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# An Integrative Approach to Curriculum Development Approach: European Master programme development in Advanced Water Treatment and Desalination Engineering

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## ABSTRACT

In this paper a collaborative experience towards the development of a new joint master degree is presented. The design of the curriculum has as main pillars: a) to provide an interdisciplinary view and approach to advanced water treatment solutions, and b) the development of the curriculum is done according to the new challenges for Higher Education in Europe, therefore providing references of good practices with this respect. The experience is worth to be shared as in an immediate future the expected collaboration among Higher Education Institutions in Europe is to increase if an integrated and high quality Higher Education Area is to be developed. To this aim the Water Reuse and Desalination Engineering (WaRDE) project is presented in this paper.

## Keywords

Curriculum development, Water Treatment engineering,

## 1. INTRODUCTION

There is by now (almost) no doubt that to establish joint collaborative experiences on curriculum design and the establishment of joint degrees in particular is one of the major challenges of the forecasted European Higher Education Area. In particular to work for a joint degree puts on the table existing differences both on academic conception of courses and on established procedures for administrative matters. In fact, *Feel Europe!!* This could be a possible synthetic way of expressing one

of the major characteristics asked for to the newly developed study programmes at European Level. Integration of parts of the curriculum to be offered by leading institutions (therefore taking advantage of acquired expertise) as well as offering the possibility of realising the different cultural experiences both from academic and social points of view.

To overcome these differences is not an easy task. It is the author's opinion that an actual barrier that avoids having a large number of experiences is the lack of knowledge on how to tackle such an interdisciplinary project or, even not knowing what are the problems that the consortium will need to face with.

This communication's aim is to present what the authors experienced as the road taken in order to establish an international joint degree. It is intended to be a guideline both for the kind of problems that arise on such projects and suggestions for strategies that will help to face them.

The road presented arises from an international experience in new Curriculum Development from the perspective of the new challenges for Higher Education in Europe, and with an interdisciplinary approach to content design [1]. One of the factors stressed in the communication is the need for collaborative work among academic and administrative staff. To run an international joint degree implies different procedures than the ones actually running on standard national degrees.

Different faces of the overall process are presented, highlighting the strategies to follow and the important points to take into account that may be possible source of problems:

a) Curriculum Structure: topics like the following ones, among others, should be taken into consideration: ECTS adopted as the central concept on the curriculum structure; Mobility designed as an integral part of the curriculum; Integration Actions to let the students know the corresponding local cultures; Teaching and Learning methods are programmed as a mixture of classical (frontal teaching) and modern (read e-learning and web based) methods.

b) Curriculum definition management: Adopted roles and procedures: (i) the use of tools for collaborative work is showed to play a central role in the sharing of information and in the development of coordination and communication aspects among partners, (ii) creation of Committees (steering, admission, quality) to tackle the different management aspects and assuring all partners are involved in the different tasks, etc

c) Academic, Administrative Procedures and legal aspects: with no doubt different legislations will go into conflict. People coming from academia are not generally aware of all the pinpoints concerning these issues. In addition to put together administrative staff from the different partner members, joint and collaborative work with administrative staff is a must in order to guarantee the success of the experience. The authors are a representative of this collaborative work.

On a broad sense, the idea is to expose on a clear way the implications of this kind of ventures trying to identify the cornerstones of the process in order to assure as much as possible the success of the experience. The sections that follow are organised in such a way that constitute a first step towards a *practical guide* of the different aspects to be considered. It is a fact that the actual lack of homogeneity among different national legislations and national degrees structure across Europe constitute a continuous source for difficulties and barriers that are to be solved. This situation constitutes an extra reason for a clear as possible guided road to the establishment of an international joint degree.

## 2. STARTING POINT: CREATION OF THE CONSORTIUM

The starting point for a project of this kind is the establishment of a consortium integrated by the partners that are to create and deliver the integrated study programme. By consortium it is meant a collaboration agreement that establishes the bases that will regulate the operation of the partner members towards the common goal of delivering a joint study programme. This agreement has to cover all the different aspects that are commented and detailed into the sections below:

- a) Organisational aspects of the consortium
- b) Curriculum Structure
- c) Joint Admission Procedure and Selection Criteria
- d) Academic Management

- e) Quality Assurance aspects
- f) Economic Management
- g) Student Services

This collaboration agreement puts together the government bodies of the partner universities towards the same objective and sits on the same table academic and administrative staff to collaborate on this. In fact this is one of the points experienced and it is the author's opinion that both parts have to collaborate. Some of the previous points could be identified as purely Administrative (*d* and *f*) or purely Academic (*b*). However, the rest contains some parts that make both parts to talk together (*a*, *c*, *e* and *h*). If this is done from the beginning, benefits from these interactions arise.

## 3. ORGANISATIONAL ASPECTS OF THE CONSORTIUM

The first step is to identify which partner plays the role of coordinating institution. The coordinating institution is recommended to host the consortium secretariat. That will be the reference contact point for any matter concerning the consortium. It will also be the central point for the management and hosting of the documentation related to the programme: as it will be seen below, admission documents, transcripts for students progress, etc

In addition each partner member should play an active role within the consortium and be in charge of a certain assignment. Identified set of tasks cover

- Programme coordination, prepare meetings and secure follow up, represent consortium towards external organisations, coordinate selection of students; set up and maintain programme website, coordinate selection of guest lecturers
- Coordination of quality assurance / continuous improvement of the course, setting up Advisory Board and preparing reports on Quality Assurance and student performance.
- Coordination of Curriculum content and delivery, including monitoring of balanced use of different teaching and learning methods
- Coordination of promotion and marketing, including creation of appropriate materials (leaflet, adds), participation in fairs etc

In addition, the creation of some committees that will be in charge of the relevant tasks is a way of assuring permanent and necessary communication among partners. Each one of the committees will have a leading partner that will be in charge of coordinating the corresponding task. Possible initial committees to be created are:

- Joint Management Committee: in order to have a view of the programme as a whole. The other committees will be reporting required information. Among the different tasks, this committee may be in charge of
  - o Academic affairs: programme management, curriculum amendments, selection of students and (potential) 3rd country lecturers.
  - o Administrative Matters: coordination of learning agreements, mobility, financial matters, issuing of degrees.

- Examination Board: where decisions about the award of the qualification and confirmation of the marks for each candidate
- Student Committee: comprising four members per cohort who shall be elected early in the first semester. A student representative will be invited to participate in the meetings of the Joint Management Committee.
- Quality Assurance Committee: in charge of the internal Quality Assurance actions, maintaining communication with external quality assurance agencies and external advisory Board.

In addition, the Joint Management Committee can create – if necessary – other boards in order to give coverage to some aspects that may arise. This list is not meant to be exhaustive but to provide an initial set of tasks that by sure will need to be covered. In addition a *trade-off* should be met between the number of committees and tasks. An excessive number of committees may imply too many different meetings and may difficult the information flow among them. A small number of committees easily facilitate major cohesion.

The management of all these committees has associated the use of supporting IT tools for cooperative work. These tools should play a key role both in the curriculum definition and conception phase as well as during implementation. With this respect tools along the lines of BSCW (Basic Tool for Cooperative Work) [4] are suggested to be used for central management of all the documentation related to the project. These tools provide a transparent management of the documentation as well as a centralized repository for documents (avoiding versions problem). In addition, all the meetings, schedules, tasks, etc can be organized with support from BSCW.

## 4. CURRICULUM STRUCTURE

The definition of the curriculum should be done from a holistic point of view. It is a usual practice just to put together modules offered at the partner universities in order to generate the global master offer. This usually provides a curriculum with no added value. One of the important points the consortium has to be able to highlight is the added value of the joint degree with respect to the individual courses offered at the partner universities: something that cannot be done by the partners on their own way.

The design of the curriculum is intended to be done on a top-down basis. Starting from the general goals that the consortium is committed to meet and melting down to de details of each one of the integrating modules.

There are some basic questions the consortium has to fix. Even sometimes they seem too basic and obvious it is important to agree on every point from the very beginning. They can be classified on the basis of the aforementioned top-down manner. General Questions at degree level:

- *Degree offered* (Joint degree, double degree): It should become clear from the very beginning if all partner institutions can award a joint degree (it may depend on local regulations and on each country legal framework)

or if double degree awarding is needed. All EHEA countries are supposed to adapt their legal frameworks according to the Bologna process standards prior 2010. To obtain a Joint Degree, a minimum of one semester mobility has to be done to another partner institution (host university/ies).

- *Diploma Supplement*: Will the Diploma supplement be used? If so the form and content should be agreed.
- *What will be the Language of instruction?* Use of local languages will introduce the need for deep knowledge of different languages on the students. It is therefore natural to ask for a common language for instruction even local languages are to be introduced in order to help the introduction of local culture settings and to help students integration.
- *What will be the mode of study?* (full time basis, distance learning based, ...)
- *What will be the duration of study?* 12 months, 24 months.

These questions can be identified as *operational* aspects. However, the consortium has also to be able to answer content related questions like:

- What is the added value of the programme with respect to existing studies?
- What are the learning outcomes/competences/skills?
- Professional Qualifications?

With respect to the course structure it is important to think on mobility aspects. What kind of curriculum is desired?

- Will the student be allowed to choose a path from the very beginning? This means the initial hosting institution may not be the same for all the students.
- Will there be the possibility of taking the same modules in more than one institution? This situation will introduce elements of choice based on geographical location more than on educational content. Therefore an unbalanced flow of students may be generated.

Advantage of the local expertise of the partners should be taken and the corresponding specialisations or elective options offered.

At module level, the description suggested from the ECTS User's guide [3] is to be employed. A common module description has to be adopted by all partners in order to facilitate both, coherent information to students as well as transfer of grading and student records information. An example of such detailed description is provided as an Annex.

### 4.1 Local Constraints

When defining the global structure of the study programme it should be beard in mind that local approvals will be needed from each partner institution (and, in some cases from the local governments). This raises the point that the final structure of the programme should accomplish with local constraints:

- Do all the partners understand and apply the ECTS under the same terms?
- What is the number of elective credits to be offered?
- Is it mandatory to assign a minimum number of credits to the Master Thesis?
- Should the programme assure methodological and/or local culture credits?

The existing local regulations at national level will establish if the awarded degree can be a joint degree or a double degree. For a joint degree it will be needed that all partners be in disposition to award a joint degree.

## 5. JOINT ADMISSION PROCEDURE AND SELECTION CRITERIA

Admission to the programme is one of the important points the consortium has to agree on. Possibly, each partner institution will have its own procedures and selection criteria. The possible conflicts have to be detected as early as possible. Therefore, each partner has to provide a detailed description of the procedures, required information and documentation the student has to provide as well as the minimum requirements; according to the corresponding national legislation; for a student to access to the degree. Therefore:

- Common standards for admission should be established: mandatory admission requirements. These standards have to accomplish with all institutions requirements. Required documents have to be legalised by at least one of the participating institutions embassies, and the rest should recognise them. It is also advisable that all institutions accept documents officially translated in English or any other agreed language. All these recognitions will make easier the legal procedures that non-EU students will have to follow.
- Common application procedure should be agreed and put in place by the coordinating institution as the consortium secretariat has to be the contact and entering point to the study programme. Note this means that just one application form will be available and that this application form may not be that of any partner institution.
- Joint student selection procedure should be organised by the coordinating institution. The criteria on the basis the applicants will be ranked should be clear and agreed. This will allow to create an applicant scale on the basis of; for example; Accepted / Waiting List / Accept to Waiting List / Cannot Accept

During the entire admission process, staff from the consortium secretariat should be in touch with the candidate and inform him/her on actions to be taken, missing / incomplete documents etc. In addition, dates and timing for application have to be announced. Once the Admission Committee has reached its decision, it is recommended that successful candidates are put in touch with local accommodation offices so that suitable accommodation can be arranged in a timely manner.

Special attention should be put into the troubles some third country students may have in getting the corresponding visas in

order to enter to the partner institutions countries. For example, the visa may only be for 6 months. In addition the student may be required to be in their home country to get the visa. This is not a problem for the first country he/she is to visit. However if the mobility requires the visit to another country this may imply an extra travel. Therefore to be taken in to account in order to minimize foreign student travel.

In case the master is going to deliver a double/multiple degree, every institution will need a certified copy of all admission and registration documents, having to update the academic transcript of all those students that are going to receive the degree issued by their institution (those spending at least one semester).

## 6. ACADEMIC MANAGEMENT

Academic management will be one of the major tasks coordinated by the consortium secretariat and will encompass a sequence of tasks that will follow the life of the student within the programme from its very beginning.

The Consortium's Secretariat will keep the full student record in order to monitor progress, to help the preparation of the Diploma Supplement and other actions requiring the full students' record. On the other hand, host institutions will provide the Secretariat with the corresponding semester qualifications, so that it can update students' academic files. This way the consortium secretariat will be in charge of providing the agreed degree and Diploma Supplement.

As the Consortium's Secretariat is to centralise the student's records, at the end of each semester the marks of each student should be communicated to the Secretariat. For this matter, the definition of the Examination Boards facilitates a communication framework among local institutions and Secretariat. The local Examination Boards will be the local committee that gives validity to the marks obtained by the students during the semester and officially communicates (by using a common agreed form) the results to the Secretariat.

## 7. QUALITY ASSURANCE ASPECTS

Actions for Quality assurance should be planned carefully. Different levels of actuation may be noted. First of all, at local level, procedures in place across the different institutions are to be present and should be discussed. Each of the partners should have institutional quality processes endorsed through the appropriate national body that will be responsible for the quality of the student learning experience and the academic standard of its own modules.

To assure quality of content and structure and to evaluate what has been done so far, it is proposed to establish an external Advisory Board, having a view on the programme from outside. Senior academic staff not involved in the programme but familiar with the scientific field and one or two persons from industry / business / professional associations in one or several of the

participating countries shall comment on the programme from an independent perspective.

Objectives of the Board could be:

- Is the programme feasible? Where can procedures be enhanced?
- How European / international is the set up?
- What are the added values for the students?
- How well is mobility organised?
- Can the presentation of the curriculum be improved (mandatory/electives, explanation of formats ...)?

The adoption of the ECTS framework also constitutes a valuable tool that helps in assuring quality standards. The ECTS learning agreement and transcript of records should be used for recognition of the parts of the programme done at a partner university. The final transcript of records will bear the ECTS Credits for each course unit plus the ECTS Grades as defined in the ECTS Users Guide, necessary for students later switching to new learning contexts (e.g. a doctorate). Therefore providing a complete and standard description of the student progress

## 8. ECONOMIC MANAGEMENT

As the access point to the programme, the consortium secretariat is the appropriate body to be in charge of the economic management of the consortium. This way the consortium secretariat will receive the agreed fees from the students and distribute them to the partner institutions according to the local costs per enrolled student.

When calculating the registration and administration fees, the consortium has to be sure that the amount will cover official fees at each institution. It is a must that all European students pay the same fee. Third country students' fees may differ.

Different national/local rules concerning fees should be solved at consortium level. This way it is preferable that the student.

In order to avoid problems, it is advisory to establish, on a yearly basis:

- What are the fees to be transferred from the secretariat to the partner universities (by student per semester) depending on the amount of ECTS credits.
- Is there any fixed amount devoted to cover administration costs?
- Regular meetings of the different meetings are also to be covered. They need to be included into the cost provision.
- Publicity and web hosting
- Language courses

An interesting option that has also to be considered is the provision of study grants directly from the consortium. If there is the possibility of having sponsors from industry the consortium may consider the possibility of granting some students per year.

## 9. STUDENT SERVICES

It is important to provide the students with a minimum level of services that guarantee a smooth integration into the local social life as well as facilitate enrolment and development of the lecturing and study activities while the stay in one of the institutions.

The members of the consortium should engage themselves in helping students with incoming procedures such as finding housing and ensure that students will have access to language courses, libraries and canteens as well as to the services of the respective International Offices.

Before any mobility, consortium institutions have to provide legal advice to students, regarding visa requirements to destiny country: how long in advance they have to ask for the visa, required documents, etc. Every European country has its own legislation and requirements, and students needs at least a 6 months stay permit.

In addition it is encouraged to provide a personal faculty advisor, chosen from the teaching staff, which will be assigned to each student. The advisor will help the student for particular needs in the curriculum and in the everyday life. In addition, non academic counselling will be provided by trained counsellors from the student support services

## 10. TRANSVERSAL AND GOOD PRACTICE CONSIDERATIONS

The elaboration of joint ventures provides a framework for the application of intercultural integration. Therefore, it is desired for the partners to promote the creation of integrated language programmes and cultural integration. This way the students will undertake other activities for improving their language skills and their knowledge of culture of the host country. Typically these classes will include the written and spoken language and/or the culture and civilization of the host country.

A practical way of helping foreign students integration is to provide them with a manual with information on each university / surrounding, structures, procedures, assistance, language tuition, etc

It is also advisable to have a Master website where all this information can be facilitated.

The implemented procedures should guarantee equal opportunities and rights between male and female. Likewise, it is important to assure easy accessibility to any disabled scholars and students.

## 11. CONCLUSIONS

In this communication a rough description of the aspects concerned when addressing the conception and design of an

international joint degree has been presented. The sections have been structures in order to classify the main points to be addressed and questions to be tackled. The description is by no means far from complete but can be taken as a global picture, therefore a starting point.

## 12. ACKNOWLEDGMENTS

The authors would like to acknowledge the European Commission, Education, Audiovisual & Culture Executive agency for his support to this project under the Socrates Curriculum Development programme.

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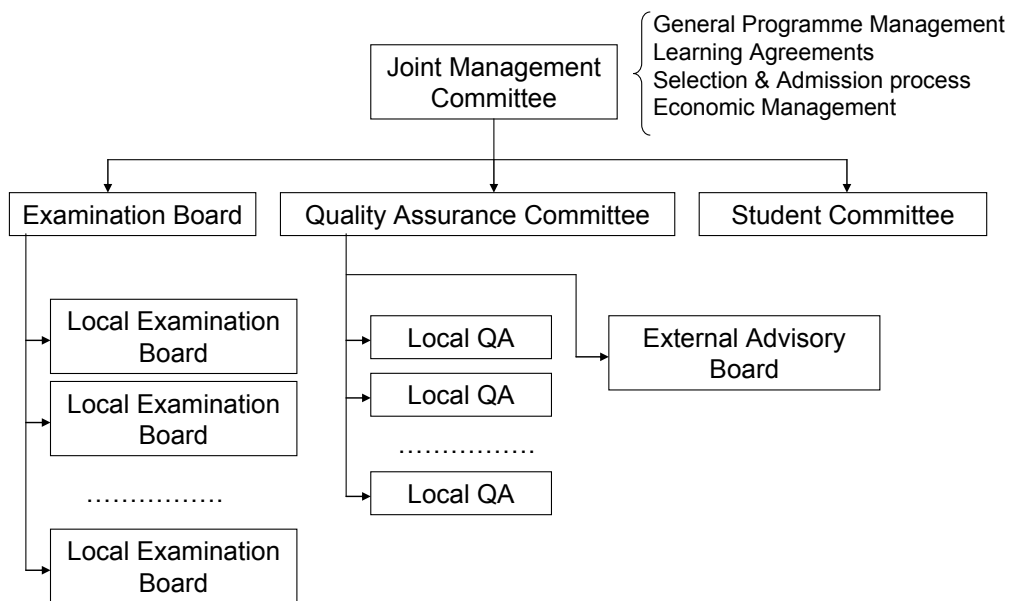


Figure 1: Consortium structure. Committees and tasks