

THE EFFECT OF ASSESSMENT PROCEDURES IN THE DEVELOPMENT OF COMPETENCES DURING INITIAL TEACHER EDUCATION: A SYSTEMATIC REVIEW

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Abstract

Competence assessment has been one of the most crucial aspects in initial teacher training in the context of the European Higher Education Area (EHEA). It has implied a change in teachers' approaches to teaching and learning and is based on different assessment procedures for their training. In order to discover the effect of the assessment procedures applied to the training of competences in teachers, the present study examines research along these lines and in this context published between 2010 and 2021 in international high-impact journals. A total of 1,772 articles have been reviewed, 17 of which were included after the application of the inclusion criteria established according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Statement. The results demonstrate the use of assessment procedures based on applied means, strategies and tools in order to train pre-service teachers in cross-cutting teaching competences. However, in the majority of the studies analysed, the effectiveness of these procedures is empirically based on the self-perception of those involved and not so much on experimental studies. We advocate the latter due to their value in terms of cause and effect.

Keywords – Competence assessment, Initial teacher education, Systematic review.

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1. Introduction

Initial teacher training is the first stage in the professional career of a teacher. It is of crucial importance as it lays the foundations for how a teacher approaches education and develops truly professional teaching skills rather than the mere learning of tricks of the trade (Caena, 2014). It seeks to achieve a committed and critical way of thinking and reflexive action, which take place within a process of ongoing learning and the constant quest for answers in order to meet the demands of the sector (Hagger & McIntyre, 2006).

The competence-based approach to teacher training arose in the Bologna Declaration (European Union, 1999) and its subsequent revisions within the context of the creation of the European Higher Education Area (EHEA). In the Lisbon Declaration (European Union, 2007) it was established that 2010 would be the deadline for the incorporation of this training approach into university study plans.

The Tuning Project (González & Wagenaar, 2003) defined the competences which would form part of the new approach to higher education, establishing two groups: specific competences, related to the exercise of a profession, and generic competences (which can be instrumental, interpersonal or systemic). These are essential both for professional development and for the development of an active citizenship.

Furthermore, the active and central role of students in training was established, along with that of teachers as guides (Vaz & Prada, 2016) and of assessment, overcoming the preoccupation with the theoretical nature of learning and taking other capacities into consideration, employing new procedures which are coherent with this education approach.

The European Commission (2013a) established two components of competence-based learning in preservice teacher education: one concerning the mastery of specialised theoretical knowledge and another concerning the mastery of skills and attitudes for the development of classroom practices, which form the essence of the teaching profession. Ultimately, this approach forms an identity-based framework of competences which makes it possible, from the very beginnings of initial education, to learn how to think, act and feel like a teacher (Feiman-Nemser, 2008).

It is significant that training in competences is approached from a holistic perspective. In accordance with Perrenoud (2010), the acquisition and development of a competence requires the simultaneous and conscious use of others. For example, in order to develop the competence of reflection, it is necessary to awaken generic competences such as the ability to work autonomously and the ability to be critical and self-critical.

It is common for the study of competences in preservice teacher education to be approached from the teachers' perception of their own development (Cabezas-González, Casillas-Martín & García-Peñalvo, 2021; Keller-Schneider, Zhong & Yeung, 2020; Pareja, Leyva & Matas, 2020), thus demonstrating a preoccupation among the scientific community and academia for detailed knowledge of this area and from this perspective. But it could be asked whether the assessment procedures used in initial teacher education effectively contribute to the development of teachers' professional competencies, as pointed out by Voogt, Fisser, Pareja, Tondeur and van Braak (2013).

In line with Brown and Pickford (2013), the complexity of training in competences requires assessment practices which, as part of the training process, guarantee that attention is paid to the students' work in real time and not later, providing feedback and strategically combining different procedures which are adjusted to the competences which are to be developed (Alqassab, Strijbos & Ufer, 2019). The European Commission (2013b) proposes competence assessment procedures in preservice teacher education based on the video analysis of classroom teaching practice, written reflections/narratives, the use of portfolios, feedback and peer review, as well as different forms of written tests. Ultimately, these are effective induction and support procedures for the development of competences.

O'Flaherty and Beal (2018) carried out a systematic review of the literature seeking to discover the presence of teaching competences in teacher education in connection with the assessment practices applied for their development. An empirical connection in terms of the effectiveness between both constructs cannot be appreciated in their study (although it is advocated). However, the importance of formulating truly effective assessment practices which guarantee and measure achievements in terms of the competences of future teachers, making them more aware and responsible. Some noteworthy aspects of the study are related with a certain degree of consensus in the joint treatment of teaching and generic competences, thus responding to a multidimensional and realistic approach in accordance with the needs of the education sector and not based on a single type of expertise or on trends (Corcoran & O'Flaherty, 2017).

Another interesting conclusion of the study is related with the importance of selecting assessment procedures which are carefully and strategically arranged and combined, given the short time dedicated to preservice teacher education. In this way, attention is paid suitably and effectively to training for real teaching practice, its priorities, needs and challenges, facilitating a better understanding of the role of the teacher (Keller-Schneider et al., 2020).

In accordance with Forzani (2014), new assessment procedures are evaluated, which constitute true opportunities to activate competences based on practice and reflection. For example, Ball (2013) and McDonald, Kazemi and Kavanagh (2013) have evaluated assessment approaches based on filmed classroom teaching practice in order to subsequently deconstruct and debate them with the class group. In this way, new teachers can put into practice, involve themselves with and share learning in order to make progress towards a more aware and responsible development of their competences (Bailey & Taylor, 2015).

Hamodi, López-Pastor and López-Pastor (2015), inspired, among others, by Brown and Pickford (2013), established an interesting classification regarding assessment procedures based on three types: means of assessment concerning evidence, products and actions carried out by the students. These provide information on learning outcomes and are used by the assessor in order to establish his/her guidelines, which vary according to the competence being developed and assessed, e.g., tests of knowledge, reflective journals, the use of forums and written work, as well as oral means such as debates and practical means such as demonstrations and supervised teaching practice. The second procedure refers to assessment strategies with regard to the framework from which the assessor systematically gathers information via the required means of assessment and the person being assessed. The most interesting and educational strategies require the participation and involvement of the students. These include self-assessment and peer evaluation (Seifert & Feliks, 2018). The third procedure is related to the assessment tools, i.e., the records of the assessor for systematising his/her perceptions, from which he/she can recognise, evaluate and rate the degree of development of the achievements demonstrated by the person being assessed. These may include observation lists, checking and estimation scales, follow-up records and rubrics (Cano, 2015).

Such a variety of procedures could be of assistance in establishing combinations to ensure the development of competences in preservice teacher education, particularly if the trainee teachers participate actively in the construction and use of such competences (Boud, Lawson & Thomson, 2013; O'Connor, Jeanes & Alfrey 2016). The versatility in terms of the combination of these procedures, the educational methods foreseen for activating learning situations and the competences to be developed imply a training triangle (teaching methods – assessment – competences) which ensures coherence and quality in training processes (Brown & Pickford, 2013). However, this ideal training approach would be desirable if it were accompanied by a research process which was empirically related with its effectiveness for the development of competences, an aspect which O'Flaherty and Beal (2018) have stated is not common.

Therefore, taking all of the above into consideration, it is considered expedient to be aware of the context of the EHEA and the current effect of the assessment procedures employed for the development of competences among pre-service teachers. This implies knowledge of the main assessment practices established in preservice teacher education; discovering the competences which are taught and assessed and identifying the effect of the assessment practices applied for the development of teaching competences.

2. Methods

In order to carry out this systematic review, the PRISMA guidelines were followed (Moher, Shamseer, Clarke, Guersi, Liberati, Petticrew et al., 2015; Shamseer, Moher, Clarke, Ghersi, Liberati, Petticrew et al., 2015), along with the indications of Cochrane (Higgins & Green, 2011). The aim of this type of review is to identify, analyse and synthesise the characteristics, dimensions, results, conclusions and any other aspect

present in different primary studies via an established systematic process in order to be able to respond to specific aspects following a rigorous methodology. All of the original studies selected and included in this review form the sample units, respecting the type of study and the format of presentation. For this study, only scientific articles published in high-impact journals have been selected.

2.1. Criteria of Eligibility

A search was carried out for articles written in English and Spanish and published on the databases of the Web of Science, Scopus, Dialnet and Latindex in the period ranging from 2010 to 2021 (both inclusive) ensuring the potential presence of research on the topic of study on a European level.

The Lisbon Conference (2007) was a turning point in the stabilisation of the European Higher Education Area (EHEA) with 2010 marking the deadline for the adaptation of study plans in this area. That year was taken as the starting point for this study of the situation concerning competences in higher education, after the study plans of the member states of the EHEA had been adapted.

The initial bibliographical search in the four databases yielded 1,172 articles, of which 95% were found on the Web of Science and Scopus. The remaining 5% were located on Dialnet and Latindex.

The following step was to refine the results by searching for scientific articles published between 2010 and 2021 in the context of the member states of the EHEA within the field of education and following certain combinations of descriptors of interest for the study, applying different search equations (Table 1).

In accordance with the PRISMA Statement, Figure 1 presents a flow chart which shows the process of identification, refinement, selection and inclusion in this study.

Database	Restrictors	Search equation
Web of Science, Scielo	Scientific articles, year of publication, member states of the EHEA, Education	TS = (“Competencies of teachers” OR “teacher’s competencies” OR “teachers qualifications” AND “Assessment instruments” OR “Assessment means” AND “Initial teacher training”)
Scopus	Scientific articles, year of publication, member states of the EHEA, Education	TS= (“Competencies of teachers” OR “teacher’s competencies” OR “teachers qualifications” AND “Assessment instruments” OR “Assessment means” AND “Initial teacher training”)
Dialnet, Latindex	Scientific articles, year of publication, member states of the EHEA, Education	“Training in teaching competences” AND “assessment tools”

Table 1. Search and refinement procedures for sources of information

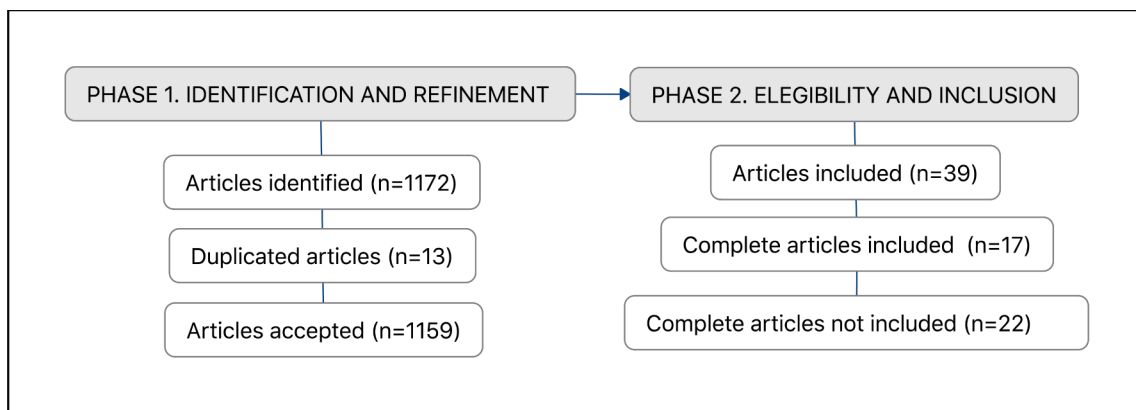


Figure 1. PRISMA flow chart: identification, refinement, selection and inclusion

In checking the title, author, journal, abstract and keywords, it was possible to discard 13 articles due to the fact that they were duplicated, thus establishing a basis of 1159 articles for the study. After analysing

each abstract (second phase), according to the inclusion criteria, 39 articles were selected, which, after a complete reading, were reduced to 17 for their final inclusion in the study. These include studies in the context of initial teacher training for early years, primary and secondary education. The inclusion criteria applied were as follows:

- a) Articles on empirical studies which demonstrate the effects of the relationship between assessment tools and training in teaching competences in the context of initial teacher training.
- b) Articles which present experiments on the use of one or more assessment tools and their effects on the training of competences in initial teacher training.

2.2. Procedure for Data Extraction and Study Dimensions

Following the protocol applied and based on the study of the full articles, the aspects to be considered for study were organised, resulting in the following dimensions (Table 2): (a) bibliometrics; (b) methodological approach; (c) assessment procedures employed; (d) competences assessed; (e) effects of the assessment procedures in the development of competences.

Dimension	Variables	Levels
Bibliometrics	1. Year 2. Country	
Methodological approach	1. Design	a) Descriptive b) Quasi-experimental c) Descriptive comparative
	2. Method	a) Quantitative b) Qualitative c) Mixed
Assessment procedures	1. Means	a) Digital b) Practical c) Tests of knowledge d) Debates e) Reflective journals
	2. Strategies	a) Only carried out by the teacher b) Those being assessed take part
	3. Tools	a) Self-assessment questionnaires b) Self-scoring questionnaires c) Semantic differential scales d) Decision matrices
Competences assessed	1. Teaching	a) Didactical, pedagogical and organisational b) Practical theoretical knowledge of the subject
	2. Generic	a) Instrumental b) Interpersonal c) Systemic
Effect of assessment procedures on the development of competences	Description of the results on the effectiveness of assessment in the development of competences in the initial teacher training of early years, primary and secondary education teachers	

Table 2. Dimensions of the study variables

3. Results

3.1. Bibliometric Analysis

Taking into account the year of publication of the studies analysed, it can be observed (Figure 2) that there is a fluctuating presence of studies until 2016, when the maximum presence of thematic studies in the context of the EHEA (41%) can be observed. After that year, the number of studies decreases again to 6% in 2021.

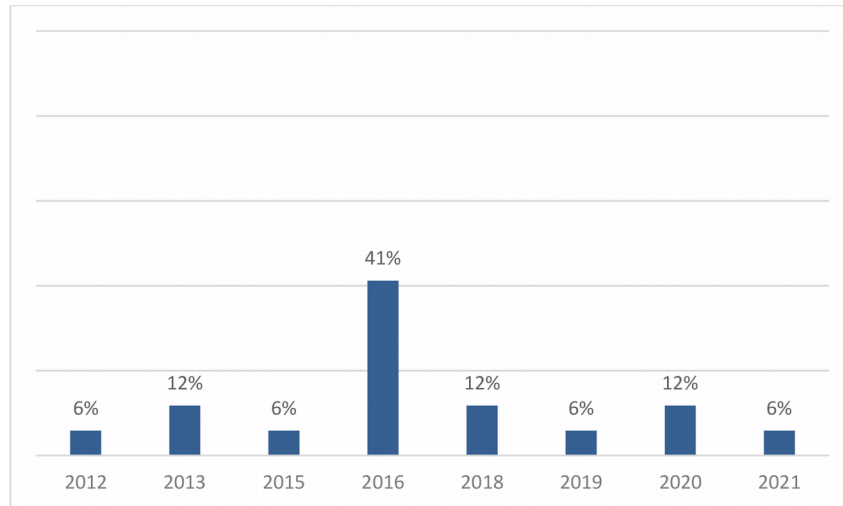


Figure 2. Studies published between 2010 and 2021 included in the review

In the context of the EHEA and in relation to the country of origin of the studies analysed (Figure 3), it can be observed that there is a greater frequency of studies from Spain (71%), followed by others from Finland and Turkey (12%), and finally, to a lesser degree, from the United Kingdom and the Netherlands (6%).

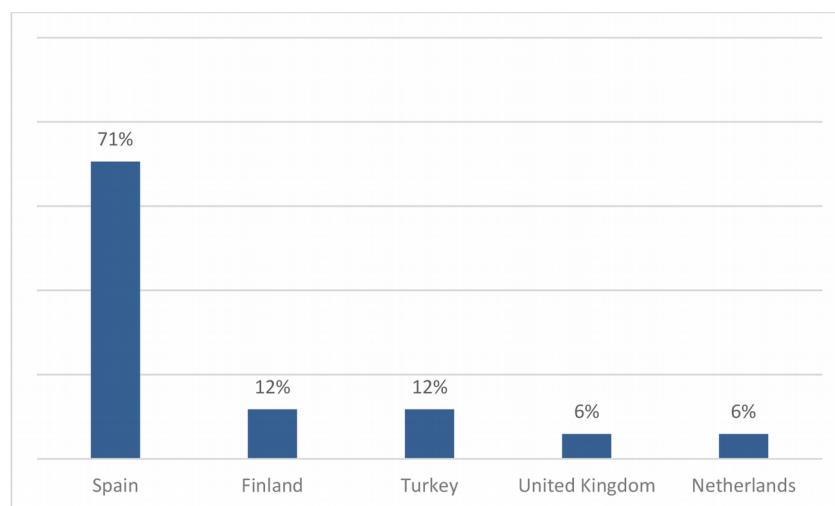


Figure 3. Country of origin of the studies analysed

3.2. Methodological Approach

As far as the methodological approach of the studies (Table 3) is concerned, three groups were found: the largest (88%) was of a descriptive nature, employing quantitative, qualitative or mixed methodologies to describe, based on the assessment experiments applied, the potential development of competences; experimental studies (6%), applying a pretest/posttest methodology; and studies of a descriptive comparative nature (6%). In relation to the methodological approach, it can be highlighted that the largest group of studies make use of a mixed research methodology (41% of the studies analysed), followed by a group of qualitative studies (35%) and a third group of quantitative studies (24%).

Design	Method	Study
Descriptive	Quantitative	Paz-Albo (2016)
Descriptive	Quantitative	Arribas, Manrique and Taberero (2016)
Descriptive	Qualitative	Lambe, McNair and Smith (2013)
Descriptive	Qualitative	Silva and López-Pastor (2015)
Descriptive	Qualitative	Rissanen, Kuusisto and Kuusisto (2016)
Descriptive	Qualitative	Admiral and Berry (2016)
Descriptive	Qualitative	Trigueros, Rivera and Moreno (2018)
Descriptive	Qualitative	Ruiz-Bejarano (2020)
Descriptive	Mixed	Gotkas and Demirel (2012)
Descriptive	Mixed	Georgeta, Cano and Cabrera (2016)
Descriptive	Mixed	Portillo and Cano (2016)
Descriptive	Mixed	Soria and Carrio (2016)
Descriptive	Mixed	Gillanders, Rodríguez and Nemina (2019)
Descriptive	Mixed	Pascual and Molina (2020)
Descriptive	Mixed	Niu, Niemi, Harju and Pehkonen (2021)
Experimental	Quantitative	Alkan (2013)
Descriptive comparative	Quantitative	Hamodi, Moreno-Murcia and Barba-Martín (2018)

Table 3. Methodological approach of the studies analysed

3.3. Assessment Procedures: Means, Strategies and Tools

As far as the assessment procedures employed in initial teacher training are concerned, a significant presence of assessment means was observed, i.e., actions and tests which were occasionally employed by trainers and served to garner information regarding the competences to be assessed. To a lesser degree, 24% contained assessment strategies, while only 18% demonstrated the use of assessment tools for evaluating the degree of acquisition and development of competences.

In relation to (1) the means of assessment (Table 4), the studies analysed reveal the presence of quite a variety, with digital means (blogs, portfolios, forums, chatrooms) standing out, along with those aimed at demonstrating practical capacities and skills (demonstrations, supervised practice, directed learning projects, *in situ* teaching), combined with other means for obtaining evidence of knowledge (examinations, tests of knowledge, reports and written work) and other capacities and skills (reflective journals, debates).

As far as (2) assessment strategies (Table 5) are concerned, in spite of the scarcity of their use, particularly worthy of note are those which imply the direct participation of students via self-assessment or peer evaluation, demonstrating a shared assessment strategy.

As for (3) the assessment tools present in the studies analysed (Table 6), it was also possible to observe a low presence, based fundamentally on self-assessment and self-scoring questionnaires, semantic differential scales and decision matrices, which trainers use to evaluate the degree of acquisition and development of the competences of future teachers.

In the comparison of the studies analysed on the combined use of assessment means, strategies and tools, only the studies by Pascual and Molina (2020) and Ruiz-Bejarano (2020) (comprising only 12% of the studies analysed), showed evidence of this combination. In the former study, the authors applied an assessment procedure in which they strategically combined a means of assessment (a reflective journal in which students narrated aspects of their teaching practice), an assessment strategy (self-assessment based on the writing of the reflective journal), and an assessment tool (a self-scoring questionnaire regarding their teaching practice). In the latter study, Ruiz-Bejarano (2020) applied an assessment procedure combining assessment means (demonstrations), strategies (self-assessment) and tools (self-assessment questionnaires). Both cases were able to rely on the participation and involvement of the trainee teachers, sharing the assessment with them.

Means of assessment	Study
Digital (blogs and portfolios, forums, chatrooms)	Gotkas and Demirel (2012) Lambe et al. (2013) Arribas et al. (2016) Soria and Carrio (2016) Georgeta et al. (2016) Portillo and Cano (2016) Hamodi et al. (2018) Ruiz-Bejarano (2020) Niu et al. (2021)
Practical (demonstrations, simulations, supervised practices, directed learning projects)	Silva and López-Pastor (2015) Paz-Albo (2016) Arribas et al. (2016) Hamodi et al. (2018) Trigueros et al. (2018) Ruiz-Bejarano (2020)
Tests of knowledge (written and oral examinations, written work)	Alkan (2013) Arribas et al. (2016) Trigueros et al. (2018) Hamodi et al. (2018) Ruiz-Bejarano (2020) Niu et al. (2021)
Debates	Arribas et al. (2016) Hamodi et al. (2018) Ruiz-Bejarano (2020)
Reflective journal	Rissanen et al. (2016) Hamodi et al. (2018) Pascual and Molina (2020)
Digital (blogs and portfolios, forums, chatrooms)	Gotkas and Demirel (2012) Lambe et al. (2013) Arribas et al. (2016) Soria and Carrio (2016) Georgeta et al. (2016) Portillo and Cano (2016) Hamodi et al. (2018) Ruiz-Bejarano (2020) Niu et al. (2021)

Table 4. Means of assessment present in the studies analysed

Design	Method	Study
Only teachers	Direct observation of student performance	Silva and López-Pastor (2015)
	Analysis of video recordings	Admiral and Berry (2016) Gillanders et al. (2019)
Student participation	Self-assessment; Peer evaluation	Silva and López-Pastor (2015)
		Trigueros et al. (2018)

Table 5. Assessment strategies present in the studies analysed

Assessment tools	Study
Self-assessment and self-scoring questionnaires	Pascual and Molina (2020) Ruiz-Bejarano (2020)
Semantic differential scales and decision matrices	Alkan (2013)

Table 6. Assessment tools present in the studies analysed

3.4. Competences Evaluated

Another of the aspects which stand out in the studies analysed is that related with how competences are addressed and evaluated (Table 7). On the one hand, the competences merely concerning teaching (1) are assessed in relation with the practical theoretical knowledge of the subject and the mastery of pedagogical, methodological and organisational dimensions (18% of the studies analysed). Also, generic competences (2) of an instrumental, interpersonal and systemic nature are evaluated in 41% of the studies analysed.

Competences	Type of competences	Study
Teaching	Pedagogical, methodological, organisational	Alkan (2013) Silva and López-Pastor (2015) Admiral and Berry (2016) Arribas et al. (2016) Paz-Albo (2016) Portillo and Cano (2016) Hamodi et al. (2018) Pascual and Molina (2020)
	Specific theoretical and practical knowledge of the subject	Alkan (2013) Hamodi et al. (2018) Trigueros et al. (2018) Gillanders et al. (2019)
Generic	Instrumental (digital competence; organisation and planning; analysis and synthesis; problem-solving; oral and written communication; handling of information; decision-taking)	Gotkas and Demirel (2012) Soria and Carrio (2016) Portillo and Cano (2016) Hamodi et al. (2018) Trigueros et al. (2018) Gillanders et al. (2019) Pascual and Molina (2020) Ruiz-Bejarano (2020) Niu et al. (2021)
	Interpersonal (working in a team; criticism and self-criticism; interpersonal skills; respect for diversity and multiculturalism; ethical commitment)	Lambe et al. (2013) Georgeta et al. (2016) Rissanen et al. (2016) Admiral and Berry (2016) Portillo and Cano (2016) Hamodi et al. (2018) Trigueros et al. (2018) Gillanders et al. (2019) Pascual and Molina (2020) Ruiz-Bejarano (2020) Niu et al. (2021)
	Systemic (initiative and spirit of enterprise; autonomous learning; ability to adapt; reflexive learning; research skills; creativity)	Lambe et al. (2013) Admiral and Berry (2016) Georgeta et al. (2016) Portillo and Cano (2016) Rissanen et al. (2016) Hamodi et al. (2018) Trigueros et al. (2018) Gillanders et al. (2019) Pascual and Molina (2020) Ruiz-Bejarano (2020)

Table 7. Competences present in the studies analysed

Seven of the studies analysed (41% of the total) are particularly worthy of note as they develop and assess both teaching and generic competences in a combined way. This is the case of the studies by Admiral and Berry (2016), Gillanders et al. (2019), Hamodi et al. (2018), Pascual and Molina (2020), Portillo and Cano (2016), Silva and López-Pastor (2015), Trigueros et al. (2018).

3.5. Relationship Between Assessment Procedures and the Acquisition of Competences

Last of all, with regard to the effects of the use of assessment procedures on the development of competences, the studies by Alkan (2013), due to its experimental nature, and Hamodi et al. (2018), for its descriptive comparative approach, can be considered to be particularly significant.

Alkan (2013), in her study on Chemistry teachers undergoing their initial teacher training, proposed two assessment experiments: an alternative process based on semantic differential scales or decision matrices (experimental group) and another more traditional process (control group) focused on the teacher and making use of a traditional knowledge-based examination. Following the self-perception questionnaire applied, the experimental group demonstrated a greater degree of awareness and mastery of the competences of the specialisation of Chemistry. Therefore, the alternative assessment experiment improved the development of competences in the mastery of the area of specialisation.

Hamodi et al. (2018), based on the use of a self-perception scale responded to by Physical Education teachers undergoing their initial training, found that the assessment means which require involvement and feedback, such as participation in the classroom via debates and portfolios, have a positive effect in the development of generic personal competences, such as interpersonal relationship skills.

Also from a descriptive perspective, the study by Paz-Albo (2016) on pre-service early years education teachers demonstrated the value of practical simulations for the development of the teaching competences of organisation, mainly in relation with interaction with families. Likewise, Silva and López-Pastor (2015), in initial teacher training in early years and primary education, applied an assessment model based on practical demonstrations and strategies such as observation, self-assessment and peer evaluation via the aforementioned demonstrations. The system proposed was deemed to be appropriate, activating teaching competences relating to pedagogy and organisation. In a similar way, Trigueros et al. (2018) and Ruiz-Bejarano (2020) studied the use of means such as practical challenges and strategies such as self-assessment and peer evaluation, demonstrating a connection in the perception of pre-service Physical Education and early years teachers between the development of generic competences of a communicative and critical nature and teamwork based on listening and dialogue.

On the other hand, the studies by Rissanen et al. (2016) and Pascual and Molina (2020) employed means and tools such as reflective journals and self-scoring questionnaires, as well as strategies such as self-assessment. Both studies observed the development of teaching competences relating to inclusive education and attention to cultural diversity.

In the studies by Gotkas and Demirel (2012), Georgeta et al. (2016) and Portillo and Cano (2016) on pre-service primary and secondary education teachers, the effectiveness of the use of blogs is recognised for the development of generic competences such as digital competence and autonomous learning, which serve as a foundation for improving methodological and organisational teaching competences, such as supporting students more than is necessary, being attentive to different rhythms of learning and creating interactive groups for more able students to help those who present more difficulties. In a similar way, the studies carried out on pre-service primary and secondary education teachers by Lambe et al. (2013), Soria and Carrio (2016) and Niu et al. (2021), demonstrated a connection between the use of assessment means such as e-portfolios and the development of generic competences such as digital competence and autonomous learning.

Last of all, Admiral and Berry (2016) and Gillanders et al. (2019), in their studies on pre-service primary education teachers, applied an assessment procedure based on a strategy of reflexive analysis of video recordings. The former study demonstrated achievements in the comprehension of the interconnection of personal and teaching competences in professional practice (for example, good interpersonal relationships and communication between the teacher and his/her students facilitates better classroom practices). The latter study demonstrated achievements in the development of methodological competences, such as the use of school cooperation.

4. Discussion

First of all, in accordance with the objectives of the present study, with the aim of discovering the main assessment practices in preservice teacher education, a generalised assessment model was found in which the basic involvement of the pre-service teachers was present. This is of importance in connection with the idea of professional development, as the awareness of competences influences the acquisition and mastery thereof, and gaining awareness of achievements and errors in real time is an essential requirement of assessment (Brown & Pickford, 2013; O'Connor et al., 2016).

Among the main assessment procedures found, a majority of assessment means stands out. It has been shown that there is a certain degree of variety favouring action and reflection on the part of the pre-service teachers. One of these is classroom practice, *in situ* teaching, simulations or supervised practice, activating the practical professional component, making it possible to demonstrate the mastery of knowledge, teaching skills and attitudes. This is the essence of teaching practice as it is contemplated by the European Commission (2013a) and the training recommendations of Ball (2013) and McDonald, Kazemi and Kavanagh (2013), who advocate the creation of true practical opportunities in which teaching competences can be activated and errors committed, enabling trainee teachers to anticipate them and reflect upon them via discussion. Based on these opportunities, other assessment means employed include reflective journals, blogs and e-portfolios, which make it possible to systematically record and share thoughts which arise before, during and after the teaching practice takes place. These make it possible to become aware of the connection between theory and practice (European Commission, 2013b; Perrenoud, 2010).

The low degree of presence of assessment strategies and tools in the studies analysed is striking. It seems that the most effective assessment procedures have to be proposed from the combined practice of such resources in a way in which the competences being developed can be practiced, recognised and verified (Brown & Pickford, 2013). Two of the studies analysed report the combined uses of the three resources (Pascual & Molina, 2020; Ruiz-Bejarano, 2020). In both cases, an itinerary is established based on the teaching practice of pre-service teachers and their reflective journals in terms of means of assessment. It is completed with the use of self-assessment and questionnaires (self-assessment and self-scoring) concerning the strategy and tools which assist in becoming aware of what has been learned and scoring the degrees of acquisition of competences. Both studies advocate, therefore, the involvement of the pre-service teachers, guaranteeing opportunities for action and classroom practice and then reflecting upon it in a self-critical way, learning to think, act and feel like teachers, helping to build their own professional identity in an active way (Bailey & Taylor, 2015; Forzani, 2014; O'Connor et al., 2016).

As far as the competences developed in preservice teacher education are concerned, teaching and generic competences are assessed, that is to say, those regarding teaching activity (practical and theoretical knowledge of the subject, pedagogical, methodological and organisational competences) and generic skills (instrumental, interpersonal and systemic), as is laid out in the Tuning Project (2003) and by the European Commission (2013a). It should be highlighted that six of the studies analysed deal with competences in a complete way, combining both groups of competences (Admiral & Berry, 2016; Gillanders et al., 2019; Hamodi et al., 2018; Pascual & Molina, 2020; Portillo & Cano, 2016; Trigueros et al., 2018). These studies are based on the involvement and active participation of trainee teachers via pedagogical methods and means of assessment which require classroom practice and interaction, which helps to gain a better understanding of the development of competences *in situ*. Thus, a training model is revealed which links the competences being developed with the pedagogical methods and the assessment procedures being promoted, articulating a coherent training triangle which ensures training in the competences to be acquired concerning the raising of awareness and ongoing improvement, as is recommended by Brown and Pickford (2013).

Furthermore, a training model is observed which, integrating teaching and generic competences in an interconnected way, makes it possible to understand the sense and usefulness of each of them in action. For example, in the cases of Admiral and Berry (2016), Gillanders et al. (2019), Pascual and Molina (2020) and

Portillo and Cano (2016), the competence of reflection is activated, via which it is possible to gain a better understanding of the connection between generic competences such as interpersonal skills (empathy, active listening, communication) and their importance in rethinking other teaching competences, which are pedagogical and organisational in nature (Perrenoud, 2010), such as the ability to identify and satisfy the learning needs of the students, by involving them and motivating them, which are not so easy to identify in the classroom for novel teachers, as is pointed out by Keller-Schneider et al. (2020).

Last of all, in seeking to identify the effect of the assessment practices applied to the development of teaching competences, the majority of the studies analysed demonstrate an investigative approach of a descriptive or descriptive comparative design, making use of quantitative, qualitative and mixed methods in an attempt to define the participants' perceptions. Several studies on the perception of competences make reference to this investigative approach, such as those carried out by Cabezas-González, et al. (2021) on the development of digital competence Keller-Schneider et al. (2020) on the development of teaching competences and Pareja et al. (2020) regarding the development of the competence regarding respect for diversity and multiculturalism.

Of the studies analysed, only in the case of Alkan (2013) is an experimental design observed, seeking to establish a cause-and-effect relationship based on the assessment practices developed and their influence on the development of competences among future teachers. This type of studies are empirically extremely suitable for gaining knowledge of the systematic interrelationships between variables (in this case, assessment and competences) regarding effectiveness and improvement following the practices carried out (Voogt et al., 2013). This would lead to the evolution and true verification of the degrees of acquisition of the competences being trained (Bailey & Taylor, 2015; Brown & Pickford, 2013). In line with O'Flaherty and Beal (2018), the low presence of empirical experimental studies which show the true effectiveness of the assessment procedures used in the training of teaching competences is recognised, advocating their use in preservice teacher education.

5. Conclusions

The review carried out of the specialised literature reveals that from 2010 (the deadline established by the Lisbon Declaration in 2007 for the inclusion of a competence-based approach in the context of training in the EHEA), there are not many studies and evidence to demonstrate the connection between the application of assessment procedures and their effectiveness for the development of teaching competences. Along these lines, the lack of studies which, from an experimental perspective, reveal the effectiveness of the assessment experiments carried out in the field of competence education for teachers is striking. On the other hand, it is also interesting to note the high number of studies which evaluate competences carried out based on the self-perception of those involved. In this sense, we believe that such a strategy could be complemented by other research perspectives.

It is also important to highlight the fact that, in putting into action the assessment procedures analysed, means of assessment are activated which, although they imply the active participation and involvement of trainee teachers, are not completed by their trainers with other strategies and tools which help to systematise, measure and validate the degree of acquisition of the competences being developed. In this sense, an in-depth review of assessment procedures and practices in structural coherence with the pedagogical methodologies to be implemented is recommended for teacher education, since it is through the connection of both elements that quality competence training will be possible.

As far as the way in which competences are approached in preservice teacher education is concerned, an interesting trend has been revealed towards integrated education in teaching and generic competences, demonstrating that teaching them in conjunction helps to better understand and put into practice teaching functions. This aspect is considered essential, and it is recommended that special attention be paid to transversal competences in preservice teacher education (especially interpersonal and systemic competences) as they help to humanise education and compensate for the possible drift towards an excessively instrumental perspective.

Last of all, certain limitations can be recognised in the present study, possibly in relation to the descriptors and search equations employed which, although they encompass the spirit of searching based on the main objective of this study, could be redefined, diversified and examine in more depth the quest for information and thus include a greater number of studies carried out in the line of research addressed.

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References

- Admiral, W., & Berry, A. (2016). Video narratives to assess student teachers' competence as new teachers. *Teachers and Teaching*, 22(1), 21-34. <https://doi.org/10.1080/13540602.2015.1023026>
- Alkan, F. (2013). The effect of alternative assessment techniques on chemistry competency perceptions and chemistry success of prospective science teachers. *Journal of Baltic Science Education*, 12(6), 774-783. <https://doi.org/10.33225/jbse/13.12.774>
- Alqassab, M., Strijbos, J.W., & Ufer, S. (2019). Preservice mathematics teachers' beliefs about peer feedback, perceptions of their peer feedback message, and emotions as predictors of peer feedback accuracy and comprehension of the learning task. *Assessment & Evaluation in Higher Education*, 44(1), 139-154. <https://doi.org/10.1080/02602938.2018.1485012>
- Arribas, J.M., Manrique, J.C., & Tabernero, B. (2016). Herramientas de evaluación utilizadas en la formación inicial del profesorado y su relevancia para el desarrollo de competencias profesionales en los estudiantes: visión de estudiantes, egresados y docentes. *Revista Complutense de Educación*, 27(1), 237-255. https://doi.org/10.5209/rev_RCED.2016.v27.n1.45724
- Bailey, J., & Taylor, M. (2015). Experiencing a Mathematical Problem-Solving Teaching Approach: Opportunities to Identify Ambitious Teaching Practices. *Mathematics Teacher Education and Development*, 17(2), 111-124.
- Ball, D. (2013). The Pedagogy of Video: Practices of Using Video Records as a Resource in Teacher Education. Paper presented at the *Annual Meeting of the American Educational Research Association*. San Francisco, USA.
- Boud, D., Lawson, R., & Thomson, D. (2013). Does student engagement in self-assessment calibrate their judgement over time? *Assessment & Evaluation in Higher Education*, 38(8), 941-956. <https://doi.org/10.1080/02602938.2013.769198>
- Brown, S., & Pickford, R. (2013). *Evaluación de habilidades y competencias en educación superior*. Madrid: Narcea
- Cabezas-González, M., Casillas-Martín, S., & García-Peñalvo, F.J. (2021). The digital competence of Pre-service Educators: the influence of personal variables. *Sustainability*, 13(4), 2318. <https://doi.org/10.3390/su13042318>
- Caena, F. (2014). *Initial Teacher Education in Europe: An Overview of Policy Issues*. Brussels: European Commission.
- Cano, E. (2015). The rubrics as an assessment tool of competency in higher education: use or abuse? *Revista de Currículum y Formación del Profesorado*, 19(2), 265-280.

- Corcoran, R.P., & O’Flaherty, J. (2017). Executive Function during Teacher Preparation. *Teaching and Teacher Education*, 63, 168-175. <https://doi.org/10.1016/j.tate.2016.12.023>
- European Commission (2013a). *Key Data on Teachers and School Leaders in Europe*. Brussels: Publications Office of the European Union.
- European Commission (2013b). *Supporting Teacher Competence Development for Better Learning Outcomes*. Brussels: Publications Office of the European Union.
- European Union (1999). *The Bologna Declaration*. Brussels: Publications Office of the European Union.
- European Union (2007). *The Lisbon Declaration. Europe’s Universities beyond 2010: Diversity with a Common purpose*. Brussels: Publications Office of the European Union.
- Feiman-Nemser, S. (2008). Teacher Learning: How do Teachers learn to teach? In Feiman-Nemser, S., McIntyre, D., & Demers, K.E. (Eds.), *Handbook of research on Teacher Education. Enduring Questions in Changing Contexts* (696-705). London, UK: Routledge.
- Forzani, F.M. (2014). Understanding ‘Core Practices’ and ‘Practice-Based’ Teacher Education: Learning from the past. *Journal of Teacher Education*, 65(4), 357–368. <https://doi.org/10.1177/0022487114533800>
- Georgeta, I., Cano, E., & Cabrera, N. (2016). Competency Assessment Tool (CAT). The evaluation of an innovative competency-based assessment experience in higher education. *Technology, Pedagogy and Education*, 25(3), 631-648. <https://doi.org/10.1080/1475939X.2015.1134635>
- Gillanders, C., Rodríguez, J.E., & Nemina, R. (2019). Impacto del uso de materiales audiovisuales para el aprendizaje de bailes tradicionales en la formación de estudiantes universitarios. *Revista Latinoamericana de Tecnología Educativa*, 18(2), 101-115. <https://doi.org/10.17398/1695-288X.18.2.101>
- González, J., & Wagenaar, R. (2003). *Tuning Educational Structures in Europe*. Bilbao: Deusto University.
- Gotkas, Y., & Demirel, T. (2012). Blog-enhanced ICT courses: Examining their effects on prospective teachers’ ICT competencies and perceptions. *Computers & Education*, 58(3), 908-917. <https://doi.org/10.1016/j.compedu.2011.11.004>
- Hagger, H., & McIntyre, D. (2006). *Learning teaching from teachers. Realizing the potential of school-based teacher education*. New York: McGraw-Hill.
- Hamodi, C., López-Pastor, V.M., & López-Pastor, A.T. (2015). Medios, técnicas e instrumentos de evaluación formativa y compartida del aprendizaje en educación superior. *Perfiles educativos*, 37(147), 146-161. <https://doi.org/10.22201/iisue.24486167e.2015.147>
- Hamodi, C., Moreno-Murcia, J.A., & Barba-Martín, R. (2018). Medios de evaluación y desarrollo de competencias en educación superior en estudiantes de educación física. *Estudios Pedagógicos*, 44(2), 241-257. <https://doi.org/10.4067/S0718-07052018000200241>
- Higgins, J.P.T., & Green, S. (2011). *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*. The Cochrane Collaboration.
- Keller-Schneider, M., Zhong, H.F., & Yeung, A.S. (2020). Competence and challenge in professional development: teacher perceptions at different stages of career. *Journal of Education for Teaching*, 46(1), 36-54. <https://doi.org/10.1080/02607476.2019.1708626>
- Lambe, J., McNair, V., & Smith, R. (2013). Special educational needs, e-learning and the reflective e-portfolio: implications for developing and assessing competence in pre-service education. *Journal of Education for Teaching*, 39(2), 181-196. <https://doi.org/10.1080/02607476.2013.765191>

- McDonald, M., Kazemi, E., & Kavanagh, S. (2013). Core Practices of Teacher Education: A Call for a Common Language and Collective Activity. *Journal of Teacher Education*, 64(5), 378-386. <https://doi.org/10.1177/0022487113493807>
- Moher, D., Shamseer, L., Clarke, M., Guersi, D., Liberati, A., Petticrew, M. et al. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Review*, 4(11), 1-9. <https://doi.org/10.1186/2046-4053-4-1>
- Niu, S., Niemi, H., Harju, V., & Pehkonen, L. (2021). Finnish student teachers' perceptions of their development of 21st-century competencies. *Journal of Education for Teaching*, 47(5), 638-653. <https://doi.org/10.1080/02607476.2021.1951602>
- O'Connor, J., Jeanes, R., & Alfrey, L. (2016). Authentic inquiry-based learning in health and physical education: a case study of 'r/evolutionary' practice. *Physical Education and Sport Pedagogy*, 21(2), 201-216. <https://doi.org/10.1080/17408989.2014.990368>
- O'Flaherty, J., & Beal, E. (2018). Core competencies and high leverage practices of the beginning teacher: a synthesis of the literature. *Journal of Education for Teaching*, 44(4), 461-478. <https://doi.org/10.1080/02607476.2018.1450826>
- Pareja, D., Leyva, J.J., & Matas, A. (2020). Percepciones sobre la diversidad cultural y comunicación intercultural de futuros maestros. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 23(1), 75-87. <https://doi.org/10.6018/reifop.403331>
- Pascual, C., & Molina, M. (2020). Evaluar para aprender en el Prácticum: una propuesta de evaluación formativa y compartida durante la formación inicial del profesorado. *Publicaciones*, 50(1), 183-206. <https://doi.org/10.30827/publicaciones.v50i1.15959>
- Paz-Albo, J. (2016). The influence of simulations on family engagement - prospective early childhood educators' perceptions. *Early Child Development and Care*, 188(2), 102-108. <https://doi.org/10.1080/03004430.2016.1202946>
- Perrenoud, P. (2010). *El desarrollo de la práctica reflexiva en el oficio de enseñar*. Barcelona: Graó.
- Portillo, M.C., & Cano, E. (2016). Regulating the writing process in the teacher training practicum guided by feedback at the University of Barcelona. *Cambridge Journal of Education*, 46(1), 55-79. <https://doi.org/10.1080/0305764X.2015.1011083>
- Rissanen, I., Kuusisto, E., & Kuusisto, A. (2016). Developing teachers' intercultural sensitivity: Case study on a pilot course in Finnish teacher education. *Teaching and Teacher Education*, 59, 446-456. <https://doi.org/10.1016/j.tate.2016.07.018>
- Ruiz-Bejarano, A.M. (2020). Educación inclusiva, criticidad y compromiso social. Innovación docente y aprendizaje-servicio en la formación inicial del docente. *Revista de Docencia Universitaria*, 18(1), 233-248. <https://doi.org/10.4995/redu.2020.12407>
- Seifert, T., & Feliks, O. (2018). Online self-assessment and peer-assessment as a tool to enhance student-teachers' assessment skills. *Assessment & Evaluation in Higher Education*, 44(2), 169-185. <https://doi.org/10.1080/02602938.2018.1487023>
- Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M. et al. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ*, 349(1), 1-25. <https://doi.org/10.1136/bmj.i4086>
- Silva, I., & López-Pastor, V.M. (2015). ¿Cómo vive el alumnado la evaluación en formación inicial del profesorado?. *@tic. Revista d'Innovació Educativa*, 14, 90-100.

Soria, V., & Carrio, M. (2016). Pedagogías disruptivas para la formación inicial del profesorado: uso de blogs como portafolio electrónico. *Profesorado. Revista de Currículo y Formación del Profesorado*, 20(2), 382-398. <https://doi.org/10.30827/profesorado.v20i2.10425>

Trigueros, C., Rivera, E., & Moreno, A. (2018). A vueltas con la evaluación de las competencias. Percepciones de los alumnos y docentes de los grados relacionados con la educación física. *Estudios Pedagógicos*, 44(2), 93-110. <https://doi.org/10.4067/S0718-07052018000200093>

Vaz, M., & Prada, M. (2016). *Manual de competências académicas. Da adaptação à universidade à excelência académica*. Edições Sílabo.

Voogt, J., Fisser, P., Pareja, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—a review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109-121. <https://doi.org/10.1111/j.1365-2729.2012.00487.x>

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