

# PRE-SERVICE TEACHER EDUCATION AND COMPREHENSION OF DIDACTIC CONCEPTS. AN EXPERIENCE WITHIN THE MASTER OF SECONDARY EDUCATION TEACHERS

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## Abstract

*The main purpose of the research was to figure out which was the level of comprehension of the didactic concepts that the students of the Secondary Education Master of the University of Alicante of the academic year 2011/12 had. With this purpose, we have collected the information provided by the answers of 227 students to an ad-hoc-elaborated semi-structured questionnaire whose data have been treated with a quantitative methodology using the SPSS.19 device. The statistic techniques were descriptive, differential and correlational. In this analysis, we take into account the scores obtained by students in variables related to their learning process and their attitudes towards it. The most interesting results prove that the students don't master the basic didactic concepts in a satisfactory way, there are differences between the levels of comprehension and other variables related to the learning of the concepts and with attitudinal variables of this learning. The research based on these results indicates the need to focus the teaching and learning processes of the Master from a different point of view and combining the strategies which enhance the understanding of these concepts by the students.*

**Key words:** *concept comprehension, didactic training, pre-service teacher education, Secondary Education Master.*

## Introduction

In Spain, the results in the different assessments both at national and international level (Rocard et al. report, 2007; MEC, 2010; diagnose evaluation of the Autonomous Communities, Organic Law of Education 2006, etc.), query firmly the quality of Secondary Education. These observations added to the identity crisis of the teachers (Escudero, 2009) place the teacher of this stage in an instable situation, which is a clear consequence of the multiple demands made by the different sections of the school community (Bolívar, 2004, 2006). The educative crisis in Secondary Education was unleashed more than one decade ago, and it produced organisational and professional deficit (Alanís, 2003; Marchesi & Martín, 2002; Prats, 2002). Probably its hybrid profile (Viñao, 2001) and its complex and vast structure are the main factors which have influenced the social interrogation of its efficiency. The triple drama proposal suggested by Bolívar (2004) which was referred to the consequences of the educative legislation itself, explained clearly which were the causes of some of these problematic situations: i) the enactment of educative laws instead of state laws, ii) the existence of scholar laws separated from the social community and hardly educative, iii) technical and barely pragmatic administrative regulations which lack of sense as shown in different researches on this topic (Fullan, 2002; Tyack &

Cuban, 2000). As Darling-Hammond (2001) highlights, the situations in the educative centres is more influenced by the beliefs, resources and motivations of the closest environment than by large scale policies. For this, the teachers' motivation is the most reliable indicator of quality of each school and of the whole educative system (Darling-Hammond, 2000; Aguerrondo, 2004; Fullan, 2002; Cochran-Smith & Fries, 2005; Vaillant, 2005; Birgin, 2006; Moreno, 2006).

As a consequence, the role of the teachers in Secondary Education is paramount for the success of the educative system, and so is their initial training (Eurydice, 2009; OECD, 2005).

More than ten years ago, the European Council of Lisbon (2000) established the basis for the modernisation of the Secondary Education in Europe, insisting on the need to focus on the teacher training (Buchberger, Campos, Kallos & Sthepenson, 2000). This is highly important for Spain, where it has turned out to be a crucial challenge (Puelles, 2009) due to the poor quantity of content traditionally found in the teacher training programmes in the didactic, organisational and institutional aspects (Benso & Pereira, 2003).

The interest for the teacher training in Spain started with the General Law of Education of 1970. Together with the modernisation of the country and its joining the European Economic Community (1986), new formative needs emerged. The Law of General Regulation of the Educative System (LOGSE, 1990) and the Law of Quality of Education (LOCE, 2002) include proposals which won't be implemented until the Organic Law of Education (LOE, 2006) promotes a wider and deeper psycho-pedagogical formation of Secondary Education teachers by means of the professional-qualifying Master (60 ECTS credits).

The substitution of the former CAP (Pedagogical Aptitude Course) by the new Master of Formation of Secondary Teachers (MPES) offers a good opportunity to value a range of topics which are related to the teaching practice (Prosser, Martin, Trigwell, Ramsden & Lueckenhausen, 2005; Hernández and Maquilón, 2010; Porlán, Martín, Rivero, Harres, Azcárate & Pizzato, 2010).

The initial formation of teachers has motivated countless theoretical and empirical works which have formulated curricular and methodological approaches to improve their formation process (Darling-Hammond and Bransford, 2005; Korthagen, Loughrany & Rusell, 2006; Fuentes, García & Martínez, 2009).

The sketching of a new formation plan is not an easy task, especially if we bear in mind how complex the inherent teaching practice can be. However, the capacity to use learning strategies and diverse didactic resources is essential to develop the professional competencies which give an answer to the different challenges of the class reality (Escudero, 2009). Thus, the specialised literature has firmly supported the diversity of contents and learning that must be included in the initial formation of Secondary Education teachers (Darling-Hammond & Bransford, 2005; Darling-Hammond, 2006; Marcelo, 2005). Nevertheless, the quality of the programmes does not depend exclusively on the coherence of the design but also on the interest, the rigour and the coordination of those in charge of putting it into practice. In relation to this, Hammond (2006) pointed out that the goodness of the formation proposals lies more in its relevance for the curriculum rather than on its contents.

The Master combines the following modules in its structure: i) generic (12 credits), in which the focus is set on the learning and development of the personality, the educative processes and contexts and the relations between society, family and education; ii) specific (24 credits), which deal with the aspects related to the complements of disciplinary formation, the teaching and learning of the subjects and the teaching innovation, and also the introduction to educative research; iii) practical, with which the student is meant to approach the real processes of teaching and learning. The formation can be very complex as a very wide range of origins can be found among the students and in some occasions, these are totally distant from the educative ambit. For that, the understanding of concepts related to didactics can represent a huge obstacle.

The learning of these concepts is one of the most concerning topics within the area of Social Sciences (Vera & Cubillos, 2010). Several learning theories try to explain how the students acquire them: empirical, associationist and rebuilding theories. Indeed, the use of concepts is a key factor in human thinking. Different theorists who have studied its learning sustain different points of view: i) the abstraction processes (Astolfi, 2001); ii) theories of connection and construction (Ausubel, 1982). According to the later, the structure of the knowledge follows a hierarchical organisation which is established by the level of abstraction, generalising and grouping of ideas. For this, the concepts are related through webs, acquired either in a spontaneous way or by social reception and interaction. Vygotski (1978) claimed otherwise. For him, the learning of the culture of the thinking modifies the psychological activity, which is visible thanks to the signs, the language and the culture. In spite of their differences, all of the theories agreed that in every concept learning process, three mental operations are required: conceptualisation, contextualisation and generalisation.

The formation of concepts can be defined as “the search and listing of the features which can be employed to distinguish the specimen from the odd ones in a range of categories” (Bruner, Goodnow & Austin, 1967; p. 233). This process requires the student to understand the features of the concepts to create the categories which have existed in someone else’s mind before. Thus, the comparison, the contrast and the use of examples are techniques which favour this kind of comprehension. As a consequence, Joyce, Weil & Clahoun (2006) state that the learning of concepts allow the teacher to analyse the intellectual processes of the students and design new didactic strategies according to them. They defend that there are several strategies to favour the formation of concepts, specially: i) the design of exercises which allow checking what strategies the students use to learn concepts, ii) the observation of changes and editing they do themselves with these activities; iii) the change in the models and ways of presenting information to influence in their processing by the students, etc. All of these strategies contribute significantly to the meeting of the educative objectives, and that is why working with them is so interesting to improve the teaching and learning processes.

The knowledge of these statements leads us to the purpose of this paper, which is to value the comprehension of the didactic concepts by the future teachers who are currently taking the Master of Secondary Education Teachers. The recent implementation of these studies and the intensification of the psycho-pedagogical formation they include have caught our interest in order to know to which extent the students have understood the basic didactic concepts once they have concluded the two thirds of the generic formation module. For that, there are six possible hypotheses. The first one indicates that the students have not consolidated the basic didactic concepts. The second one claims that the majority of the concepts are learnt while taking the Master. The third one maintains that there are significant statistic differences between the comprehension of concepts and the previous studies of the students. The fourth one states that there are significant statistic differences between the comprehension of basic concepts by the students who have previous teaching experience and those who don’t. The fifth declares that there are significant statistic differences between the level of comprehension of the concepts and some variables related to their learning (complexity, lack of time, shallow and insufficient explanation by the teacher). The sixth hypothesis establishes that there is a relation between the level of comprehension of the didactic concepts and some attitudinal-type variables such as the interest, the dedication and the satisfaction with the learning.

### **Methodology of Research**

This research is based in a quantitative methodology with three different phases: descriptive and frequency analysis, differential analysis and correlation analysis. Obtained data through the analysis allow testing the hypothesis established and contribute to answer the research problem.

### *Participants*

The data collected from 227 students from the 385 which integrate the nine groups of students registered in the Master of Formation of Secondary Education Teachers during the academic year 2011/12. Their participation was asked in a voluntary way, also detailing the aim of their cooperation. The group of participants was composed of 123 women and 104 men whose age ranged 25-29 (SD=1.1). The percentages referred to their previous formation indicate that the biggest group is Humanities (41%), while the smallest is Arts (4.8%). The frequencies corresponding to the rest are as follows: Social Sciences (21.59%), Sciences and Technology (21.59%), and finally Health Sciences (11.01%). It is interesting to insist on the fact that 43.2% have had teaching-related experience, either in personal classes or in leisure and free time, infant and youth activities.

### *Measuring Instruments*

The data corresponding to the variables of this research have been collected by means of an ad-hoc elaborated semi-structured questionnaire. The validation of its content took two phases. Firstly, it was tested by four experts of the Department of General and Specific Didactics of the University of Alicante. Then, it was offered to students of one of the groups of the Master (38 students) who suggested some modifications in the formulation of some items in order to improve their understanding and filling in.

In order to collect the data related to the level of comprehension of concepts by the students, they were given a list of 10 random-selected concepts from the *Glossary of Pedagogical Terms*, by Escamilla & Blanco (2002). The answers were analysed later on in a consecutive way by two experts and according to four levels of gradation: non-defined, wrongly defined, insufficiently defined and correctly defined. The data from the contextual variable were collected with a check list with four options: previous experience, school context, family context, formation in the Master, television and other communication media, and finally, other contexts. Eventually, the seven items which referred to the variables related to the concept learning process and the attitudes implies were measured with a Likert-type scale.

### *Procedure*

The questionnaires were delivered in the same week, with the consent of the teachers of each group and at the beginning of each lesson of a subject of the generic module. The teachers themselves acted as collaborators. They had been told what their task was and the warnings they should give to the students when the questionnaires were handed. The time provided to fill them in was between 15 and 20 minutes. It was administered right after the month of December began, as by that time, the students have already taken two thirds of the generic formation and, hopefully, they should have acquired the concepts that they were required to define.

### *Design and Data Analysis*

The purpose of this research and the hypotheses establish three phases which differ in design: descriptive and frequency analysis, differential analysis and correlation analysis. The first one includes data which generates reflection on the level of comprehension of concepts as on the predominant context in which they have been learned. The second one includes the analysis to find out possible differences. To start with, by means of the ANOVA calculus of a factor, between the groups of the so-called variable "studies of origin" and the level of comprehension of basic didactic concepts. Then, a t-test is applied to the independent samples

with the purpose of valuing the differences in the level of comprehension of didactic concepts between the students with previous teaching experience and those without any. Finally, through a correlation study, the relation between a series of intervening factors in the learning process of the didactic concepts and their comprehension is analyzed; additionally, the relation between this comprehension and other attitudinal variables is analyzed.

## Results of Research

The statistic analysis is exposed by considering the three abovementioned aspects: the descriptive and frequency analysis, the differential analysis and correlation analysis.

### *Descriptive and Frequency Analysis*

With the purpose of exposing the descriptive data, percentages are presented firstly, mean and typical deviations which reveal the level of comprehension of the basic didactic concepts; then, the frequencies of the contexts in which most of the students have learned are exposed. Lastly, the data which refer to the learning process of concepts and to the attitudes, which were measured by means of a Likert-type scale, are presented too.

**Table 1. Percentages and statistic descriptors of the results related to the definitions of the didactic concepts.**

Concept	Non-defined (%)	Wrongly defined (%)	Insufficiently defined (%)	Correctly defined (%)	M (SD)
Prescriptive curriculum	52	21.1	17.6	9.3	1.84 (1.02)
Curricular content	32.2	42.3	7.9	17.6	2.11 (1.05)
Attitude	23.3	17.2	33.9	25.6	2.62 (1.10)
Formative evaluation	44.9	21.1	24.7	9.3	1.98 (1.04)
Globalisation	51.1	40.5	5.3	3.1	1.60 (0.73)
Didactic resources	27.3	17.2	43.6	11.9	2.40 (1.01)
Personalisation	34.4	20.7	16.7	28.2	2.39 (1.22)
Content	25.6	28.2	40.5	5.7	2.26 (0.91)
Procedures	25.6	48.9	20.3	5.3	2.05 (0.82)
Educational purposes	31.3	7	18.5	43.2	2.74 (1.30)

As from what can be extracted from the content of Table 1, the students do not know sufficiently the basic didactic concepts. In fact, 52% do not define the prescriptive curriculum concept, 48% define procedures wrongly, 43.6% do not wholly define the didactic resource and only 43.2% define the educational purposes correctly. As an average, the statistic data confirm that none of the concepts were properly defined by the sample of students.

Another important aspect is the context in which these concepts have been learned. The percentages included in Table 2 show that a significant percentage of students (77.1%) have learned them during their formation in the Master and that 39.2% have by experience.

**Table 2. Contexts where the students have learned most of the basic didactic concepts.**

Context	Percentages
Previous experience	39.2
School context	32.2
Family context	16.3
Master formation	77.1
TV and other communication media	7.9
Other contexts	7.9

As for the variables related to the process of learning concepts, it can be observed that in one of them, the average of the punctuations is normally in the centre of the scale, giving neutral results.

In a different section, in relation to the variables of attitudinal type related to the level of comprehension of didactic concepts, the mean shows that the interest is high ( $M=2.45$ ), as also show the highest percentages (45.4%). The degree of dedication is located in intermediate levels ( $M=2.90$ ); in fact, the highest percentages (50.7%) of this item adopt neutral values. Finally, the degree of satisfaction with the learning is medium ( $M=3.10$ ), with a percentage of 39.2% among the students.

#### *Differential Analysis*

The *ANOVA* of a factor is calculated to know the eventual differences between the initial formation of the students and their mastery of the didactic concepts. It shows evidence of the existence of significantly statistic differences between the groups ( $F = 8.59$ ;  $p < 0.05$ ). The means also demonstrate that the groups with a higher conceptual mastery are in the Arts section ( $M=2.73$ ) and Health Sciences ( $M=2.51$ ). On the contrary, the students of Social Sciences obtained a different mean ( $M=2.16$ ) and so d did the ones of Humanities ( $M=1.95$ ). These data were obtained by the post-hoc analysis and they illustrate the statistically significant differences between the groups. The results indicate that they are located mainly between the Humanities group and the Health Sciences group ( $p=0.005$ ), between the Humanities group and the Technological Science group ( $p=.001$ ) and finally between the Humanities group and the Arts group ( $p=0.010$ ).

At the same time, the results of the t test help us check that the statistically significant differences between the previous teaching experience before the Master and the level of comprehension of the basic didactic concepts. This test included equal variations with the *Levene* test and that shows that there are no statistically significant differences ( $t = 1,147$ ;  $p > 0.05$ ) between both groups of students.

#### *Correlation Analysis*

In order to know the possible relations between the variables of the study, two correlation analyses have been developed. The first one tries to identify the relations between the mastery of the didactic concepts and the variables related to a range of aspects related to the learning process. As Table 3 shows, there are statistically significant relations between the level of comprehension of the concepts and the lack of time, the lack of depth and the lack of

thoroughness of the explanations of the teachers. Other relations offered by the analysis link the complexity of the contents with the lack of time, the lack of depth and the lack of explanations by the teacher. A statistically significant relation is established between the level of depth and the lack of time. Finally, there is also a statistic bond between the lack of explanation by the teachers and the lack of depth.

**Table 3. Pearson r correlation. Variables related to the learning of concepts.**

Variable	1	2	3	4	5
1. Level of comprehension	1				
2. Complexity of contents	0.030	1			
3. Lack of time	0.141*	0.413**	1		
4. Lack of depth	0.147*	0.163*	0.306**	1	
5. Thoroughness of explanations of teachers	-0.243**	0.149*	0.117	-0.285**	1

\*p<0.05 \*\*p<0.01

The second correlation analysis means to demonstrate the relation between the level of comprehension of the concepts and some attitudinal variables related to their learning. As shown in Table 4, there are statistically significant relations between the degree of mastery of those concepts and the interest, the dedication and the satisfaction with that learning. This relation also exists between the level of dedication and the interest for the comprehension of those concepts.

**Table 4. Pearson r correlation. Attitudinal variables related to the learning of concepts**

Variable	1	2	3	4
1. Level of comprehension	1			
2. Interest	-0.094	1		
3. Dedication	-0.027	0.542**	1	
4. Satisfaction	-0.132*	0.597**	0.512**	1

\*p<0.05 \*\*p<0.01

## Discussion

As previously mentioned, the main objective of this research is to know the level of comprehension of the basic didactic concepts by the students of the Master of Secondary Education once they have done the two thirds of their generic formation. This objective is linked to the wider purpose of knowing to which extent the formation of the teachers taking the new Master implanted in the year 2009/10 is efficient.

From this perspective, in relation to the first hypothesis, the results show that the students of the Master do not have a sufficiently consolidation of the basic didactic concepts, as do evidence the low quantity of correctly-defined concepts. The statistic descriptors strengthen this statement since none of the concepts is properly defined. This is a consequence related to the verification of other hypotheses. Indeed, the results show that the students in their majority have learned didactic concepts through the formation offered by the Master, and here emerges a double reflection: on one side, the Master seems to be an adequate path to favour the formation of concepts of future teachers and on the other side, they face the comprehension without any previous knowledge about them.

The third hypothesis indicated that there are differences between the groups of students in relation to their previous university formation. Curiously enough, the results of the highest punctuations in the comprehension of concepts come from the groups with a formation that was not related to the educative field (Arts & Health Sciences). This can be explained by two facts of which we have no evidence. Firstly, the mastery of the concepts may respond to the fact that they have completed a previous formation of a high level of exigency. Secondly, it may be related to the task done by the teachers in charge of the groups. Wenglinsky (2002) examined the relation between the formation of teachers, their practice and the level of achievement of the students. The results indicated that an adequate pedagogical formation together with a practical teaching focus contribute to grant success in the learning.

It is also surprising to realise there are no statistically significant differences in the results of the variables when we consider the students with previous teaching experience and those who don't have any. The results make us think that these practices (particular teaching of socio-cultural leisure activities) are performed without previous theoretical formation in spite of being considered extracurricular activities with educative purpose.

Another matter which is raised refers to the existing relations between the level of comprehension of concepts and some factors associated to the learning (complexity, lack of time, lack of depth or thoroughness in the explanations of the teachers). The results show there are significant relations between these variables, except for the complexity of the contents. This leads us to thinking that there is no epistemological difficulty but methodological aspects related to the comprehension of concepts. The time, the depth, the design, in other words, the performance of the teacher is a element which has a great relevance in all the educative process. Consequently, the learning comes from the students and from the didactic elements, of which the teacher is the only person in charge. No doubt, the teaching skills are activated and optimise the teaching and learning processes if they incorporate the technological advances and they are related to the proper pedagogical focuses which create opportunities to implement the curricula in an innovative ambient of support to the teaching activity, as described by Coto&Dirckinck-Homfeld (2007).

Finally, another fact has been proved. There is significant relation between the level of comprehension of didactic concepts and the interest, the dedication and the satisfaction with the learning of the students. This fact has attracted our interest in a future analysis of the theoretical bases of the structural models with cognitive-motivational variables related to the academic performance (Montero & Alonso, 1992; Navas, Castejón & Sampascual, 1996; Valle *et al.*, 1999a, 1999b, 1999c, 2003; Bandalos, Finney & Geske, 2003; McKenzie, Gow & Schweitzer, 2004; Swalander & Taube, 2007; Fenollar, Román & Cuestas, 2007; Miñano & Castejón, 2008).

## Conclusions

All in all, the analysis of the results leads to the conclusion that it is necessary to insist on the teaching and learning process of didactic concepts in the subjects of the generic formation of the module, by resorting to a range of learning strategies whose effectiveness must be share by teachers and students through a constant feedback. The Master offers an amplification of the psycho-pedagogical formation which must stress the theoretical aspects to grant an ulterior and sustainable reflexive teaching practice. The learning must be emphasised from the previous knowledge of the class group since the formation of origin of the majority of the students is not linked to the educative field. A good learning of the didactic concepts will favour the acquisition of other concepts and its correct use in the professional practice. But we must bear in mind that these strategies must be taught together with contextual references which help the students access and assimilate the real meaning of each concept.



Eventually, it is a good opportunity to recommend the design of motivating teaching strategies which catch the interest of the students and let them find the sense of the learning of conceptual bases on which they will develop their future professional practice. As was demonstrated in this study, there is a relation between the comprehension and the dominance of the concepts and the attitudes on them, the interest they generate and the dedication to their learning.

Among the limitations of our work, we must highlight that it hasn't shown any evidence on the differences on the level of comprehension of concepts between the groups. For that, we would recommend a complementary investigation to check that out. At the same time, the level of previous knowledge of didactic concepts should also be taken to evaluation when the students start the Master in order to compare later the learning and the predictive value of the initial punctuations. It is also important to stress the variables which influence the concept learning process, considering a wider regulation of time, depth and the importance of the explanation of the teacher for its understanding.

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