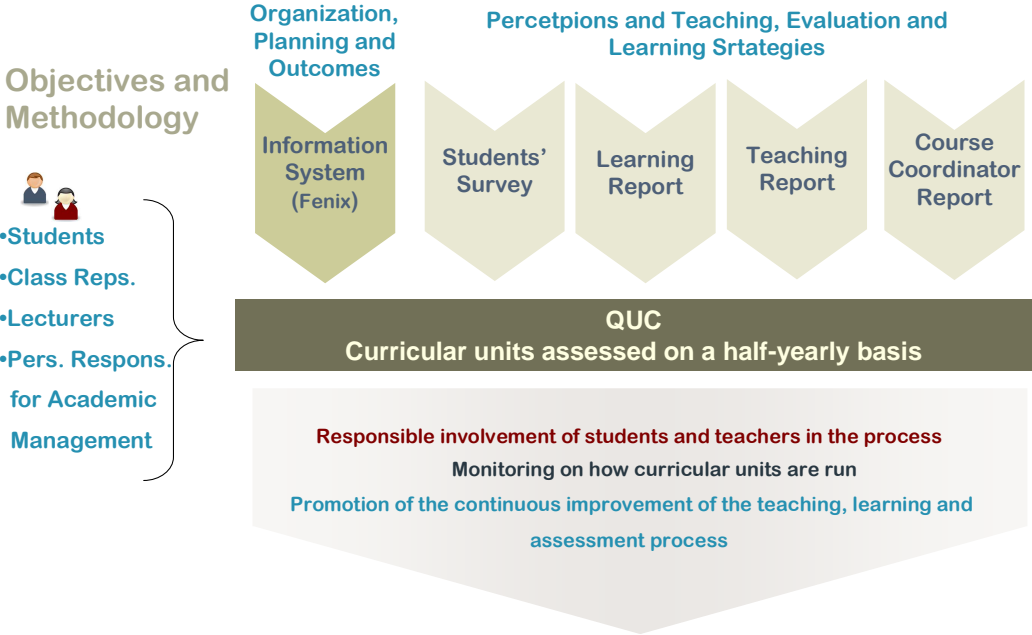
Objectives and Methodology

- Students
- Class Reps.
- Lecturers
- Pers. Respons. for Academic Management

Organization, Planning and Outcomes

Percetpions and Teaching, Evaluation and Learning Srategies

| Information System (Fenix) | Students' Survey | Learning Report | Teaching Report | Course Coordinator Report |

QUC
Curricular units assessed on a half-yearly basis

Responsible involvement of students and teachers in the process
Monitoring on how curricular units are run
Promotion of the continuous improvement of the teaching, learning and assessment process

Figure 2: Quality Assurance System for the IST Curricular Units (QUC)

In a summative perspective, namely in terms of the assessment on how the curricular units are run, indicators dealing with the organization and planning are sought, which include quantitative outcomes.

In a formative perspective, namely in terms of the teacher's professional improvement, the assessment is based on issues that are centred on the strategies used (Akerlind, 2007, *in* Edström, 2008, p.12) – building up practical experience (how to teach); building up one's content knowledge (improving what to teach); building up a repertoire of teaching strategies (becoming more skilful as a teacher); increasing one's understanding of what works for the students (becoming more effective in facilitating student learning).

The main sources of information on which this assessment model is based are therefore the curricular contents of each curricular unit, namely regarding the organization, planning and outcomes in each one, a student opinion survey, a learning report completed by the class representatives, a teaching report completed by the curricular unit responsible and the respective teaching body, and a programme coordinator report.

The collection of information is generally based on IST information system (FÉNIX), and the different participants in the process can download a wide range of forms from the respective portals.

The Pedagogical Council is in charge of disclosing outcomes to the academic community as a whole. Informing the academic community on an array of elements on how the curricular units are being taught, a readjustment of contents and ways of teaching and learning can be provided in a sustained manner, in addition to involving the community with a more participative, critical and responsible attitude. To avoid the risk of assessment procedures outcomes becoming confined to a bureaucratic data compilation ritual, it is of paramount importance to define action lines that promote the participation of the academic community, wherever and whenever necessary, as well as procedures to tackle unsatisfactory and exemplary outcomes.

3.2   From the Teaching Reports to the dissemination of good practices

The Teaching Report (TR), which includes information obtained from the previously mentioned tools, aims at bringing together relevant information on the teaching strategies and the factors that might have most contributed to the outcomes obtained in each curricular unit at the end of each semester.

Aiming to a self-assessment of the work developed by the Teachers, this Report foresees an array of questions to be answered by all the elements of the teaching body and an additional one addressed only to the responsible of the curricular units. It should therefore include a final balance in terms of strengths and weaknesses and the characterization of proposals for the improvement of curricular units.

Based on new models of teaching and learning, and acting as a supervisor of the learning process, the teachers are invited to develop an analysis of the learning experience with their students and the level of skills developed (Fiolhais, 2004, *in* Morais, 2005 pp. 49-50). A

critical reflection is therefore promoted (self-evaluation) as well as continuous professional development, encouraging the characterization of initiatives developed under the scope of the improvement and innovation of the teaching and learning process.

In short, this self-evaluation shall promote a reflection among Teachers on:

- the running conditions and development of outcomes obtained;

- the promotion and development of technical and scientific skills set forth in the objectives of the curricular units, through a reflection not only on the teaching contents but also on the ways of learning used;

- the pedagogical activities developed under the scope of the curricular unit;

- the inventory of a set of good practices which are likely to be disclosed to the whole academic community.

3.3   Best Practices in teaching

The identification of good teaching and learning practices developed by Teachers during the semester is one of the intended outcomes of this system (QUC), but an intermediate step of refining teachers own description of their best practices is in need before the Manual of Good Practices can be developed, and disseminated inside IST community. At the same time, the discussion and reflection of the team involved on this analysis, will (hopefully) increase the pedagogical quality of further Teaching Reports and improve teachers self-esteem by producing descriptions of their best practices that can be disseminated and (ideally) reproduced (when appropriate) by their colleagues.

The information submitted by teachers in their Teaching Reports referring to the second semester of 2007/08 and first semester of 2008/09, regarding the best practices, provided only minimal descriptions of the pedagogical innovations leading to the development of learning outcomes within the curricular units and of the technical and scientific skills promoted in relation to the stated objectives. These descriptions, far from being satisfactory, can be considered as a good start point, making obvious the need for further data collection before a comprehensive inventory of good practices can be reached. In truth, in an institution oriented to Engineering education and, therefore, less prone and less aware of the importance of

dissemination of pedagogical experiences, the introduction of tools of this nature requires some time for adaptation.

Preliminary content analysis of the teachers' self-assessment, following the *'Seven Principles for Good Practice in Undergraduate Education'* (Chickering & Gamson, 1987) and the concept of *constructive alignment* proposed by Biggs (2003), resulted in 9 categories:

BP1. 'Encourage interaction between students and the faculty'

A regular contact between the student and the faculty in the classroom or outside of it, which is aimed at involving and motivating him or her, keeping him or her focused on the task and encouraging him or her to think about his or her study plans. Examples: constant follow-up of practical work, articulation with other course units; promptness to clarify doubts.

BP2. 'Encourage the interaction and the cooperation among the students'

It aims at fostering the student's involvement by sharing ideas with peers. Examples: student self-evaluation/shared-evaluation between teacher and students; group work and projects.

BP3. 'Use of active learning methodologies and techniques'

This type of learning does not exclusively involve lecturing. Instead, it promotes active participation by the students starting from their experiences and the application of the contents to practical situations. It aims at encouraging the students to master the curriculum contents. Examples: classes with practical examples and work; availability of summaries of the curriculum contents; suggest supplementary theoretical material.

BP4. 'Ensure that the student has immediate feedback on his/her performance'

To promote self-evaluation opportunities designed for the student by inviting him or her to carry out academic work. It aims at optimizing performance giving him or her timely information on the quality of his or her performance. Examples: work out problems in class; availability of exercises proposed so that students can make them by themselves, with feedback; disclosure of timely evaluation outcomes.

BP5. 'Emphasize the carrying out of tasks within fixed time'

To propose academic tasks in which time management is a requirement. It aims at helping students learn more effectively, by managing their effort and according to time limits.

Examples: work out problems within a prefixed time limit; gradual scheduling and follow-up of laboratory projects/practices; introduction or project productivity and management tools.

BP6. 'Communicate high expectations to students'

To ensure that teaching staff motivates students for a positive atitude for the pratice of engineering activities with the purpose of promoting their motivation for learning. Examples: participation of companies/external speakers; link to projects in progress outside of IST/labour market; carrying out of challenging and/or original projects.

BP7. 'Respect the diversity – talents, experiences and learning ways'

To promote forms of lecturing the academic contents that allow for observing the different ways of learning of each student. It aims at harmonizing the teaching methodologies so that all students have learning opportunities adapted for their different points of view. Examples: review/doubt classes; adequacy of the evaluation to the students' knowledge/skills.

BP8. 'Explain the learning objectives'

The learning objectives for the course unit (knowledge and understanding, application of knowledge, judgement making, communication and learning skills) must be clear for students since the beginning of the term, with the purpose of guiding them to achieve success. Example: definition of the course unit objectives.

BP9. 'Structure learning support materials that allow for tuning the learning objectives with the evaluation practices for the course unit'

The curriculum characteristics must be consistent with the learning objectives and with evaluation. This consistency aims at harmonizing the learning activities and the evaluation tasks with the learning objectives for the course unit. Examples: online availability of the main material and further material for the course unit; review/adequacy of the class support materials; online planning of classes; adequacy of evaluation to the course unit objectives.

A questionnaire was then elaborated to test these categories among the Excellent Teachers (considered to be excellent during the second semester of 2007/08 and the first semester of 2008/09) - 86,7% (n=52) of them filled the questionnaire (sent to them trough an e-mail). From the original 55 variables, 22 were selected, among the ones chosen by at least 35% of the teacher's answering to the questionnaire. An hierarquical cluster analysis was then performed using the Furthest Neighbor method. Euclidian square distance, binary, was used

as a measure of the difference among variables. To decide how many clusters should be considered, the following Dendogram Using Complete Linkage (Fig. 3) was used, as well as the graphic representation of the fusion coefficients in different solutions (Fig. 4).
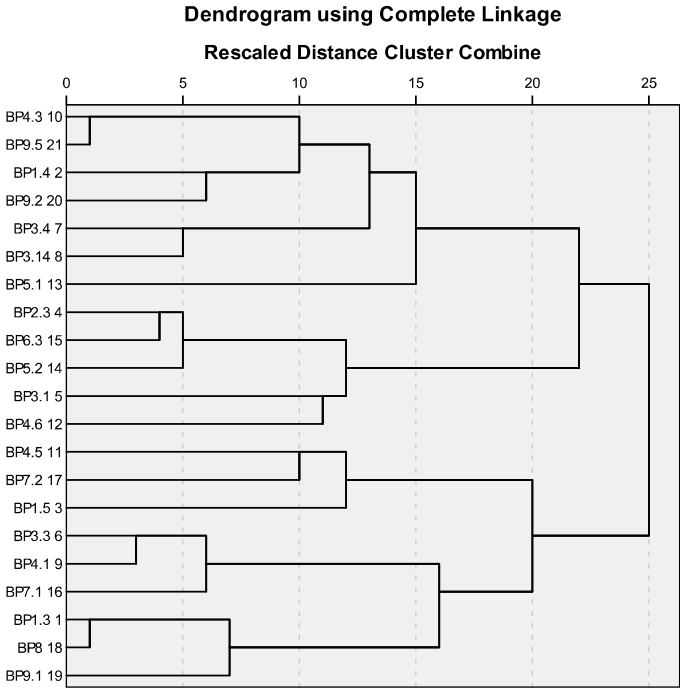
Dendrogram using Complete Linkage

Rescaled Distance Cluster Combine

Figure 4: Dendogram using Complete Linkage
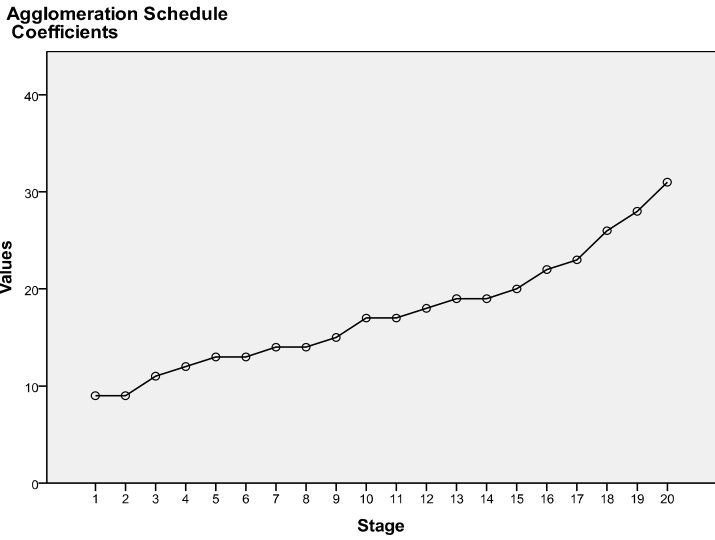
Agglomeration Schedule Coefficients

Figure 5: Agglomeration Schedule Coefficients

The following clusters were then found:

Cluster 1: availability of exercises proposed so that students can make them by themselves, with feedback √; adequacy of evaluation to the course unit objectives √; online availability of the main material and further material for the course unit; review/adequacy of the class support materials √.

Cluster 2: promote study and autonomous work √; work out problems within a prefixed time limit; review making √.

Cluster 3: group work and projects √; carrying out of challenging and/or original projects; gradual scheduling and follow-up of laboratory projects/practices; discussion and understanding of work outcomes √; classes with practical examples and work.

Cluster 4: constant follow-up of students; disclosure of timely evaluation outcomes √; adequacy of the evaluation to the students' knowledge √.

Cluster 5: coordination between theory and practice; work out problems in class; review/doubt classes.

Cluster 6: promptness to clarify doubts √; online availability of the main material and further material for the course unit √; definition of the course unit objectives.

If we compare the clusters identified through cluster analysis and the categories we've reached through content analysis of the spontaneous answers of teacher's in the TR while identifying 'the pedagogical innovations leading to the development of learning outcomes within the curricular units', we notice that clusters found only partially match the proposed description for the categories hypothesized. Grossly, cluster 1 matches BP9 ('constructive alignment'), cluster 2 matches BP3, cluster 3 matches BP2, cluster 4 matches BP4, and cluster 6 matches BP1 – for an easier read, the match for pedagogical activities is marked with a '√' in each cluster description. Cluster 5 matches none of the categories defined and categories BP 6 - 'Communicate high expectations to students' and BP7 - 'Respect the diversity – talents, experiences and learning ways' are absent from the cluster analysis and, in fact, underrepresented in teacher's identification of the pedagogical innovations within the curricular units.

4. CHALLENGES AND FURTHER STEPS TOWARDS A MANUAL OF BEST PRACTICES

Although still at an initial stage, QUC involved a high number of participants. In 2007/2008 (2nd semester) 87% of students and 73% of teachers participated, numbers who evolved to 97% of students and 90% of teachers in 2008/2009 (1st semester). It can be said that QUC has already allowed for a certification/review of the tools that comprise the system and the procedures to be adopted in their implementation, an identification of some curricular units with problems at the level of the organization and methods of evaluation (5%), and also the identification of a wide array of pedagogical practices.

The identification of good teaching and learning practices developed by Teachers during the semester is one of the intended outcomes of this system (QUC), the ultimate purpose being the elaboration of a Manual of Best Teaching Practices, permanently to be updated through the insight of teachers in each semester and also the establishment of a relationship with the pedagogical models of the different curricular units of IST and other indicators gathered within the scope of the QUC, assuring the constructive alignment (Biggs, 2003) that might exist between the learning objectives, the teaching and learning methodologies, the assessment methods and the good teaching practices. In order to reach these purposes, further steps are still needed, including the refinement of data collection procedures and the diversification of sources, including the collection of complementary data on the curricular units homepage, the analysis of best practices by type of class (theoretical, practical, laboratory, seminar), and interviews to excellent teachers. These interviews can be complemented with the publication of selected case studies, and will include the following sample questions:

- Which, in your **personal history**, was the major contributor for your good performance as a teacher – training actions, important teachers, books you read, feedback from other teachers and/or students, personal features…;
- Can you identify some **positive** aspects from your experience as a teacher regarding class preparation, relationship with students, relationship with peers and with your faculty…;

- Can you identify some **difficulties** of your experience as a teacher regarding class preparation, relationship with the students, relationship with peers and with your faculty …;
- What do you think that could further **improve** the quality of your teaching practice – training actions, incentives, quality of educational resources, quality of interaction among the teaching body…;
- What **advice** would you like to give your colleagues, who now start their teaching career – the do's and the don'ts, the things to consider, the skills to develop, the difficulties they might expect, the skills they must develop to tackle those difficulties…;
- How do you manage the three strands involved in the teaching career: teaching, research and management?

The video tapping and edition of some of these interviews will also be useful either for pedagogical and marketing aims alike. The joint discussion and reflection of the team involved on this analysis, the teacher's interviewed, the pedagogical council and the whole of IST's community, including students, will (hopefully) increase the pedagogical quality of further TR's and improve teachers self-esteem by producing descriptions of their best practices that can be disseminated and (ideally) reproduced (when appropriate) by their colleagues. Also, this joint reflection will probably also result in the identification of deficits in the pedagogical training of Higher Education teachers, and therefore result in proposals regarding Teachers' training in areas deemed relevant to their pedagogical development, through group sessions or, where appropriate, through a customized follow-up, making use of coaching techniques (Pérez, 2009). The 'Tutorado' program (Lourtie, 2009) as already started some training activities for Tutor's and some coaching activities that encourage an openness of IST's community to the dissemination of training and coaching activities as a way to improve pedagogical quality of the teaching-learning process.

5. FINAL NOTES

The preliminary results from the implementation of QUC may give some clues to the challenges of gathering and systematizing a collection of good pedagogical practices at IST.

With this experience as a starting point, it would be interesting to know other realities, namely concerning the following aspects:

- Do other institutions, particularly the ones oriented for the education of engineering, have similar systems? And similar difficulties?

- If yes, how are these experiences going and which are the results? Are teachers in similar institutions providing more detailed reports of their practices?

- Which mechanisms and refinement procedures do other, (similar) higher institutions have to promote, describe and disseminate good results/practices among their faculty members?

- Are teachers available to identify and share with colleagues the good teaching practices they develop and implement? Do coaching techniques belong to other higher institution practices in Europe? What is their acceptance among these institutions?

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