

ANALYSIS OF THE ABILITIES DEVELOPED BY A PRACTICAL PLACEMENT IN BUILDING ENGINEERING AT UNIVERSITAT JAUME I

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ABSTRACT

Society expects that the knowledge gained during university studies is applicable to professional practice. For this to happen, a greater application of the theoretical knowledge on real production sectors is required in the studies.

Spanish regulations include a list of competences for professional study programmes, like Building Engineering [6]. This has led Universitat Jaume I in Castellón (Spain) to plan specific activities for students in the 2nd year of the Building Engineering degree. The intention of these practical activities is to integrate subjects into professional competences by following the academic methodology of project-based learning.

Firstly, all the future professional competences specified in the new regulations need to be adhered to. Teachers have then to propose their subject activities in accordance with these competences. For this research, it would be interesting to know whether these activities are related to the proposed competences. A questionnaire analysing the relationship between competences and activities has been carried out for students to evaluate these activities and to define whether the project activities they have previously done coincide with their professional needs.

In conclusion, we could say that all the activities in the project dealt with in the subjects of the 2nd study year are related to basic or specific competences, and that the activities which students valued the most are those related to transversal knowledge.

Keywords: Reflective learning, learning benefits, learning abilities, competences.

1 INTRODUCTION

Society expects that the knowledge gained during university studies is applicable to professional practice. For this to happen, a greater application of the theoretical knowledge on real production sectors is required in the studies.

Future study programmes in the Higher Education System should be designed to provide students with the abilities and competences that lead to professional activities.

As a professional, the building engineer needs personal abilities and technical capabilities to develop coordinated projects on time according to economic and technical planning. Thus, more reflective learning [1] is required by students. This is why the design of the new study programme for the Building Engineering degree at Universitat Jaume I has set out to follow the objectives of these competences in accordance with the Bologna Process.

The next important step is to recognise and include higher education in any industry strategy to adapt study programmes to industry's needs. Then industry should support the development of the higher education interface and creative industries [2].

The following competences for new professional study programmes for Building Engineering was developed by Spanish regulations [6]:

1. Manage the building process in residential houses. This involves controlling the quality and bill of quantities of all building construction elements and services according to the project documents, and registering all changes in a final project definition.
2. Design safety studies for projects and safety plans on site. Coordinate companies in the interests of safety during the project definition and the construction process.
3. Develop technical activities related with all the project's phases: calculation, bill of quantities, value, viability studies, building inspections, levelling plans, etc.
4. Design and manage projects according to the legislation in force [7].
5. Manage building maintenance. Define life cycle studies of construction materials and elements. Site environmental management.
6. Technical assistance for production processes
7. Project management

The professional competences expected are:

Basic competences in:

1. Organisation concept, legislation, models, planning and control techniques, decision-making, production systems, cost analyses, financial sources and financial plans based on budgets.
2. Capability to organise medium-sized companies, to work on multidisciplinary group projects in large-sized companies.
3. Public administration legislation, contract process for public and private situations.

Specific competences in:

4. Knowing building materials, building elements, traditional building systems and prefabricated elements. Physical and mechanical properties.
5. Managing the correct selection of building materials according to building typology and use. Managing on-site quality control of the building materials and building processes. Understanding the test material results and the final testing building elements.
6. Identifying building elements and building systems, defining their function and their compatibility during the construction process. Designing and finding solutions to construction details.
7. Knowing the control procedures implemented during the construction processes.
8. Applying technical requirements.
9. Engineering calculation and control construction (services, structural elements).
10. Abilities to programme and organise building site processes, technical and human resources, and future maintenance.
11. Applying safety regulations on the site.
12. Implementing quality management on the site.
13. Knowledge of professional organisation (offices, contractors, developers, promoters, suppliers, etc.)
14. Ability to define building prices, budgets and cost control plans, etc.
15. Ability to develop building study markets.
16. Ability to analyse and inspect building defects.
17. Knowledge about urban plans.

18. Ability to design technical projects for demolition and decoration.
19. Ability to follow all the administrative procedures.
20. Ability to present and defend projects and technical solutions.

2 CASE STUDY

Universitat Jaume I in Castellón (Spain) is developing a new study programme for the Building Engineering degree with specific activities for 2nd year students. The intention of these practical activities is to integrate specific subjects into professional competences by following the project-based learning methodology.

This project involves the degree course director as coordinator, lecturers of some of the disciplines and an external agent, this being the Developers and Contractors Association of Castellón (DCAC). University staff design and control the project development, and the DCAC provides company contacts. Members of the DCAC are interested in having students attend their building sites; this interest is based on the possibility of obtaining future students for practical placements.

The University believes that part of the working abilities and professional competences can be developed in the studies [5]. Then this research can identify the best activities to achieve this aim.

The University, Students and Developer and Contractor Companies project is based on the study of a real building project, where groups of students will analyse the documents of a real building project. They will have the opportunity to visit the same project under construction. Then the teachers of the different subjects will decide which requirements and procedures the students should follow, and will define the reality of the building execution processes.

This project corresponds to the academic year 2006-2007. The first stages were to design how to coordinate all the activities and the parties involved. The objective of this second year is to analyse objectively the abilities acquired by students through this programme [5].

The methodology to follow was: firstly identify all the future professional competences as specified in the new law [6]. In accordance with these competences, teachers should then propose their subject activities. Since the project has been underway since 2006, we specify the activities that students actually do according to these competences rather than according to the aims of the subjects. Another information resource is to identify the activities of all the student group projects through, for example, the "Student diary", and then only the most common activities or those that have achieved the expected aim are considered. These activities will help to analyse the abilities developed.

These project activities are analysed with a questionnaire. The first column of the questionnaire identifies all the competences required, while the second column identifies those activities that we think students have carried out in their projects. See the examples in Table 1 for basic competences. Therefore the aim of this questionnaire is to ask those students who have been involved during the first semester of the present academic year 2007-08 if they consider that these activities are really the ones that they have done or whether they have even proposed new activities which were not included in their students group. They have to evaluate all the activities with scores between 0 and 5; 0, activity not applied; 1, activity hardly applied; and 5, the activity that was most widely applied. If they did not apply, it is possible that those activities would be done in the second semester or maybe in the last year of the degree.

This will help draw conclusions about the practical activities which improve the development of professional competences; cooperation between the DCAC and their

site managers took place in the project-based learning of the Universitat Jaume I in the 2nd year of the Building Engineering degree.

Table 1 Example of the questionnaire for basic competences

COMPETENCES/ABILITIES	ACTIVITIES
Basic competences in:	
1. Organisation concept, legislation, models, planning and control techniques, Decision-making, productions systems, cost analyses, financial sources and financial plans based on budgets.	1. Plan their work 2. Read through the project legislation and compare with the update requirement. 3. Decide the correct solution through comparison. 4. Study the financial sources of the company (promoter).
2. Capability to organise medium-sized	5. Work with 3 more students in groups.
3. Public Administration Legislation, contract	6. Analyses of the different contracts within the building site.

3 CONCLUSIONS

By analysing the results of the questionnaire, we can come to the following conclusion: all the activities planned in the project, applied to the subjects of the 2nd study year, are related to basic or specific competences; if some of them are not related, it is because students are in the 2nd study year and they have still not completed the subjects from the third, final academic year.

See Figure 1 for the activities that students value the most, these being those related to transversal knowledge or basic competences: those that allow them to attend meetings, to present solutions, to work in groups, to make decisions, etc. These activities are difficult to do during normal practical activities in laboratories.

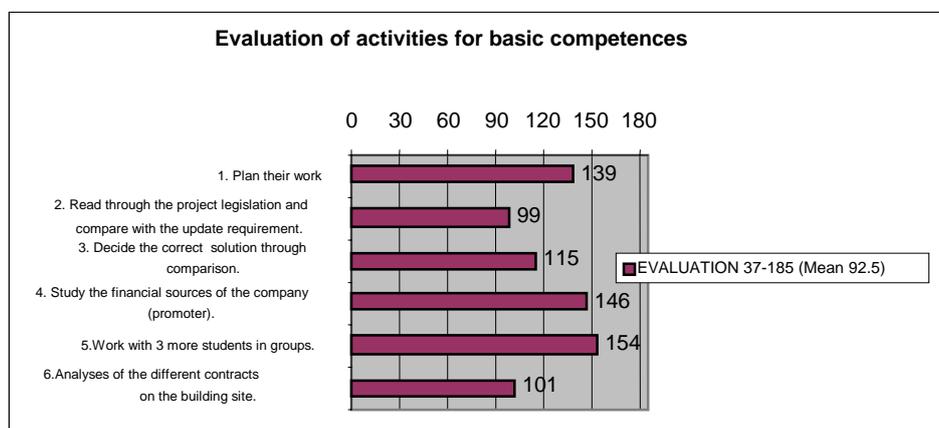


Figure 1 Students' analyses of activities for basic competences

The activities related to the specific competences are evaluated in Figure 2. We can see how those subjects with higher teaching requirements have received higher scores, and how students acknowledge that such activities have prepared them for professional activities.

If the results expected with this research were:

- How to relate project, activities, abilities, competences;
- How to improve students abilities; and
- How to inform students of the advantages of the project based on abilities and competences;

Then it could be concluded that:

This research has related professional competences with project activities for the 2nd study year of Building Engineering studies. Then can identify which activities are missing; for example, in *Figure 1*, competences 11, 12, 14, 17 and 18 do not have activities because the required context or subjects correspond to the following academic year.

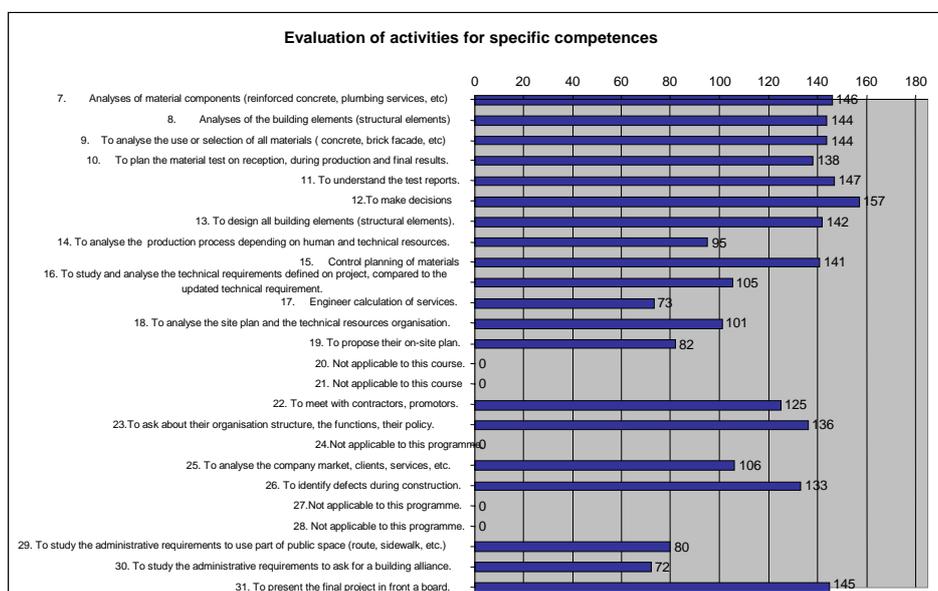


Figure 2 Student analyses of activities for specific competences

It can be observed that this questionnaire helps students evaluate whether the activities done within their studies were related to professional aims. This table can help to identify deficiencies, that is to say, what activities need to be maintained, changed or included to meet professional competences.

This is the way to inform students from the beginning, what they are to expect, what the project is for, etc. With this information, they can be motivated to do those activities because they are supposed to provide them professional ability.

To improve the students' basic abilities, additional free-choice subjects could be planned. Another proposal would be to implement a similar project-based learning scheme in the third year of the Building Engineering degree, since the scheme is currently applied in the first and second years, but not in the third academic year.

REFERENCES

- [1] Schön, D. *The Reflective Practitioner. How professionals think in action*, London Temple Smith. 1983
- [2] Wedgwood, M. *Higher Education and the Creative Industry Sector of the Northwest*, 2002
- [3] Aguiar, M.E. *Las competencias profesionales: algo más*, 2005
- [4] Cinterfor, OIT. *Las 40 preguntas más frecuentes sobre competencia laboral*, 2003
- [5] Gallego, T. *A project-based learning platform of cooperating between constructions Companies and the University*, 2007

- [6] ORDEN ECI/3855/2007, de 27 de diciembre, por la que se establecen los requisitos para la verificación de los títulos universitarios oficiales que habiliten para el ejercicio de la profesión de Arquitecto Técnico. Spain
- [7] Ley 38/1999, de 5 de noviembre, de Ordenación de la Edificación, Spain

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