



Validity and reliability of a questionnaire on primary and secondary school teachers' perception of teaching a competence-based curriculum model

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ABSTRACT

The aim of this study is to develop a scale to measure primary and secondary school teachers' perception of a competence-based curriculum model in Spain. After reviewing the literature, we designed an initial questionnaire with 37 five-point Likert-type items. This was then reviewed by a panel of experts. A pilot test was conducted with 100 participants using exploratory factor analysis. This resulted in a final scale with 23 items across five factors (beliefs about the theoretical model, level of implementation of the model, difficulties in implementing the model, resources and professional development). To verify, using new data, the level of fit of the measurement model generated by the first sample, we conducted an exploratory factor analysis, and, subsequently, a confirmatory factor analysis with structural equations on a sample of 1408 respondents. Acceptable levels of internal consistency and model fit were obtained. The result is a scale which is rapidly and easily administered. It demonstrates good criterion validity in explaining teachers' beliefs about the competence-based curriculum model, and thus reveals teachers' perceptions of the impact of this curricular reform.

KEYWORDS: VALIDITY, RELIABILITY, QUESTIONNAIRE, TEACHER, COMPETENCE

1 INTRODUCTION

Since the European Union's 2006 recommendation on a framework for key competences for lifelong learning (OJEU 2006), the different Member States have gradually incorporated these competences into their educational legislation. The eight key

competences set out in the European framework are: (1) communication in the mother tongue, (2) communication in foreign languages, (3) mathematical competence, (4) digital competence, (5) learning to learn, (6) social competence and civil competence, (7) enterprise and entrepreneurship, and (8) cultural expression. One of the main aims of these key competences is to ensure that initial education and training systems equip children and young adults with the basis for further learning and working life. The key competences provide a reference level for educational legislators, teachers and students in the different EU Member States (Pepper, 2011). However, this type of top-down reform, where the proposal is developed by the political class to subsequently be administered in the reality of the classroom, tends to be highly problematic in its implementation. There is always a risk of the educational community viewing pedagogical innovations as simply a change in terminology, resulting in no more than a bureaucratic change without actually impacting on the reality of schools and classrooms (Valle & Manso, 2013).

In Spain, the competence-based curriculum model was established in the Organic Law of Education (LOE, in its Spanish acronym, 2006) and was upheld in the Organic Law for the Improvement of the Quality of Education (LOMCE, in its Spanish acronym, 2013). With the aim of determining how, ten years later, this model is being implemented in Spain, we have designed a questionnaire to obtain information on teachers' perceptions of the competence-based curriculum.

Questionnaires on competence-based curriculums have been created focusing on different areas of knowledge, e.g.: (1) school counselling (Velaz-de-Medrano, Manzanares, López-Martín,

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& Manzano-Soto, 2013), (2) information and communication technology (Vera & Soriano, 2011) and (3) physical education (Hortigüela, Abella, & Pérez-Pueyo, 2015a). A number of studies have administered questionnaires on different aspects of teaching, e.g.: (1) the perception of head teachers and heads of department on the process of implementing and developing the competences (Hortigüela et al., 2015a, 2015b, 2015c), and (2) assessment (Quirós, 2013). The latter works have a direct link with our research. Hortigüela et al. (2015a) administered two Likert-type questionnaires. The first was aimed at head teachers and their teams, measuring 28 items across four dimensions: (1) importance of key competences in the schools' work; (2) professional development for teachers during the school year; (3) methodology and assessment applied to work on key competences; and (4) implementation processes and impact on students' learning. The second questionnaire focused on heads of departments of physical education (PE), and contained four dimensions: (1) implementation of key competences in syllabuses; (2) aspects of classroom assessment; (3) structure and organisation for work on key competences; and (4) adaptation of physical education to key competences.

The study by Quirós (2013) on teacher competences in educational assessment used a five-point Likert-type scale in a questionnaire measuring the four dimensions of technical, methodological, participatory and personal teaching competences. However, our questionnaire, the validation process of which is described in the present work, attempts to go one step further by obtaining information on the current situation of one of the most significant pedagogical innovations proposed in recent education laws in Spain, that is, the competence-based curriculum model. The questionnaire analyses five key factors related to the implementation of this educational reform: (1) teachers' beliefs about the model; (2) level of implementation of the model; (3) the difficulties experienced by teachers in implementing the model; (4) teachers' perceptions of resources available to implement the model; and (5) professional development received for developing the model.

The questionnaire may be administered in different curricular areas and levels of education, which means it will provide in-depth knowledge of the actual situation in which the key competences are being implemented. The aim of this work, then, was to develop an easily administered tool to determine teachers' perceptions of delivering a competence-based curriculum.

2 METHOD

2.1 Sample

The study sample comprised 1408 teachers, 719 women and 689 men, aged between 24 and 67 years ($M=43.49$; $SD=8.9$).

The inclusion criteria were:

- Primary and/or secondary school teachers.
- Teachers currently working in public or public schools in Spain.
- More than one year of teaching experience.

The questionnaire was sent to every school in Spain: The secretary at each school was asked to forward it to the teachers, who were then invited to respond voluntarily.

2.2 Material and methods

To design the scale, we first decided the dimensions to be included in the tool and the items for each dimension. To this end, we

identified the key elements related to teachers' perception of teaching through a competence-based curriculum model. This was done as follows:

- Through a review of the scientific literature on competence-based teaching models (Adelman & Walking-Eagle, 2003; Fullan, 2002; Hargreaves, 1994; Hargreaves & Fink, 2008; Hopkins, 2008; Monarca & Rappoport, 2013), we identified the following relevant dimensions. a) beliefs: a.1) beliefs about the theoretical model; a.2) beliefs about the implementation process; a.3) level of implementation; b) level of practical implementation of the competence-based curriculum model; c) difficulties in implementing the competence-based curriculum model; d) professional development of teachers.
- We assembled a group of four experts in teaching competence-based curricula. These teachers, who had more than 15 years of teaching and research experience in the field of didactics, designed a qualitative research study. The Delphi technique was used. The aims of these two phases were: a) to conduct a critical review of the literature to find the limitations and weaknesses existing in the field; b) to provide evidence of the validity of the content of both the scale and the individual items; and c) to determine criteria to analyse the discriminatory capacity of the scale. Each of the experts was asked to score the items from one to five, based on their representativeness of the corresponding construct and the precision of the language used. They were also asked to support their assessment of the items they considered appropriate and to give an overall assessment of the questionnaire. Their contributions were used to redesign the scale, which was then sent to the experts once more for their assessment. Following this, we calculated the between-class correlation coefficient, yielding a Cronbach's alpha of .87 or higher.
- An exploratory factor analysis (EFA) was used to verify the data fit to the model. We conducted a pilot study with 100 teachers, which enabled us to make a selection of the items and determine the performance of the scale. This derived in a final scale comprising five key factors: (a) Factor 1 – beliefs about the theoretical model; (b) Factor 2 – level of implementation of the model; (c) Factor 3 – difficulties in implementing the model; (d) Factor 4 – resources; and (e) Factor 5 – professional development for teachers. Table 1 shows the items.

2.3 Procedure

The data were collected by means of a questionnaire (scale) on teachers' perception of teaching a competence-based curriculum model. The questionnaire was sent online to every school in Spain (17,747 at the time of data collection). Respondents were asked to indicate their level of agreement with the items, using a five-point Likert-type scale. We emphasised the need for the items to be scored accurately, to ensure the validity of the results: Items 1 to 19: (1) completely disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; and (5) completely agree. Items 20 to 23: (1) very low; (2) low; (3) neither high nor low; (4) high; and (5) very high.

Figure 1 shows a graphic representation of the research design.

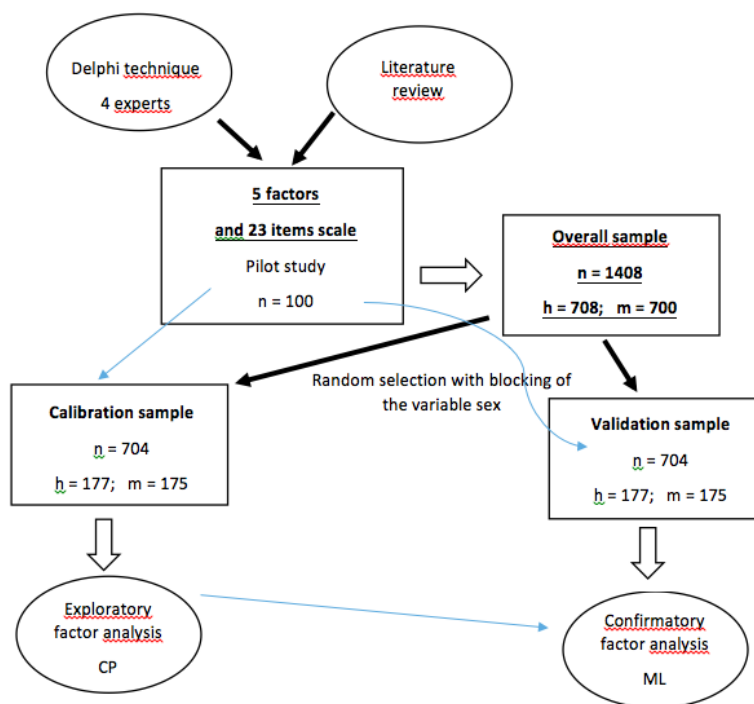


Figure 1. Research design

Table 1. Means and standard deviations of the items and dimensions comprising the original scale

Dimension - Item	Mean	S.D.
Beliefs about the theoretical model		
A competence-based reform was necessary	3.37	1.22
The competence-based curriculum model has the potential to improve on the previous curricular approach	3.25	1.20
The competence-based model presents a realistic approach which can be implemented in the curriculum	3.09	1.13
The competence-based curriculum model is improving the previous curricular approach	2.90	1.15
The workload involved in implementing the competence-based model is in balance with the benefits obtained	2.50	1.11
Level of implementation of the model		
I use the competence-based curriculum in my teaching	3.41	1.02
My lesson planning follows the competence-based curriculum model	3.46	1.11
I take into account the competence-based curriculum when designing units of work	3.39	1.08
I design teaching activities which aim to develop the key competences	3.54	1.01
The teaching strategies I use are in line with the competence-based curriculum model	3.51	0.97
I evaluate my students' achievement of competences when assessing their learning	3.28	1.08

Difficulties in implementing the model		
The level of implementation of the competence-based curriculum is similar across all the teaching staff	2.11	1.04
The level of implementation of the competence-based curriculum is similar in all schools	1.95	0.95
The educational authorities set clear guidelines for developing a competence based curriculum	2.09	1.07
When I am unsure about something related to competence-based teaching, I have access to appropriate advice	1.98	1.07
Resources		
The number of pupils per class is suitable for competence-based teaching	1.83	1.08
The classroom materials available are suitable for competence-based teaching	2.38	1.07
The facilities at my school are suitable for competence-based teaching	2.67	1.13
The economic resources available at my school are sufficient to implement a competence-based curriculum	2.31	1.13
Professional development		
My need for training in lesson planning for the development of the key competences is	3.34	0.99
My need for training in lesson planning to link key competences to specific competences of an area/ areas of curricular knowledge is	3.35	0.99
My need for training in the design of tasks to develop the key competences is	3.32	0.98
My need for training in designing a model to assess the development of the key competences is	3.49	1.05

The final scale comprised five factors with 23 items to assess teachers' perceptions of teaching a competence-based curriculum.

2.4 Statistical analysis

For the statistical analysis, we randomly divided the sample into two subsamples with the same number of observations (704). An EFA was conducted on the first subsample to determine the factor structure of the scale. To establish the internal consistency of the scale, we conducted a reliability analysis, calculating Cronbach's alpha coefficient for each of the factors and the overall scale. Finally, using the second subsample, we conducted a confirmatory factor analysis (CFA) with structural equations to verify with new data the fit to the model generated with the first sample.

STATA, V13 (State Corp., Texas, USA) was used for the statistical analysis.

3 RESULTS

Table 2 shows the means and standard deviations for the scale. The scores ranged from one to five. The highest mean scores correspond to items in the professional development (PD) dimension: PD_21 (M=3.34), PD_22 (M=3.35), PD_23 (3.33) and PD_24 (M=3.49). The lowest mean scores were found for items in the dimension of difficulties in implementing the model (DI): DI_13 (M=1.95), DI_15 (M=1.98) and DI_16 (M=1.83). The means scores are not particularly high, being situated around the middle of

Table 2. Confirmatory factor analysis

Variable	BTM	LI	DI	REC	PD
Beliefs about the theoretical model					
A competence-based reform was necessary	0.860				
The competence-based curriculum model has the potential to improve on the previous curricular approach	0.896				
The competence-based model presents a realistic approach which can be implemented in the curriculum	0.805				
The competence-based curriculum model is improving the previous curricular approach	0.857				
The workload involved in implementing the competence-based model is in balance with the benefits obtained	0.692				
Level of implementation of the model					
I use the competence-based curriculum in my teaching		0.840			
My lesson planning follows the competence-based curriculum model		0.879			
I take into account the competence-based curriculum when designing units of work		0.892			
I design teaching activities which aim to develop the key competences		0.844			
The teaching strategies I use are in line with the competence-based curriculum model		0.804			
I evaluate my students' achievement of competences when assessing their learning		0.775			
Difficulties in implementing the model					
The level of implementation of the competence-based curriculum is similar across all the teaching staff			0.792		
The level of implementation of the competence-based curriculum is similar in all schools			0.803		
The educational authorities set clear guidelines for developing a competence based curriculum			0.677		
When I am unsure about something related to competence-based teaching, I have access to appropriate advice			0.648		
Resources					
The number of pupils per class is suitable for competence-based teaching				0.503	
The classroom materials available are suitable for competence-based teaching				0.721	
The facilities at my school are suitable for competence-based teaching				0.836	
The economic resources available at my school are sufficient to implement a competence-based curriculum				0.832	
Professional development					
My need for training in lesson planning for the development of the key competences is					0.851
My need for training in lesson planning to link key competences to specific competences of an area/ areas of curricular knowledge is					0.895
My need for training in the design of tasks to develop the key competences is					0.889
My need for training in designing a model to assess the development of the key competences is					0.879

Note: BTM: Beliefs about the theoretical model; LI: Level of implementation of the model; DI: Difficulties in implementing the model; REC: Resources; PD: Professional development

the range (2.5), with the exceptions mentioned above. Table 1 also shows the standard deviations. The variability of the items with respect to the means scores observed in the sample is low.

The sample, which comprised 1408 participants, was randomly divided into two subsamples: a calibration sample (n=704) and a validation sample (n=704). Gender was used as a blocking variable to create subsamples with the same number of men and women. The calibration subsample was used to develop a measurement model which could then be empirically tested in the validation subsample by means of CFA.

Due to the lack of a sufficiently grounded theory on teachers' perception of teaching within a competence-based curriculum model, we conducted a principal component exploratory factor analysis with Varimax rotation. The results from the calibration sample are shown in Table 2. In the first analysis, we eliminated 14 of the initial items from the scale as they showed low levels of reliability with factor loadings below .5, compromising the reliability of the scale. We conducted another EFA, which yielded five factors across the remaining 23 items: (1) *Beliefs about the theoretical model*, comprising five items; (2) *Level of implementation of the model*, six items; (3) *Difficulties in implementing the model*, four items; (4) *Resources*, four items; and (5) *Professional development*, four items. As can be seen in Table 2, most of the factor loadings are higher than 0.80 and all are above 0.50.

The internal consistency of the scale was calculated using Cronbach's alpha coefficient. Cronbach's alpha for factor 1 was 0.907, for Factor 2, it was 0.937, for Factor 3, 0.909, for Factor 4, 0.779, and for Factor 5, 0.777. Cronbach's alpha for the overall scale was 0.892.

The measurement model generated by the EFA presented a good fit to the data. Using STATA 14, we conducted a CFA in the second subsample. The parameters were estimated using maximum likelihood estimation. The following indices of fit were used χ^2 , χ^2/df , Standardized Root Mean Squared Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI). The values found were: $\chi^2_{220} = 1056,184$ ($p < 0.001$), $TLI = 0.935$, $CFI = 0.924$, $RMSEA = 0.066$; 90% CI (0.062-0.071) and $SRMR = 0.054$.

The goodness of fit of the model is acceptable and the factor loadings are adequate (Figure 2), with a minimum of 0.47 for item DI_16 and a maximum of 0.93 for item PD_22. The correlations between factors are generally low, especially between factors three and four and two and five.

4 DISCUSSION AND CONCLUSIONS

In the introduction, we justify this study on the basis of the relevance of validating a questionnaire to assess teachers' perceptions of following a competence-based curriculum model (LOE, 2006; LOMCE, 2013). In light of the crucial role of key competences in European educational policies (OJEU, 2006), the findings of studies of this type are highly important. It is essential to have assessment tools which serve to analyse how these competences are put into practice in the reality of the classroom.

A number of studies have analysed teachers' beliefs about the difficulties involved in programming, assessing and organising educational activities in competence-based teaching (Hortigüela et al., 2015a; Lleixa et al., 2016), and the importance of competence-based teaching in education systems has been demonstrated (Pepper, 2011). Effective education systems are vital in the 21st century knowledge society (Valle and Manso, 2013), but for these systems to be implemented and perfected, the assessment of all the agents involved is necessary (Calderhead, 2011). The aim

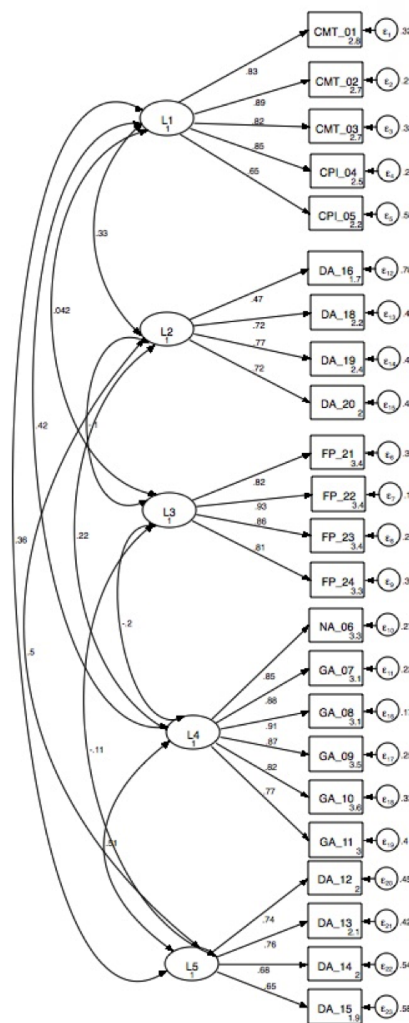


Figure 2. Confirmatory factor analysis

of our research was to design a tool to assess teachers' perceptions of teaching within a competence-based curriculum model. Assessment through teachers' perceptions is essential for public authorities and policy-makers to take decisions to drive forward improvements in educational practice.

The aim of this study was to design a tool to assess teachers' perceptions of teaching through a competence-based curriculum model. The lowest scores were found for items in Factor 3, "difficulties in implementing the model" and factor 5, "resources", which represent the main obstacles faced by teachers when attempting to implement this model. The highest scores corresponded to items in Factor 2, "level of implementation of the model", which highlights the efforts made by teachers to put into practice the key aspects of competence-based curricula.

The results of the EFA identified the key factors for a questionnaire on teachers' perceptions of teaching through a competence-based curriculum model. These five factors showed a good internal consistency with values higher than 0.77, explaining more than 50% of the variance in the factor with the lowest Cronbach's alpha (Factor 5). The Cronbach's alphas for Factors 1, 2 and 3 were higher than 0.90, suggesting that some items could be eliminated. We decided to maintain all the items in Factor 2 as they were considered necessary to explain the construct of "level of implementation of the model". These values suggest the reliability

bility of the scale is adequate.

The results of the CFA confirm the validity of the construct. We have thus obtained a parsimonious measure of the five dimensional construct. The factor structure of the model also presents good stability with the validation sample obtaining adequate values in the fit statistics, with both the RMSEA and the SRMR yielding optimum values below the reference value of 0.8.

The questionnaire validated in this study is a powerful tool which permits an analysis of the current situation of the Spanish education system with regard to the curricular changes involved in the shift towards a teaching model based on the key competences. The questionnaire facilitates an overall description, going beyond previous questionnaires focusing on specific areas of knowledge or concrete aspects of teaching or administrative function. The questionnaire identifies teachers' beliefs about the theoretical model of a competence-based curriculum, their perceptions of the level of implementation of the model and the difficulties in implementing it, and the limitations in the resources and professional development available.

The selection of items, which was based on psychometric criteria, has yielded a brief scale comprising 23 items across five factors. The scale is simple and rapid to administer. The tool presents good criterion validity, explaining teachers' beliefs about the theoretical model of a competence-based curriculum.

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