LEARNING MODEL AND COMPETENCES CERTIFICATION IN THE PROJECT MANAGEMENT SCOPE: AN EMPIRICAL APPLICATION IN A SUSTAINABLE DEVELOPMENT CONTEXT

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Abstract

The article proposes a collaborative model, the result of an interdisciplinary study, which aims to promote a change in the methodology of learning professional competences in the field of project management and its subsequent certification. The model seeks to integrate a solid base of scientific, expert and experienced knowledge, supplemented with five essential components: the international context, the teaching faculty, educational programmes, professional competences and employability, and the certification of individuals. The application into a graduate program demonstrates the advantages of integrating processes of learning and certification of competences in the international field

1. Introduction

The design of the model of learning and certification of competences in project management for sustainable development integrates two complementary bases of knowledge: a) scientific knowledge and b) expert and experienced knowledge.

This cooperative learning model is a result of an interdisciplinary study, designed to promote a methodological shift from learning and competency assessment in college. It relies on a learning strategy that amalgamates the five methods of teaching and learning (ABC, AOP, PBL, AC and CBL).

The model consists of five components: 1) The international context, referring to the legislation of higher education and the international standards for certification of professional competences, 2) The teaching staff, faculty, researchers and managers, 3) The employability and professional competences, 4) The educational programmes and graduate education strategy, 5) Means of cerification for people.

The objective of this research is to scientifically support and contrast the designs of models for learning the the certaifcation of competences for development project management.

2. Scientific Bases of the Model

The model integrates two complementary bases of information. Within one part is a secondary base, consisting of studies, articles, scientific literature and international experiences in relation to models of professional competences, certification models and learning strategies. Within the other part is a primary information base, consisting of empirical knowledge based on experience and perception of the protagonists involved in the models of competence certification.

2.1. Scientific knowledge

Composed by: different theories on the generation of and approaches to competences; the body of knowledge of project development and the different characteristics of sustainable development projects; the concepts and theories within it domain of learning; the methodologies and tools for models of teaching and certification of competences in project management.
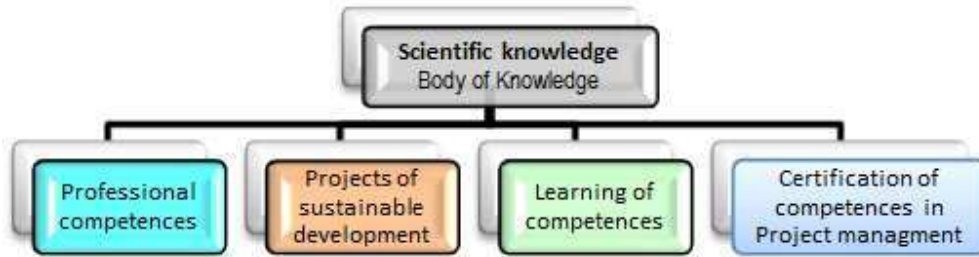

Figure 1. Knowledge field integrated by the model

2.1.1. Professional competences

For the model of learning and certification of competences in project management we have chosen the competency model based on a holistic approach as developed by Cheetham and Chivers [6]. This approach has been selected as it brings together the work performed and the individual's own attributes that allow a successful performance. The model notes that a complex mixture of knowledge, skills, attitudes and values come into play, and depending on the needs of a particular context, particular attributes for intelligent performance are implicated as well. Thus, it enables the integration of ethics and values as part of the elements of competent performance and the need for reflective practice.

2.1.2. Projects of sustainable development

This refers to the study of sustainable development through the holding of global summits, conferences and statements, which are characterized approaches and variables that over time have been involved in shaping the concept. It also addresses other development concepts that complement and add significant elements: economic development [8], social development [12], cultural development [1], local development [4] and rural development [5]. It stresses the human dimension [15] [14], people being the central element as they are the recipients of the fruits of development, and thus being the means and the end to sustainable development.

2.1.3. Learning of competences

The choice of methodology was based on the promotion of intellectual development, acquisition of skills in critical thinking, problem solving, communication, research, independent learning and teamwork. The five methods: the ABC methodology described mainly by Villa & Poblete [16], AOP by De Miguel [7], PBL by Prince [13], AC by Johnson & Johnson [11] and CBL by Boehrer & Linsky [3], are all capable of making students active participants in the processes of teaching and

learning. Therefore, it is not a matter of choosing one methodology but rather using all of them for form a teaching strategy.

2.1.4. Certification of competences in Project management

The comparison of certification systems in project management as well as consistency with the purpose of this work makes IPMA [9] the most complete and appropriate competences certification system for the model of certification of competences in project management.

2.2. Expert and experienced knowledge

Based on the experience and perception of the different actors involved in the model of learning and certification: international field training managers, academic and researchers of educational innovation groups, professionals from certifying organisms, agents of training, graduate students, managers of the public and administrative field, etc.

3. Components of the model

The graphical representation of the model is based on the holistic model proposed and revised by Cheetham & Chivers [6]. The following describes the components:

3.1. International context

The model is part of the current field of higher education, which is in the process of adapting universities to meet the standards of the European Higher Education Area and European Research Area. These areas are organized according to certain principles (quality, mobility, diversity, competitiveness) and orientated towards the attainment of two principal strategic objectives: a) increasing employability in the European Union and b) the conversion of the European System of Higher Education into a pole of attraction for students and teachers from other parts of the world.

In this context we must also consider the international standards related to the direction of sustainable development projects and models of learning and competences certification such as ISO 21500 "International standards for project management, international standards of the International Project Management Association [8] that develop the methodological foundations of personal competences for project management.

Thus the characteristics required by the international context for the direction of sustainable development projects by professionals include: meeting peoples' needs, professionalism, respect, awareness and ethics, environmental sustainability, decision-making in wide and participatory processes, appropriate management of scarce resources, etc.

3.2. Teaching staff:

Teachers play an important role in the formulation of this model, which is composed of teachers, researchers and managers of international training programmes. The teaching staff seeks to implement the model to lead to a cooperative and coordinated methodological change, oriented to the field of international competency models. When implanting the new methodologies the teaching faculty should raise and respond to questions such as: What to learn? How to learn? Who do you teach? When do you teach? How do you teach? What, how and when do you evaluate students? [2].

Therefore the model of learning and competences certification is basically a cooperative model that considers:

- The definition of shared objectives, within which ethics and values are considered.
- The development of standards and concepts to establish the learning process and evaluation of competences.
- The design of a model of competences to be included in the curriculum.
- The implementation of the model and the worth of the exchange of experiences. .

Also, the teacher should choose the methods to be used and apply them to their respective strategies of teaching and learning. Possible methods to develop are specified in Table n° 01.

Table n°01 – Teaching-learning methods

Method	Aim
Presentations / Lectures	To transfer knowledge and enable cognitive processes in the student.
Case Studies	Acquisition of learning by analyzing real cases
Solving exercises and problems	Exercising, testing and using prior knowledge.
Problem-based learning	Developing active learning through problem solving
Project-oriented learning	Carrying out a project to solve a problem, by applying skills and acquired knowledge.
Cooperative learning	Developing active and meaningful learning cooperatively.
Contracts of learning	Developing independent learning

The teaching staff must have specific objectives: to support the comprehensive education of students through the acquisition of professional competences, to incorporate ethics and values, and to facilitate international accreditation of students in project management competences for sustainable development. Furthermore, to develop lines of research applications related to sustainable development projects that complement the work and training from the teacher, and broaden the scope of graduate studies, thus seeking the transfer of knowledge from research to the education of students.

3.3. Educational programmes and education strategy:

When designing the educational program, we should consider international standards, the potential challenges, educational innovation based on the development of competences, aptitudes, learning objectives, planning of activities, the implementation and teaching-learning methodologies that lead to achievement of varied objectives.

It is necessary to consider the integration of teaching with ongoing research by the teacher in order to provide students with work and research procedures similar to what has led the scientific development of the subject. This will explain the links between what is taught with how we teach it, thus providing models of learning that highlight how to learn the material and what we can do with what we have learned. It is also important to establish evaluation systems that allow reprocessing and reflection of ideas. It is necessary to adopt these new life-long learning approaches, which will allow universities to initiate changes in methodology that include approaches oriented to the evaluation of competences.

The educational program therefore should seek to develop links to vocational training with professional certification and competences evaluation. Consequently it should be aimed towards the development a gradual process of acquiring knowledge, values, and skills that the student will be able to use early in his professional experience by connecting the skills acquired in the field of project management. Further it should be aimed at achieving the integration of teaching and research according to the certification levels proposed in the IPMA model, in order to achieve a gradual formation and growth (See Figure 2)
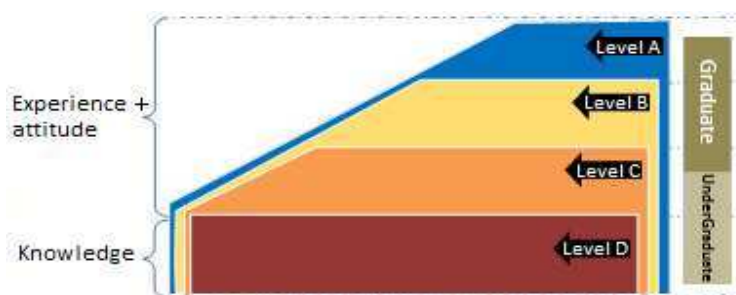

Figure 2. Graduate-UnderGraduate Education Strategy

Conversely, the educational program should propose to integrate competences into the curriculum, the interaction creates the possibility of recognition of the program by a certifying organization. In order to integrate competences into a program we must consider the following: objectives shared by the teaching staff, common standards that indicate the processes of teaching and learning, development of joint activities, common experiences in sustainable development projects, the definition of competences in sustainable development projects, establishment of

measures to implement the graduate program and adoption of uniform methodologies and means of evaluation by teachers.

3.4. Professional competences and employability:

The competences include a wide range of knowledge, procedures and attitudes combined, coordinated and integrated that the individual is responsible to knowing for professional practice. It also incorporates the ethics, values and practice into this domain, which allow the individual to act effectively in professional situations.

Professional skills that people count on are cited in the IPMA model grouped into three areas: TECHNICAL, BEHAVIORAL AND CONTEXTUAL, and are consistent with the holistic model. So it's the characteristics of the individual and their knowledge, skills, abilities, attitudes and values that can affect a competent performance, depending on the context. The aforementioned list clearly indicates the requirements demanded by sustainable development projects in order to have a strong relationship with these communities and for environmental conservation.

An important aspect to consider is that employability is achieved through the development of skills and competencies that are considered basic or transversal competences (instrumental, interpersonal and systemic) and the specific competences required (specific to each profession). These exist for the purpose of creating individuals who are aware of scientific and technical knowledge, as well as their ability to apply them to different contexts and to integrate them with their own attitudes and values. It is therefore not just about improving the professional preparation of students for a specific position, but providing a stronger foundation that is more consistent with what should be a good university education should teach students regarding how to live and to be. This requires the development of competences that go beyond mere knowledge, and emphasizes integration between the content of what students learn with the integration into the mindset of each student, making the learning more meaningful and lasting. (Villa & Poblete, 2007).

Therefore the requirements of sustainable development project managers show professionals that they must focus their attention and training on development of competences, which are the key elements to the new educational models.

3.5. Certification bodies of persons:

The certification of the individual aims to ensure that the professional meets the certification requirements set forth by the governing organization. This model incorporates the International Project Management Association (IPMA) as the international certification model in project management, which creates a specific process to recognize the knowledge, skills and techniques of the professional domain, regardless of how these skills were acquired.

International certification models help enrich competences evaluation systems of the universities and build bridges between the development of competences and certification of people.

4. Empiric Application

Below, the application of the model at European level is shown. The example is from the shift in methodology at the Polytechnic University of Madrid (UPM) in the European Higher Education Area (EHEA), where various factors determine the appropriateness regarding the definition of new educational models based on competences. The application of this model is used in the Erasmus Mundus Masters MIDRL, Local Rural Development Project Management Agris Mundus, the pioneer master's program in the European Union and throughout the world for project management for sustainable rural development.

The components of the model are as follows:

- International Context: Erasmus Mundus, the European Space of Higher Education, International Standards of competences IPMA.
- Teaching staff: teachers from 6 universities in the EU, 8 from universities in third-world countries. The teaching staff of the PSU is certified by the IPMA model meeting REP requirements and for a greater understanding of the model.
- Educational Program: MIDRL- Agris Mundus Erasmus Mundus and recorded by AEIPRO as REP of IPMA.
- Professional competences: Elements of competence for the management of rural development projects according to the IPMA model.
- Certification organisms of people: Spanish Association of Engineering Projects (AEIPRO).

In the Figure 3 we can see the relationships between the components of the model com, and highlight the link in the evaluation of competences (training) with the certification of professional competences that is facilitated by the preparation of graduates for the certification of professional competence (IPMA) and thus generates an enrichment of competences in each person (technical, contextual and behavioral) that can by measured in relation to sustainable development projects.

5. Results.

5.1. Results in the International Context

Consolidation of an international network with the participation of UPM, five universities of the European Union: Agropolis CNEAR Montpellier (France), Wageningen University and Research Center (Netherlands), The Royal Veterinary and Agricultural University KVL (Denmark), University of Cork (Ireland), University of Catania (Italy) all of which belong to the International Association NATURA "Network of European Agricultural" which is an organization related to rural development and was created in October 1988 in Louvain-Belgium. Also seen is the participation of eight universities of foreign countries (Africa, Asia and Latin America), which create Agrismundus Alliance: Sustainable Development. This network has resulted in the consolidation and application of the same teaching structure, a new Erasmus Mundus and doctoral program Erasmus Mundus AgTrain in 2010.
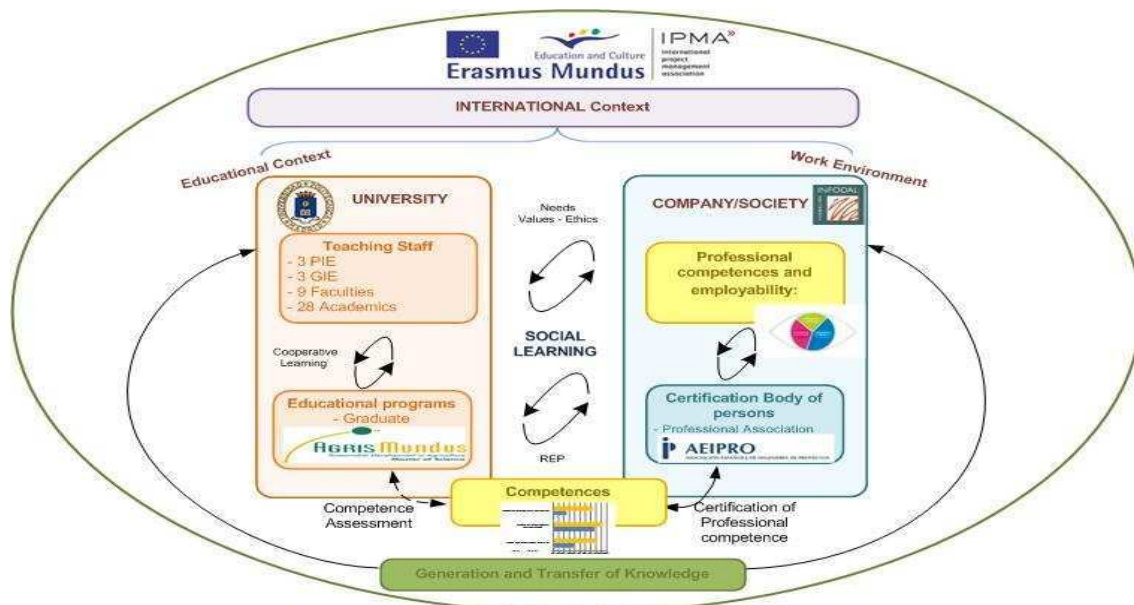

Figure 3. Application of the model

As per the results of the model and the formation of the thematic network in project management, it can be seen that **IPMA model promotes international relations** with Latin America, and is achieving success in the sub-projects in Peru (APDP) and Mexico (AMIP). Further it continues to work with other projects in Latin American countries in 2011, such as Costa Rica (ADIPRO), Chile (CCDP), Panama (APGP), Guatemala (APMG) and is in the process of negotiations with Ecuador, Colombia, Uruguay and Bolivia.

5.2. Results in the teaching faculty

A relationship between the Educational Innovation Group (GIE-PROJECT) with other groups was encouraged, as the model was developed jointly in a project of educational innovation (PIE) and coordinated with the participation of the GIE-PROJECT, which is composed of different groups for educational innovation UPM: GIE-GICAC, Edu-Tecna, and eight teams of teachers from eight schools and colleges in the UPM and 22 professors.

The linking of the Research Group in Planning and Sustainable Management of Rural-Local Development (GESPLAN) and the GIE-PROJECT allows the integration of teaching and applied research for the development of a complete strategy of graduate and postgraduate education. It encourages learning based problems and competencies in project management and methodological approaches. It shifted from supporting individual work methodologies of teachers to supporting more complex structures.

A thematic Network in project management was launched, in coordination with the GESPLAN-UPM, the University of Piura (Peru) and the Graduate School of Mexico (COLPOS). The role of this network was to define a modular training structure flexible enough to train students in diverse disciplines with a basic professional expertise in the field of development projects.

5.3. Results in the educational programmes

Registration of the International Masters in Rural Development-Local-Agris Mundus (MIDRL-AM) is achieved as Registered Education Programme IPMA (REP). With this REP program the first 46 elements of IPMA competence in the field of rural development projects management are integrated worldwide, incorporating the three dimensions of competence in the various modules of the MIDRL program.

Another result of the model that consolidated equipment and the network of institutions in the international context is the **Erasmus Mundus AgTrain doctoral programme**. This project seeks to integrate the educational strategy at the Graduate and Doctoral levels (Master and Doctorate) for the gradual formation of the student. The program seeks to integrate a strategy (see Figure 4), which has an initial training period (undergraduate level) in various subjects, and integrates with the official Master Erasmus Mundus graduate level.
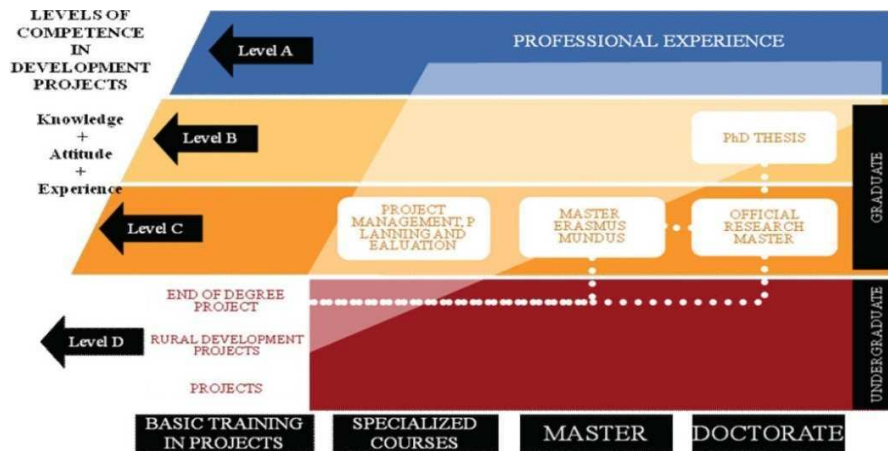
Figure 4: Educational strategy in relation to Project Management competences

5.4. Results in competences and employability

The results of the gain of competences are measured through creation of a system of continuous evaluation of the student throughout the entire process, and the development of competences for project management as perceived by students through a survey of self-evaluation. Employability outcomes are measured by current management positions in the projects and programs of the students, which are primarily in non-government organizations and institutes of higher education. The results show that the best level of employability is in Spain, and the professionals believe that the IPMA certification has had positive effects on their own employability and on their work environment.

5.5. Results in the certification organisms

Relationships between IPMA and the UPM model for the certification of students are encouraged through Project Management Classroom "Puesta a punto", which aims to offer comprehensive training of students as future project managers in the international context. In the UPM model, steps for certification of students in the IPMA model are set: *""Puesta a punto", UPM Graduate Seminar and Certification IPMA-AEIPRO.*

Conclusions

The model for learning and certification of competences requires a strategy composed of active teaching and learning methods (ABC, AOP, PBL, AC, CBL) in order to promote intellectual development, the acquisition of skills in critical thinking, problem solving, communication, research, self-directed learning, and teamwork, with a strong student-teacher relationship.

The analysis and reflection on the application of the model allows us to extract some features that made the application of the model possible:

a. It is the framework of the EHEA and based off the standards of the International Project Management Association (IPMA), which introduced a methodological change in the UPM.

b. The model is applied in graduate courses, with students of master's programs (MIDRL). The design and implementation consisted of applying the standards of the NCB, incorporating the approach to Project Based Learning (PBL), and focusing on the technical, contextual and behavioral competences, all for the Project Management of Sustainable Development.

c. A stable interdisciplinary group was created – with teachers who were certified in IPMA, allowing the use of a common language – and thus facilitated collaboration between UPM Schools, and opened new possibilities for communication, educational innovation, and cooperation.

d. Training and certification of competences were linked, which facilitated the preparation of Graduates of the UPM for Certification of Professional Competences (IPMA). Actions were taken in the UPM certification according to the IPMA 4LC model.

e. Students attested to an improvement in their own technical, behavioral and especially contextual skills.

The proposed cooperative learning model seeks to develop a strategy that combines project-based learning and competences-based learning for the certification of competences as related to the field of project management.

The international context demands project management programs in sustainable development, and professionals must meet the needs of the population. Professionalism, respect, awareness and ethics, environmental sustainability, decision-making in extensive and participatory processes, proper management of scarce resources, and so on are integral.

The teaching faculty will seek to implement the model, thus leading to a cooperative and coordinated methodological change, which will be oriented to the field of international competency models.

The competences involve a wide range of knowledge, procedures and attitudes that are combined, coordinated and integrated that individual must know in order to be a professional. It also incorporates the ethics, values and practice as elements in the domain, which will permit the individual to act effectively in professional situations.

The educational program should seek to link vocational training with professional certification and evaluation of competences; and the certification of people means ensuring that the professional meets the certification requirements by governing organization.

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