



Agència
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del Sistema Universitari
de **Catalunya**

General framework for evaluating interaction between university-level research and teaching

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Presentation

When the proposal was made for the Quality Assurance Agency for the Catalan University System (**AQU Catalunya**) to draw up a series of general frameworks, the then members of the board of directors expressed their great interest in one of these frameworks enquiring into and setting out good practices to guide effective interaction between the teaching and research activities of university academic staff. For the purposes of coherency with the other frameworks, it was also necessary for this complex issue to be dealt with in a summarised way.

This difficult challenge was accepted wholeheartedly by the members of the commission that was established to draft the wording, which finally consists of four different sections, a reflection on the new challenges and demands being made on higher education at a time of great changes, the conceptual framework for interaction between teaching and research, assessment of this interaction, and good practices that can be introduced to improve interaction between teaching and research. As this is a text published by **AQU Catalunya**, I believe it to be a sensible choice that assessment of the interaction between teaching and research is analysed as a fundamental stage in the process of progress being made in strengthening the link between the two, which are ultimately the basis of the work of university academic staff.

I am very grateful to the members of the commission that has drawn up this general framework, and especially to the co-ordinators and the secretary for their dedication and endeavour in preparing all of the material, the drafts and the final wording. It has not been an easy task. I am also very grateful to the students who were consulted and gave their opinions and suggestions for ways to make the text more comprehensible.

The document that has finally been produced goes beyond what was originally planned and will, I am sure, interest all students and particularly academic staff and authorities. It comes out at a key time when a new structure and orientation are being given to university teaching and also when it has become evident that what strengthens a country is the quality of research and training of its citizens.

Gemma Rauret i Dalmau

Director of **AQU Catalunya**

AQU Catalunya: quality, the assurance of improvement

The activities of **AQU Catalunya** are guided by a set of values that underline its engagement to the improvement of quality. The values upheld by **AQU Catalunya** are as follows:

- View quality as a way of doing things and of working better. **AQU Catalunya** was the first agency certified by ISO standard 9000.
- Innovate continuously in both methodologies and processes.
- Maintain a European focus with respect to the activities carried out to allow the smoothest possible integration of the Catalan university system in the European Area of Higher Education.
- Assure maximum transparency, objectivity, impartiality and equanimity with respect to the services that it renders. The users of **AQU Catalunya**'s services are assured of the rights to information, direct personalised attention, and to submit claims, complaints and suggestions in relation to the services that are provided. The methods of procedure of **AQU Catalunya** are set out in its Code of Ethics, which is approved by the Board of Directors.
- Foster co-operation between the universities, the Administration and **AQU Catalunya** with the aim to generate maximum added value.
- Foster co-operation with other national and international bodies and agencies that have the same purpose.
- Work through a network of experts on issues relating to university quality that allows the rapid development of knowledge and the promotion of the culture of quality in the entire Catalan university system.

Structure of the document

This document is structured as follows:

- Section one gives a summary of the new challenges and demands on higher education, and the meaning of the concept of **research-led teaching** is explained, along with teaching-research interaction.
- In section two, the foundations of the **conceptual framework** for the interaction of teaching and research, which is often disperse and fragmented, are established. These must serve to form a view shared by the university community of the meaning, appropriateness, implications and benefits involved with improving this relation on all levels. The framework is divided into three analytical levels: **organisational level**, **processes** and **agents**.
- The third section of this General Framework sets out, on the basis of the elements outlined in the conceptual framework, the main indicators for **evaluating** teaching-research **interaction**.
- The fourth and final section offers a series of **good practises** that can be implemented to strengthen the link between teaching and research.

1. The university, a research and teaching institution

The idea of institutions of higher education as transmitters and creators of knowledge is relatively new and dates from the early nineteenth century when Wilhelm von Humboldt (University of Berlin, 1810) transformed the idea of the university into an institution based on the unity between teaching and research. Up to this time, the universities had basically been teaching institutions that contributed to the dissemination of knowledge and served as a preparation for professional practice, whereas it was in the academies where the technical knowledge being developed by craftsmen and the acceptance of observation and experimentation as basic elements of the progress of scientific knowledge were being encompassed. The modern research-orientated university heralded by Humboldt soon gained an axial position in the crossroads of the modern world and the profound economic, technological, social and cultural transformations taking place in society.

One of the characteristics of modern European universities is that teaching and research form the main core of academic activity and are fundamental factors in its foremost position in the great social, economic and technological transformations occurring in European society. They are not separate viewpoints because, over and above the actual work and functions of teaching staff, there is a **manner of working** that can be conceived to be truly **academic**, namely work that is rigorously and meticulously undertaken and the use of critical thinking (scholarship). It is the quality of this manner of

working, together with the spirit of inquiry, fervent scepticism and active research, that must nurture both research and teaching activity because this is what they share in common.

Within the context of this general framework, **research** is understood to be:

- The **discovery of knowledge**, which contributes to the stock of human knowledge and to an institution's intellectual influence. This also includes creative work in literature, the arts, etc.
- The **integration and interpretation of knowledge**: Serious, disciplined work that, in original research, discovers, integrates and interprets new elements. Connections are made between different disciplines and changes in the context in which knowledge is presented, while the division of knowledge into increasingly esoteric bits and pieces is eliminated.
- The **transfer of technology** and knowledge to the wider community, or the application of knowledge to resolve society's problems, with the understanding that interaction between theory and practice mutually improves both.

Teaching comprises the teaching-learning processes at the undergraduate and postgraduate (including doctorate) levels, where students are initiated into the values of academic discipline, enabling them to understand and participate more fully in a broader scientific culture. As with other areas of academic work, teaching must be carefully planned, it must be associated with the subject being taught, and it must be continually assessed. It must encourage learning that focuses on the individual so that the student becomes a critical, active thinker with the ability to learn by the time he/she leaves university.

Nevertheless, although everybody accepts the statement that teaching and research are the main core of academic activity and that is written into the statutes of all universities, daily practice shows that there is very little interaction between teaching and research functions, that it neither materialises very much nor is it very visible when there is, and that their coexistence can even lead to significant tension and disorder within institutions. There are two facts that contribute to this. On the one hand, as a result of discipline specialisation and organisation, a significant proportion of curriculum content is not directly connected with research in a clear way. On the other hand, the fact that the two functions are not given equal incentive and that research, in contrast to teaching, moves in a highly competitive context, tends to polarise the activity of academic staff to a great degree.

New context, new demands. Research-led teaching

Technological, economic and social changes have transformed and continue to transform society, in which people are the leading actors. The best way to face the challenge of change is lifelong education and training: it is the human capacity to **create and use knowledge** effectively and intelligently, on a continually changing basis, that counts most (European Commission, 2000).

The university is being increasingly subjected to external and often contradictory demands caused by changes that it has itself contributed to create. It can no longer just prepare students to learn an orderly series of theories and methods, neither can it just offer “knowledge” but instead must offer the means to achieve this and to **prepare for the future**; it must provide students with a solid base to deal with learning in the future, without overlooking the fact that learning is not about accumulating information but **constructing ways of seeing and working**. Although it cannot compete as a *transmitter of knowledge* with the news media that are currently available, it can nevertheless fulfil this role by providing training, through the faculty-alumni community, in the exchange of ideas, role modelling, skills development, and stimulating **academic socialisation** by cultivating the skills and values that the university excels in.

The new European Higher Education Area seeks to respond to the abovementioned scenario and three of the Bologna proposals are relevant concerning the objectives of this general framework:

- **The introduction of the European credit system** based on the evaluation of student work-load and recognition in teaching work not just of the number of hours spent teaching but also of the number of hours spent organising, guiding and supervising students' work.
- **The undergraduate and postgraduate structure** (*Bachelor-Master*) that is based on competence descriptors for degrees in the European Higher Education Area.
- **The European qualification supplement** that will specify the knowledge, competences and professional capabilities acquired.

These proposals point to a change in the model of higher education: from teaching to learning; from the classroom to a learning environment; from the accumulation of knowledge to knowledge with competences and an attitude towards a kind of learning that needs to be defined beyond the scope of implied content and with specific competences to be developed. **It is natural for such competences to be acquired more easily in a context where there is interaction between research and teaching.**

The universities thus have a key role to play in the European project in addressing the challenges facing the knowledge society, and this will depend on an intensification of research and the enhancing of **research-led teaching** (Berlin Communiqué, 2003; Graz Declaration 2003), where academic staff and students are learners and researchers of knowledge generation, where the atmosphere at university encourages critical and transformative

capabilities, and where the teaching-research binomial becomes an inseparable and indispensable reality, and this becomes synonymous with its identity.

Research-led teaching is teaching where teaching and research interact and mutually benefit and enrich each other. Several positive aspects of this interaction are:

- Research-linked teaching enables content to be continuously updated. Research is the driving force that updates study programmes and contributes dynamism. The same can be said for technology transfer.
- Learning is in itself a process of discovery that is new, not for the academic community, but for the individual; in this respect, the interaction between research and teaching is the key for explaining and learning how knowledge that is transmitted is generated.
- It facilitates the progressive transition towards improved teaching methods that focus on the students and student learning.
- Teaching enables the totality and context of scientific research, which is sometimes highly fragmented and removed from reality, to be retained. Teaching is also a source of learning for the person who does the teaching.
- It enables students to develop their capabilities of critical thinking, analysis, problem solving, inquiry and self-learning.

- Research often means testing, making mistakes, checking, etc. The communicating of research, reflecting on the teaching implications of research, and research turned into teaching all often lead to reflection and re-examination.

Several erroneous concepts as to what research-led teaching means help to shed light on this issue:

- Research-led teaching does not mean to orientate teaching so that all students become researchers.
- It does not mean that research-based teaching must be present in each and every subject in the study programme, although students should have experience with it during their studies, with the degree to which they are exposed to it depending on their level of training.
- It does not mean that all research can or must be taught.
- It does not mean that undergraduate or doctoral study programmes have different courses where research that is being carried out is explained.
- It does not mean that all academic staff are carrying out both activities equally and at all time which, in fact, is probably not even convenient.

From an institutional perspective, reinforcement of the interaction between research and teaching is also an opportunity to:

- Enhance the distinctive role of the universities at a time of change and uncertainty in the future of higher education: strengthen the institution's research capacity, as well as its attractiveness, on the basis of research-based teaching.
- Improve the interaction between the external observers: society, government, the agents of innovation, etc. The influence in general of the results of research on the surrounding area and on society is much greater when innovation in teaching is involved.
- Develop functional and organisational changes in universities that provide for the effective balance of teaching and research endeavours.
- Increase the quality of overall research activity through the cross-fertilisation of ideas and learning between academic staff, students, enterprises and other agents.

This is the reason why the European Universities Association (EUA, 2003) states that research must be an integral part on all levels of higher education, that graduates need to be exposed to an environment of research and training in research, and be trained in problem-solving and initiated into research methodologies as part of their education.

How can this be achieved without enhancing the interaction between research and teaching?

Conclusion

Positive interaction between teaching and research involves dealing with a multitude of contextual obstacles although at the same time it is an opportunity for the university to become a student-focused research institution, which is essential in the information and knowledge society with its needs for human capital that is capable of inquiring into, querying, resolving and anticipating problems and where science and the socialisation of science have become a key element.

The present time, with significant transformations taking place in higher education, is a good moment to review the way things are done although even more important than this is for specific, planned measures to be carried out so that all of the agents involved achieve real mutual benefit from the interaction between teaching and research, because the ultimate purpose is for this to be beneficial for the processes of learning and research. In other words, this means realising a university of quality.

To sum up, reinforcing the interaction between teaching and research is important:

- **Strategically** - in that it reinforces the position of the research-based university and orientates the dynamics of change.
- **Conceptually** - by helping the needs of society and the development and communication of science.
- **Operationally** - in terms of reciprocity concerning improvement to research and teaching-learning activities.
- **Individually** - as a process that is beneficial to students and academic staff.

2. The frame of reference for teaching-research interaction

This section deals with aspects where interaction between teaching and research is evident and specifically materialises and that together give form to the conceptual framework of reference for evaluation.

2.1 Interaction at the organisational level

2.1.1 Institutional level

It is not just facts that need to be put aside from the teaching and research duality but also expressions like “teaching workload”. This means essentially a **cultural change**, from knowledge-transmission teaching to facilitative teaching, from conventional learning to student-focused learning, from an emphasis on what is learnt to how one learns (deep learning versus superficial learning), of teaching and research as separate activities to research-based teaching, and a change that needs to be led not just institutionally but also strategically and operationally.

Planning and organisation

While in the best of cases universities have strategies for research on the one hand and teaching and learning on the other, they hardly ever take each other into account and rarely is there a particular strategy for the teaching-research duality, which is an essential step for establishing operative actions to enhance interaction.

The challenge is to create a joint vision of an integrated, research-based university that transcends the walls between the different organisational units, where intra- and inter-disciplinary debates are entered into; a university that overcomes the trends towards hyper-specialisation that isolate the expert from his/her academic community, or the trends leading to the isolation of the different training/research units, thereby ensuring a vision that is shared, with balanced individual, institutional and social interests; all of which requires thought being given to the organisational model (see Frans van Vught, 2001).

In order to be able to warrant this consensus, centres, departments and other structures of teaching and research co-ordination must all be involved in the process of strategic and operative definition. Instruments and procedures, such as contract-programmes, staff assignment agreements, areas of intra- and inter-disciplinary communication and interaction, etc., need to be developed to make this possible.

Academic planning policies

Curriculum design must go beyond a list of courses that are more or less arranged in an itinerary and needs to include the **competence and knowledge learning descriptors** to be attained by the student (see General framework for study programme design), together with the necessary **teaching-learning methodologies**, the most significant **assessment systems** and material means and, lastly, **the type of academic staff** that can achieve the objectives of a degree course and adequately respond to the learning processes.

The internal and external assessment of study programmes needs to incorporate indicators that verify the introduction of the strategy to encourage teaching-research interaction in the defining of programme specifications as well as in teaching-learning methodologies, and specifically in the characteristics of graduate workload and their evaluation.

Human resources policies

Although academic staff activity must legally be distributed between different teaching and research activities, the profiles that actually exist are very different, which is not to be criticised although they should be monitored and planned to ensure that the institution offers a good service to the community.

Policies dealing with incentives, assessment, staff assignment, staff, selection, training, etc. need to operate synergistically in order to direct and reinforce interaction between teaching and research. Moreover, a systematic analysis of whether these are beneficial to interaction or not is necessary when they are being defined.

Human resources policies

Staff and selection

The necessary **academic staff specifications** need to be determined and **selection processes** orientated accordingly.

The fact that no specific basic funding is available for research as it does in other contexts implies serious difficulties for change. In spite of the system's restrictions, however, each university's own policies, the defining of staff specifications and appropriate personnel selection need to be included as an integral part as soon as possible.

Assignment

Teaching-research interaction needs effective instruments to both regulate assignment intensiveness and stimulate positive interaction between teaching and research. **Instruments are needed to regulate assignment** by consensus within the department and that take into account the objectives of teaching and research projects from both collective and individual points of view. The writing up of a teaching objectives report and an end report on activities that have been carried out helps to make these activities more explicit and transparent and they can then be analysed, shared, evaluated, etc.

Training

One essential element for improving the interaction between teaching and research is to train academic staff so they have the tools to give concrete form to this interaction in the classroom (student-focused learning approach, tools for analysing and being able to reflect on teaching activity, etc.). It is necessary to establish a **training plan** that provides the necessary competences for introducing teaching methodologies based on, or conveyed by way of research.

Assessment

Assessment and incentive systems are also an important element that promotes positive interaction between teaching and research and is an indicator of institutional commitment with regard to this aspect. Incentive policies must take the incorporation of interaction between teaching and research into consideration, in addition to the factors conditioning interaction in teaching and research processes where academic staff are involved. This is one of the areas where both Spanish and Catalan public administrations need to be involved in order to make possible and give impetus to an incentive system that stimulates this interaction.

2.1.2 Training unit level: (centre/department)

Research and teaching-learning strategies and operative action

The nexus that is effectively established between teaching and research “materialises” at the faculty/department level. Co-ordination of the operative interaction of teaching and research must remain with the university training units and not become an affair at the individual level.

The implementation of a conscious strategy at the unit level is in itself a very important element of institutional cultural change, given that it implies having to openly and collectively deal with discussions on teaching and research interaction that, in turn, inexorably imply having to talk about and discuss, for example, what and how to teach, how to integrate research into courses, teaching-learning methods, the development of pedagogical research or how to assure that the research strategy backs up and supports the curriculum, especially at the postgraduate level.

Human resources management

It is necessary to guarantee that there is somebody who has the authority to regulate and orientate personnel management, with a complete overview of the processes involved. This general factor in assuring quality in human resources management becomes essential if one wants to introduce teaching and research interaction, as a result of the cultural dispersion of these activities.

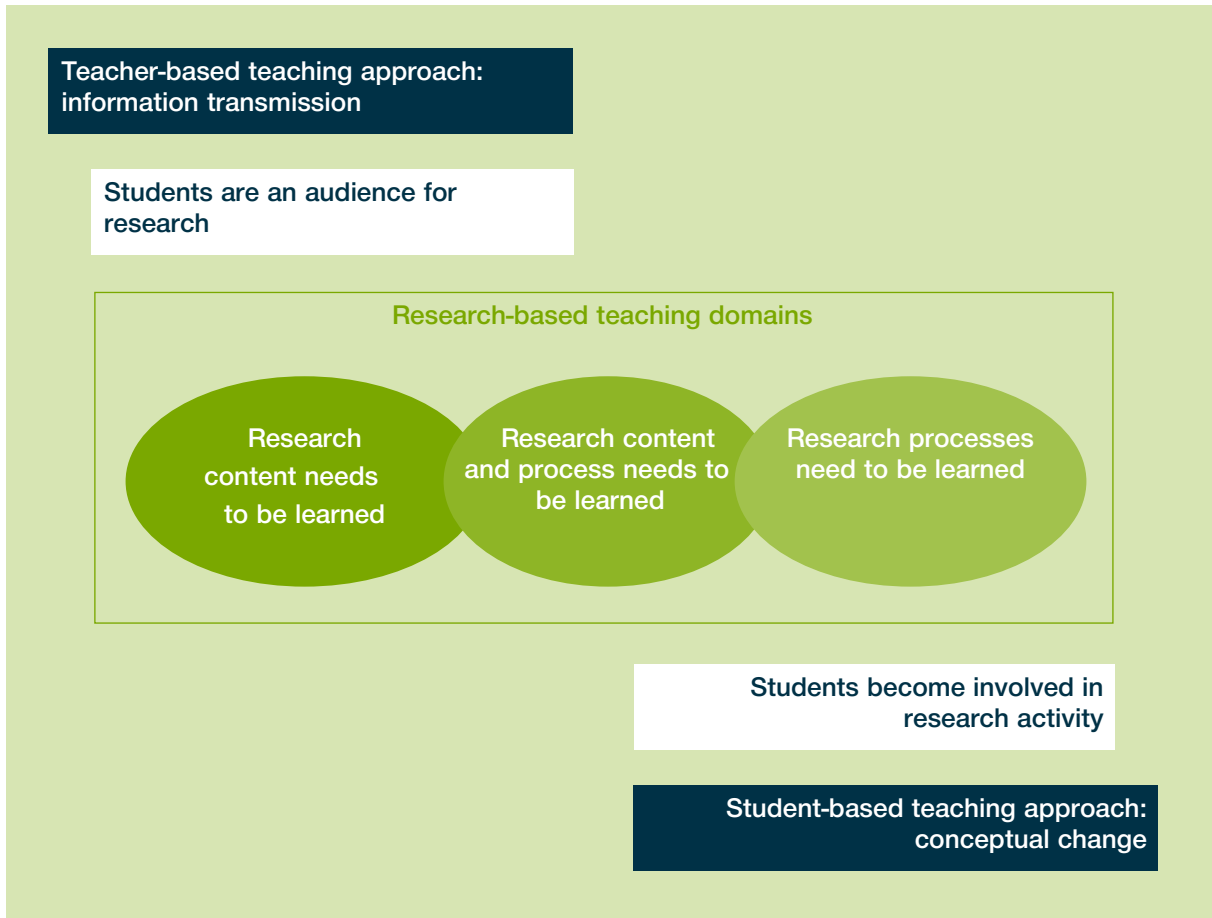
The fundamental elements by which units need to impinge on teaching and research interaction are: staff assignment management, performance assessment, support for improving the activities of academic staff, training schedules, promotion, decision-making, etc., and teaching and research interaction needs to be furthered in all of these.

2.2 Interaction through key processes

2.2.1 Teaching-learning processes

It is explained above that, in order for it to be reinforced, teaching-research interaction needs to be facilitated (institutional policies) and to become established (unit policies). Implementation of this is by way of design processes and teaching development, which are what ultimately have an impact on student learning.

Furthermore, research has shown that there is a very close connection between the way students approach learning and the perception of what is required of them by the institution (memorisation, comprehension, etc.). “How one learns” is therefore more determinant for the result of learning than what is being learnt.



Source: Brew, 2002

Undergraduate level

Teaching and research interaction must be made evident in both the description of content and competences and in the methodologies for developing them.

Many of the competences that students are meant to learn during their studies, such as the ability to interpret and interrelate information and problem-solving, to name but a few, are clearly grounded in and **inherent to the research process**. A research-based context facilitates both

the acquiring and teaching of these (various examples are described in the section on good practices).

It is also worth pointing out that study programmes need to contain some **research experience**, or projects to be carried out in the case of technical courses, that enable the theoretical knowledge that is taught to become coherent. It is important for the spirit of inquiry, together with the methodological approaches and techniques that are fundamental characteristics of disciplines and their specific conventions, to be incorporated into academic programmes and teaching development. Scientific communication, the ability to interpret, summarise and/or criticise a scientific text, etcetera, also become key elements in the student's learning. Nevertheless, it is even more important for the student to understand and grasp the mechanisms whereby the knowledge that is being transmitted has been discovered. It seems paradoxical that, while the introduction of research work into secondary education has been notably successful, a student can graduate without having done any empirical work. As is mentioned in the introduction, differences between disciplines will evidently result in differences in this research experience with regard to form, time, etc.

Postgraduate level

Postgraduate studies are much more specialised and study of a specific area of knowledge goes into much greater depth. In relation to the analysis of teaching-research interaction, a distinction needs to be made between professionally orientated postgraduate studies and research-orientated studies.

■ Specialised postgraduate study / advanced professional training

Within the scope of specialised postgraduate and on-going training courses and seminars, interaction with the professional labour market is essential.

It must be ensured that knowledge transmission takes place with an intensity and a methodology that are appropriate to the objectives of the course and the interests of those participating. The usual procedures for supervision, evaluation, the degree of student satisfaction, etc., will also be highly necessary in this case.

■ Research-orientated postgraduate study

The purpose of this type of postgraduate study is to precisely teach to research, and this can only be done effectively by bringing doctorate/Master's programmes into line with the research and technology transfer that is being done.

Teaching-research interaction can be brought about most “naturally” and fully between academic staff and doctoral students given that subject matter, being more specific, can be linked more to research and stimulate more interest in academic staff. Knowledge transmission, procedures, competences, etc. can thereby go in both directions (teacher-doctoral student) and create feedback. Furthermore, the incentive and inducement to learn often occur when students get immersed in research and group integration.

As specific and in certain cases very specialised knowledge is being dealt with, care must be taken so that teaching in the doctoral field (and also in postgraduate and specialised courses) has sufficient structure in relation to the subject and is neither too disconnected in relation to the links with other similar fields of knowledge nor inadequate or ineffective in relation to procedures and methodologies.

Analysis and teaching-led research

There are different ways in which teaching-led research can be linked to teaching:

The use of research in teaching		
Before teaching	During teaching	After teaching
<ul style="list-style-type: none">■ Research and disciplinary scholarship used to prepare teaching■ Use of research and scholarship in relation to the teaching used (general or specific to the discipline)	<ul style="list-style-type: none">■ “<i>Saying</i>” as to “<i>implying</i>”: Students as an audience for research or actively involved in the research activity■ Student-focused approach as to a teacher-focused approach■ Teaching objective: the content of the research, the process of research or both	<ul style="list-style-type: none">■ Reflect on teaching itself by using different approaches to comprehend the results and experience of the students, and to introduce improvements■ Disseminate the teaching methods and approaches to colleagues or more widely by way of forums and national and international journals

Source: Brew, 2002

Teaching is and must be reflective, systematic, intentionally designed, theoretically-based and systematically evaluated. The ultimate consequences of teaching, as an academic activity, are the importance of the results and processes of student learning which serve as inputs for the analysis and change of teaching practices and topics in the respective disciplines. As to just designing what must be learnt, academic teachers therefore also need to design how their discipline is to be taught and to submit their work to critical analysis (Hutchings, 2000). Teaching must therefore become enriched through:

- The transfer of the results of research (either pedagogical, general or specific to the disciplinary field) to teaching practice.
- The improvement of teaching practice by way of evaluative research: teachers as teacher-researchers. The development of research action where academics combine the roles of researcher and teacher in the research of their own teaching activity.

Teaching-led research is thus an academic activity in which teaching is dealt with as a researched and researchable activity (obtain data, analyse data, reappraise methods, experiment, etc.), that is to say, research-based teaching. It is obvious that, for learning to improve in a disciplinary field, it is the experts in that field who are most suitable for discovering what and how to learn, as well as what should be learned and how.

Teaching-led research can also be a good connector between research and teaching because it can be carried out by way of actually being taught itself or by any researcher within the teaching group who has the role of teacher, no matter what the field of research and no matter how removed it is from the activity being carried out in the classroom. Teachers, just like any other group of professionals, need to know their tools to carry out their work, including tools for analysis and evaluation.

2.2.2 Research development

Research culture and views on what research is

Researchers normally carry out their research in increasingly narrower fields of knowledge. Hyper-specialisation leads to the expert becoming isolated from the academic community. Highly specialised and fragmented knowledge that, on the other hand, prevents an overall view, together with an understanding of how it is connected with society, from being gained can hardly respond to the problems of society that are increasingly polydisciplinary, transversal, multi-dimensional and global (Morin, 2000). The issue is whether intellectual progress will come from new connections between disciplines or the discovery of increasingly smaller bits of information.

The experience of highly research-orientated universities in the US, as well as the experience here in Catalonia in departments that are highly research-orientated, shows that excessive dedication to research has effects that are not always beneficial for teaching.

Teaching, with the orientation proposed here, can mitigate these pernicious effects. The development of undergraduate and postgraduate teaching implies the need to be up-to-date within the broad limits of the discipline, a fact which reinforces research capabilities. One of the functions of teaching is to offer *integrated views* of knowledge by seeking connections between intra- and inter-disciplinary discoveries and contextualising the results of research within the disciplinary context. In this respect, teaching in collateral fields also stimulates broader scientific viewpoints.

Moreover, good teaching activity involves intellectual and emotional activities and the development of communication and knowledge skills that become an important element for the teaching staff to develop research activity. The communication of research and consideration of the teaching implications of this research often lead to reflection and re-examination.

Operative processes in research

Inversely, research carried out by university teaching staff improves the quality of teaching:

■ The frame of reference for teaching-research interaction

- It increases the teacher's knowledge of a very specific subject.
- It gives the teacher the opportunity to transmit not just new and specific information to the students but also the intrinsic curiosity of scholarly effort and an appreciation of the search for answers that is implicit in research work.
- It gives teaching staff moral authority in the eyes of the students, especially in advanced courses and specialised subjects.
- It is beneficial for the students who, through the teaching staff, can get a better grasp of how research methodologies are applied.

2.3 Interaction from the point of view of the agents

Teaching staff

In spite of the fact that teaching and research are, or should be, a composite endeavour, this must be based on individual competences, which are defined by professional specifications.

In order for teaching and research to interact positively, there is a certain number of characteristics that must be identified in the staff, bearing in mind that every member of the teaching staff, on being recruited, has to carry out both research and teaching as a basis for his/her work as an academician, which is an explicit

specification that defines and provides the context for what is expected of a significant proportion of university faculty staff in terms of what they do and are meant to be. So, for example, one can expect a university teacher to:

- Be involved in different forms of research (as defined in the introduction), especially in the case of an ordinary teacher/lecturer.
- Stay up to date in terms of knowledge and capabilities through their professional career, etc.
- Acquire and renew methodological approaches in the areas where they are involved in teaching.
- Incorporate the dialectic and way of thinking and style of the discipline in their teaching work.

The cultural change mentioned on various occasions must of necessity occur at the individual level. Good teaching and good research at a teaching and research institution need to be recognised and appreciated. The link only exists if both activities are appreciated at the same level. If this does not ultimately occur, it will be difficult to reinforce the bond between teaching-research no matter how many strategic and operative views are used.

The students

Undergraduate students that live in a certain atmosphere of research attach higher value to the authority of their teachers and the institution in general. Research-based learning makes the students more independent and critical as learners, a very important factor in connection with the labour market. It prepares them for the continuous demand for new knowledge that present-day society demands of us all.

A student should be able to expect the following from a teaching and research university:

- Active learning. In other words, this means acquiring knowledge in an active way instead of passively receiving information that is presented, and learning by way of reasoning and critique more than just through knowledge transmission.
- To have expectations and the opportunity to work and be in contact with significant researchers who guide and encourage the student's efforts.
- To have access to high-level research facilities and services: laboratories, libraries, computer systems, etc.
- To be able to choose between different fields of study and directions within their studies, including areas and lines of work that are possibly not available in other types of institution.

- Opportunities to interact with people from different backgrounds, cultures, experience and levels of knowledge, from new-entry students to senior researchers.

All graduates in a knowledge and information-based society need to understand the tools for carrying out research but above all they need the capability and confidence to apply these tools in the real world in order to formulate solutions to problems, to know how and where to collect proof, if this proof is appropriate or not, and how to demonstrate that it is valid.

Educational administration

Educational administration, as part of the national administration, understands the importance of interrelating the universities with the corporate system and public institutions, not just a matter of training university students in order for them to get a job but also because, efficiently trained, their employment generates more added value, a process which results in an increase in the country's general income and quality of life.

Entrepreneurial ability to be able to compete today (in Western countries at least) has largely to do with the possibilities of innovation, creating new products and improving existing ones. This means allocating more budgetary resources and grants to increase scientific and technological knowledge, and to stimulate all processes involved in R+D. In spite of the increasing importance of research, however, it cannot remain dissociated from quality

■ The frame of reference for teaching-research interaction

teaching, which is responsible for training the workers, entrepreneurs and researchers of the future. In any event, it is very difficult to understand why the processes and results of research do not get transferred from researchers to students, especially in the more advanced levels of higher education.

If the administration is giving aid to specific research programmes and has also recently turned its attention to help implement programmes to improve teaching innovation, especially concerning the use of new technologies, it is essential for special care to be taken in watching over the close interrelation and enrichment taking place between teaching activity and research activity.

Various possible joint actions by the administration and universities that would stimulate this link are:

- Reward teaching innovation based on the use of research processes and results in class.
- Support actions that lead to exchanges of experience between different members and groups in the Catalan university system, seminars, symposia and workshops, and the preparation of materials, etc.
- The use of instruments, processes and results in course content must also be taken into account when periods of research are assessed.
- Incorporate teaching-led research as a research merit.

All of this together with the purpose of increasing the existing link between good research and good teaching, as well as enhancing the university's degree of excellence.

When a PhD holder obtains a post, either tenured or untenured, he/she is given full teaching and research capacity. Belief in the idea that these capacities are dissociated would be to commit an outrage against the excellence of the institution that one is in the service of. The role of the administration must in this case be to safeguard that the interrelation between teaching and research does not weaken and to promote multiple connections within it.

Employers and other external agents

If the universities' task is to form agents who are prepared to work in society, it is logical for this to influence the university function through representative people in different groups and social institutions. For example, articles often appear in the press about the fact that employers call increasingly for graduates who are capable of adapting to change, managing people, lifelong learning, etc. The Social Council is the body whereby, by law, society participates in the university and its members include representatives from local entities, workers' trade unions, business organisations, professionals and former students/alumni.

It is through the Social Councils that a link is sought between entrepreneurs, professionals and former students so as to tighten the bonds between the universities and an important number of those who have benefited from them, those who exercise positions of corporate responsibility and use knowledge and methods supplied by the universities, and also those with job offers for people with advanced training. Altogether, the result is a host of interests that ensure that the university does not become divorced from the interests of employers and other social groups and that these in turn value and are aware of the benefits of university training.

The economy of the knowledge society implies that this is neither stable nor permanent but that it multiplies, with new knowledge making old knowledge obsolete. This means that employers will want to acquire new knowledge and that this will only be accessible if qualified employees have been taught in such a way that they continue to learn, to innovate and to research.

The participation of dynamic employers and former students (alumni) with professional responsibilities in the advisory bodies of universities for the purpose of defining the required characteristics of postgraduate study plans and programmes is considered to be highly necessary and fundamental in conveying academic activity to society and for promoting the dialectic between theory and practice, and teaching, research and society.

3. Evaluating teaching-research interaction

The previous sections covers the aspects and factors that would enable an environment conducive to teaching-research interaction to be formed. This section describes the main indicators of this context and outlines the contents that an evaluation guide to teaching-research interaction would need to develop.

Analysis of these indicators permits, on the one hand, the state of the issue concerning teaching-research interaction to be diagnosed and clarified, and the potential of interaction to be assessed. On the other hand, analysis enables aspects to be improved or reinforced to be pinpointed through identification of loopholes, deviations and difficulties in the current situation.

Interaction at the organisational level

The institution

Planning and organisation

Assess in the different institutional documents, especially the university statutes, the suitability of the following factors with regard to the treatment of teaching-research interaction:

- Institutional commitment to strengthen the bonds between teaching and research.
- Explicit mention of the teaching-research duality in institutional documents.
- Setting up of the dual system of functions and responsibilities enabling the interaction between teaching and research to become operative.
- Suitability of the strategy for dealing with teaching-research interaction.

Policies dealing with academic planning and human resources

- Different teaching and research points of view are taken into account in **defining the profile of the academic staff**. **Selection processes** that are coherent with the definition of the academic staff profile.
- Existence of instruments to **regulate teaching assignment** (teaching objectives report, record of activities carried out, etc.).
- Assignment allocation should enable the teacher to combine the different facets of the teaching function throughout the different stages of his/her professional career.
- Assignment of teaching and research activity assures overall teaching-research interaction.
- The **training plan** sets in order the subjects connected with the introduction of teaching methodologies and evaluation instruments that enable teaching-research interaction to be given definite form in the classroom.
- **Incentive policies** incorporate the assessment of teaching-research interaction.

The training unit

Research and teaching-learning strategies and operative action

- Existence of teaching and research strategies at the faculty and department level with regard to: the management of staff assignment, performance evaluation, support to improving the activities of the academic staff, the training programme, the promotion programme and decision-making, etc.
- Co-ordination of the teaching and research strategies at the training unit level.

- Involvement of the community in designing and implementing the teaching and research strategies.

Human resources management

- Responsibility for regulating and orientating personnel management is clearly defined.
- Adaptation of personnel management to the actual situation arising out of disciplinary differences.

Interaction through key processes

Undergraduate and postgraduate

Design and contents

- Curricula include **a definition of the competences to be developed**, especially those associated with research.
- Plans are systematically updated with new knowledge and methodologies obtained through research.
- The **teaching methodology** and the **form of evaluation** reflect teaching-research interaction: active learning, research work, projects, etc. Suitability and evaluation of the workload.
- The student participates in contexts connected with research.
- Existence of mechanisms for assessing teaching-research interaction: student satisfaction, academic staff satisfaction, indicators of scientific production, etc.

Postgraduate

- Appropriateness of contacts with the labour market, especially with regard to specialised postgraduate courses and advanced professional training.
- Co-ordination of postgraduate programmes.

Analysis and teaching-led research

- Degree to which research-based or research-focused teaching is developed, including its dissemination.

Interaction from the point of view of the agents

Academic staff

- Academic staff keep knowledge and their abilities up to date through their professional career.
- Academic staff become involved in different forms of research (intra- and inter-disciplinary, teaching innovation, etc.).
- The way of thinking, methods and techniques are transferred from their discipline to teaching.
- Methodological approaches are acquired and renewed in the areas where teaching is developed.

Students

- Students participate in active learning (learning more by way of reasoning and critique than just by way of knowledge transmission).
- Attainment of oral communication and writing skills, together with other research-associated skills.
- Degree to which the student has had contact with researchers, and options for interacting with people from different backgrounds, cultures and experience.

	<ul style="list-style-type: none"> ■ Students have had access to research facilities and services. ■ Policies for basic and applied research: teaching innovation, support for actions for the exchange of experiences, preparation of materials, etc.
Educational administration	<ul style="list-style-type: none"> ■ Policies and methods for evaluating academic staff: professional evaluation (including both teaching and research activities). Degree to which recognition and salaries of academic staff is linked to this overall evaluation. ■ Degree to which the interrelation between teaching and research activity is overseen and encouraged. ■ Degree accreditation takes into consideration the fact that research-linked methodologies, techniques and competences are developed. ■ Mechanisms for assessing stays of research include critical knowledge of the teaching-research interaction in the workplace where the research stay was carried out.
Employers and other agents	<ul style="list-style-type: none"> ■ Degree of effective involvement: collaboration in defining the training specifications, occurring of debates between the academic world and the labour market, development of research into courses of technology transfer, etc.

4. Annexes

4.1. Good practices

Various examples of good practices to strengthen the relationship between teaching and research at undergraduate level are briefly described below. They are classified into two groups, actions that can be carried out at the organisational level and examples of good practices in the teaching-learning process.

a. Good practices at the organisational level

Educational administration level

- Introduce a corrective element that reduces the difference between incentives to teaching and to research. For example, an indicator in the periods of teaching evaluation for teachers that promotes interaction between research and teaching.
- A line of funding that provides incentives for teaching-aligned research, for example, assessed as research merit.
- Include in the programme memorandum that teaching is to ensure that interaction between teaching and research is stimulated.
- Take into account the transmission of teaching-applied research as an evaluation criterion in the accreditation of academic staff.

Institutional level

- Treat the reinforcing of teaching-research linkages as the institution's mission, and derive specific objectives out of this.
- Identify on all levels those in charge of watching over teaching-research interaction, including a member of the institution's governing body (for example, the Vice-Chancellor competent in quality matters).
- Clarify where the responsibility for teaching lies.
- A teaching assignment agreement: each teacher must be able to choose a non-uniform assignment between teaching, research and management, although it must be ensured that there is a balance in this assignment that can change throughout one's professional career.
- Dedicate part of sabbatical periods evaluating the implications of teaching.
- If the university has a line of funding for research, everything that produces feedback with teaching should be given incentive and prioritised.

- Define systems to give incentive and to motivate academic staff to carry out teaching-aligned research.

Centre level

- Ensure that there is a balance between research and teaching.
- The figure of the teaching co-ordinator who ensures that course programmes get renewed through the incorporation of new advances is necessary.
- Co-ordinate study programmes with all of the academic staff that participate in a particular degree course.
- Use the budget for annual strategic objectives to promote and provide incentives for the relation between research and teaching.
- In cases where departments carry out research in very specific fields and it is therefore difficult for them to transmit a broad overall view of the discipline, have staff specialised in other fields to complete this overall view as an aid to teaching.
- Periodically review the curriculum to co-ordinate the different courses and activities included in a degree course (programme auditing).
- Promote an external evaluative and comparative study of the research carried out in recent years to help orientate future research: define subject areas, assess prioritised subject areas, etc.
- Stimulate interaction between departments and centres so that the faculties know what type of research is being done.
- Establish a research culture and make it visible to the students.
- Disseminate research carried out in the departments connected with the degree course: student guide, colloquia for first-year students, coverage in general reading periodicals, etc.
- Organise and establish mechanisms so that staff can participate in activities to popularise research, and at the same time promote teaching (participation in congresses, seminars, lectures, etc.).
- Develop mechanisms for establishing links between students and academic staff involved in research: seminars, colloquia and lectures on teaching-applied research.

b. Good practices in accordance with key processes

A series of types of action that involve different levels of scope and change and that are applicable to any disciplinary field is described below. These range from isolated to faculty-level actions (incorporating elective credits linked to a research project) to actions involving study programme design according to a research-based teaching model.

- **Actions for first-year students:** The first year at university should offer stimuli for cognitive development and a solid basis for inquiry-based learning and communicating information and ideas. One possible activity in this context consists of organising interdisciplinary seminars given by research staff, where an integrated view of courses is offered and the curiosity of the students stimulated by showing them the richness, diversity and scope of what remains to be explored.
- **Tutoring of secondary education research projects by university academic staff:** Establish contacts between the academic staff of the university and that of secondary education institutes in relation to developing research projects at secondary schools.
- **Programme of research projects for undergraduate students:** Help students to either carry out their own research projects or to join research projects being carried out by staff. Students can benefit economically from this or receive credit recognition. Different kinds of organisation are possible:
 - a) Collaboration with research carried out in the departments: this provides contact with the way that the research team works and involves the inexperienced student in tasks that are more or less peripheral, depending on the disciplinary field. This is in fact learning in specific methods and techniques.
 - b) Offer *ad hoc* research projects as extraordinary curriculum, which enables students to become involved, especially in their last year, in the process from when it is created through to completion (for example, by offering elective credits).
 - c) In some cases, there is a project whereby inexperienced students are connected with more experienced ones (mentor project).
- **Visits to local and regional research institutions:** The objective is for the student to carry out basic research techniques based on projects that are currently under way. This is beneficial to both students, who are exposed to a range of possibilities from different disciplines, and staff, who remain in contact with research subjects of local and/or regional implication and issues that are current. Evaluation can be carried out on the basis of a problem taken from a newspaper that includes thoughts on the research, abstracts of reading material associated with the subject, etc.
- **Teaching of skills to learn to read research articles:** The objective being for the student to make a critical analysis of the literature on a research subject. Activities range from making a summary to commenting on graphs and tables with a view to understanding the methodological approaches used, etc. Selected articles should give a broad overview of the research carried out in a particular area.

- **Problem-based learning:** This enables undergraduate students to develop an approach to research-based learning, giving them the necessary cognitive competences to deal with a wide range of problems. Teaching processes focus on developing abilities to innovate, work independently, establish and solve problems, handle large quantities of information, etc.

There are different degrees of implication in designing problem-based activities:

- a) Design of a problem-based course.
- b) Problem-based learning designed jointly by a group of teachers of different courses.
- c) Design of a study programme, the core of which is problem-based learning.

- **Publishing of scientific journals written by the students:** This initiative consists of articles written by the student during the academic year that are published, generally on-line, and is implemented in universities where there is a tradition of problem-based learning. The objective is to stimulate the student to write and to have work published. The writing of articles can form part of learning evaluation.

- **Research into teaching:** The staff of a disciplinary field are best prepared for optimising learning of the contents and competences in their discipline. The objective of this programme is to improve learning by undergraduate students by promoting the staff's research in learning within their particular field. The challenge is to employ evidence- and theory-based teaching. The issues raised by the academic staff on the learning process are those fomented by the research (for example, if group work improves individual learning, if one learns more in small groups, etc.).

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<http://www.unizg.hr/tempusprojects/predavanje.htm>

Other resource sources

<http://www.brookes.ac.uk/schools/planning/LTRC>, website of the Linking Teaching with Research and Consultancy project, which includes a guide for evaluating interaction, links to websites with explanations of good practices, information on all publications connected with the subject, etc.

<http://www10.gencat.net/dursi/ca/un/eees.htm>, website of the Catalan government with relevant information and documentation on the process of creating the European Higher Education Area.