Research paper

Validation of the narrative analysis category system for dual teacher education

Maria Carme Peguera-Carré [a],[*] , Jordi L. Coiduras-Rodríguez [a] , Andreu Curto-Reverte [a] , Robert G. Valls-Figuera [b]

[a] Departament de Ciències de l'Educació, Facultat de Ciències de l'Educació, Psicologia i Treball Social, Universitat de Lleida, Lleida, Spain
[b] Departament de Mètodes d'Investigació i Diagnòstic en Educació, Facultat d'Educació, Universitat de Barcelona, Barcelona, Spain

ARTICLE INFO

ABSTRACT

This study focuses on the SCAN instrument, designed to assess reflective narratives of pre-service teachers in Primary Education within a dual system. The instrument promotes structured reflective writing and enables consistent evaluation of PTs. A total of 1560 PTs narratives were assessed using the eight-item instrument. Exploratory and Confirmatory Factor Analyses confirmed a three-factor structure: Description and Comprehension, Professional Transformation, and Documentation, with adequate fit indices (CFI = .97, RMSEA = .07, SRMR = .02). The instrument aligns with the competencies of the institution's curriculum and promotes a critical and argued professional vision for the development of reflective competencies through the narratives.

1. Introduction

Autobiographical texts in initial teacher education are part of a long tradition of recording learning about the teaching experience. In different formats, these narratives explain the relevant events of educational activity, interpreting and arguing the progress and difficulties experienced (Eutsler et al., 2023; Zhang et al., 2023). It has been extensively discussed that this narrative exercise fosters the development of the intellectual habit of thinking about one's own practice, in accordance with a training model based on participation, engagement and reflection (Hoffman et al., 2015). Although reflection is part of most teacher education programmes, various authors have expressed the problem of its conceptualisation (Clarà, 2015; Collin et al., 2013; Correa-Molina et al., 2010). There is agreement on the need to monitor and evaluate professional development itself. In this regard, reflection has been considered a meta-competence (Beauchamp, 2015; Correa-Molina et al., 2010) that enables awareness and supervision of professional learning. Narratives can contribute to the development of the professional vision (Goodwin, 1994), as '[…] socially organised ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" (p. 606), in this case the social group of Pre-service Teachers (PTs). Muchnik-Rozanov and Tsybulsky (2021) asserted that reflection contributes to the development of professional identity by predicting the teachers they will become, by formulating

expectations of themselves as educational professionals, and by expressing their concerns about their future practice.

1.1. Reflection and written narratives in teacher training

PTs' narratives —diaries or portfolios— have been considered effective approaches to reflection, but at the same time it has been highlighted that they may tend to be superficial if a consistent and systematic approach to them is not taken (Alt & Raichel, 2020; Rué et al., 2013; Tripto et al., 2016; Zhang et al., 2023). Reflection training and its assessment is considered a very complex issue since it cannot be directly inferred or taught in a classroom, nor can it be assessed in a traditional written test. Instead, it is recommended that the analysis of educational situations should be encouraged by means of certain regulatory principles and that the results achieved should then be evaluated in metacognitive exercises. Gibbs' reflective cycle (1988) presents six phases to develop these exercises, including a *Description*, the *Feelings*, an *Evaluation*, an *Analysis*, a *Conclusion*, and an *Action plan* on the practice that has been the topic of reflection. Thus, narrative texts present a two-fold formative challenge. On the one hand, the need to scaffold the expression of a personal inquiry to understand the experience and clarify uncertain situations. And, on the other hand, given their subjective nature, the need to define criteria for their evaluation.

Written narratives as a learning task provide PTs with opportunities

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to make connections between theoretical knowledge and practical learning about teaching performance (Clark et al., 2018; Hudson et al., 2021), and allow for the monitoring of PTs' learning derived from their classroom practice, personal analysis, and mobilisation of the profession's own concepts and frameworks in analysing the experience. These provide information on the literacy of PTs who acquire specific and professional terminology in relation to the curriculum, the pedagogical design and its implementation, and the learning outcomes. As the ALACT model proposes, PTs could develop a systematic reflection that refers to the *Action, Looking back on the action, Awareness of essential aspects, Creating alternative methods of action,* and *facilitating a Trial* phases of reflection (Korthagen & Kessels, 1999, pp. 13–14). However, this model "does not provide guidelines for how to arrive at such meaning-oriented reflection" (Korthagen, 2017, p. 395). In this regard, the Onion model (Korthagen, 2004) has been highlighted in the literature as it better considers the levels and contents of the reflection process (Yalcin Arslan, 2019). The Onion model is a six-layered framework that structures reflection to achieve deep critical analysis, and not only superficial descriptions. García-Lázaro and Reyes-de-Cózar (2025) state how this model could assist PTs navigate professional tensions during school-based field experiences.

Various authors also concluded in their research that writing to improve metacognitive awareness is effective (Gadsby & Cronin, 2012; Lang, 2018), using concepts that link to practice and allow them to reach higher levels of comprehension. Tripto et al. (2016) also found that structured writing prompts promote greater understanding and inference generation, in comparison to unstructured models. Combining written narratives with structured models not only strengthens PTs' analytical skills but also provides university tutors with actionable insights into their reflective depth (Korthagen & Vasalos, 2005). This synergy fosters intentional professional development, positioning field experiences as catalysts for improving initial teacher education. However, there is insufficient research on the relationship between the degree of structure and the quality of reflection. Assessment tools, if they have been communicated to PTs, also imply an organisational structure that acts as a scaffold.

1.2. Other experiences in evaluating teaching reflection texts

Reflective writing assessment instruments enable standardised assessment of the reflective ability of PTs' texts, while providing appropriate and meaningful feedback to university tutors. Among the most used tools in the assessment of reflective writing, Ward and McCotter (2004) proposed a generic rubric with three dimensions: (1) the *Focus*, or object of concern, on the actual practice, (2) the *Inquiry* process on the chosen problem, and (3) the perspective *Change* in the understanding of the situation and of performance in practice. For each of the dimensions, these authors proposed four qualitative levels: (1) *Routine*, not linked to change; (2) *Technical*, instrumental answer to specific situations without change of perspective; (3) *Dialogic*, inquiry part of the process, involving cycles of questions and actions; and (4) *Transformative*, when fundamental questions and change in practice are expressed.

Wald et al. (2012) designed the Reflection Evaluation for Learners' Enhanced Competencies Tool (REFLECT) to evaluate reflective narratives in medical education. They defined the following criteria: *Writing spectrum, Presence, Description of conflict or disorienting dilemma, Attending to emotions, Analysis and meaning making,* and, when considered relevant or necessary, *Attention to assignment.* This tool assesses the text with four levels for each criterion. The first level, *Habitual action,* or lacking deep introspection, with a superficial and descriptive explanation. The second level is called *Thoughtful action or introspection,* which is characterised by impressions and experiences. Although these may not be fully explored at this second level, the meaning of the experiences, their impact on PTs' learning, the effects on the context and the appraisals may refer to an awareness of one's own learning. The third level,

Reflection, refers to incipient reflection, with a narrative that relates PTs' experience and learning, even though it does not yet develop into inferences. The last level, *Critical reflection,* involves an in-depth and critical examination of assumptions, values, beliefs and prejudices, as well as an exploration of the consequences of actions, and an awareness of transformation or change in the perspective of analysis or in the associated practice.

Alsina et al. (2017) developed the Rubric for Narrative Reflection Assessment (NARRA) as an instrument for the formative assessment of reflective narrative. Its design considers factors linked to learning and teacher development, as well as levels for achieving critical reflection. It includes nine specific indicators for the assessment of reflective writing in higher education which are grouped into four elements: (1) *The academic or professionalising experience, situation or activity;* (2) *Ideas and prior beliefs;* (3) *Inquiry and targeting;* (4) *Transformation.* Alsina et al. (2018) validated the rubric and proposed five dimensions: *Description, Intrapersonal inquiry, Interpersonal inquiry, Argumentation* and *Improvement.*

Based on the aforementioned instruments and on previous literature, some common yet differently named aspects were found. These are the establishment of the object or focus of analysis, expressed by means of a contextualised description of the situation in question (van Es et al., 2017; Zhou et al., 2023); a personal inquiry based on one's own educational experience and the consultation of different sources of information (Leroux & Portelance, 2018; Resch & Schrittesser, 2023); and the argumentation of the new understanding achieved as an expression of a change of perspective with regard to the initial approach (Barth-Cohen et al., 2018; Du Plessis & Dreyer, 2024).

Taking into account these previous studies, Peguera-Carré et al. (2021) proposed an instrument with a system of categories for the analysis of texts. Based on the assumptions of analysis and review of the action set out in the syllabus, and following NARRA (Alsina et al., 2017) and the Gibbs' reflective cycle (1988), a text structure is proposed to address: (1) the presentation of an unexpected or challenging situation, which, going back to the described theoretical models, is aligned with the *Environment* and *Behaviour* reflection levels in the Onion model (Korthagen, 2004), (2) a personal inquiry in which different professionals and sources of information should be consulted, which is aligned with the *Looking back on the action* phase in the ALACT model (Korthagen & Kessels, 1999), and (3) a semi-structured narrative incorporating an explanation of the experienced change in understanding, which can be translated into practice, also aligned with the *Awareness of essential aspects* and *Creating alternative methods of action* phases in the ALACT model.

1.3. Present study

From our context in the dual system, the need to design an *ad hoc* instrument for this specific training scenario was addressed. In this context of a dual system, PTs have a total of 40 % face-to-face activity in schools from the first to the fourth year of the degree. Throughout the degree, PTs attend different types of schools, including urban, rural and culturally diverse ones, as well as those located in a disadvantaged, medium or high socioeconomic context. The aim of this dual system is to ensure they get to know the full range of student populations and learn about teaching practice in them. Considering this specific context, this study required an *ad hoc* instrument as it is in line with the curriculum of the institution where it is undertaken, with a dual model of studies, in which the Orden ECI/3857/2007 is applied. This official order establishes the competences that students of the primary education degree must have on completion of their studies.

The Narratives Analysis Categories System (SCAN) instrument takes into account the aforementioned literature, and responds to the need to analyse PTs' narratives during their curricular internships in the study's specific context (Peguera-Carré et al., 2021). This instrument was designed with several purposes in mind: to facilitate an illustrative

structure for the PTs' reflection texts, to share common criteria with university tutors, and to achieve a more objective evaluation. Thus, the main objective of this study is to validate the SCAN assessment instrument in pre-service teacher education.

2. Material and methods

2.1. Approach, design and sample

This study included the analysis of 1560 narratives from PTs (57.05 % female; mean age between 19 and 22 years) enrolled in the 2020/21, 2021/22 and 2022/23 academic years to validate the SCAN assessment instrument. They were in the first (n = 850), second (n = 298) and third year (n = 412) of the Primary Education Degree within a dual system at a southern European university.

The SCAN instrument is implemented in the first three years of the degree. Therefore, PTs are required to produce narrative texts, with an open-ended theme, about their own performance in a classroom setting. To introduce this work at the Primary Education Degree, some activities are established in the university lessons. In particular, before PTs start to write their narratives, the university tutors present a guiding script, following the same structure and order as the SCAN instrument. In this initial phase, to inform PTs about how to write about their own practice, and train them to understand and use this instrument, three simulated assessments of narratives from previous students are conducted, intentionally selecting examples with both high and low evaluations. After the first submission of PTs' narratives, feedback on the evaluation with SCAN is provided by university tutors through a seminar. Moreover, during the first, second and third year of the Primary Education Degree, PTs participate in various training sessions, including debates, seminars, and presentations by school mentors. These sessions aim to facilitate the integration of classroom experience with theoretical frameworks, and the concept and implementation of reflective practice.

It is also important to highlight that, before a narrative submission, school mentors conduct an initial non-evaluative review to avoid potential issues related to data protection or the use of sensitive data about schools—e.g. personal information about pupils, primary school teachers, and other professionals—. Also, they reviewed the narratives as an exercise of transparency and recognition of their role, as well as to validate the adequacy and consistency of the information provided. Then, using the SCAN instrument, some of these narratives are analysed not only by the PTs themselves, but also by their classmates and their university tutors. This study focuses on the data obtained from the evaluations of narratives conducted by the university tutors using SCAN to validate this instrument.

2.2. Instrument

The rubric of the SCAN designed by Peguera-Carré et al. (2021) was applied to analyse the evolution of narratives produced by PTs during their dual Primary Education practicum. The aim of this instrument is to promote structured and systematic writing and, at the same time, provide more specific and less general or diffuse feedback and assessment. In the aforementioned study, the instrument was validated by a group of experts considering the relevance and clarity of each item. The validity of the instrument measured by Aiken's V test was .83. SCAN demonstrated internal consistency by the coefficients obtained with Cronbach's alpha (.882 and .890). Also, in the study the instrument's application showed an improvement on the PTs' narratives.

This instrument comprises eight items, and each item includes five levels of achievement. SCAN describes levels 1, 3 and 5 textually to help evaluators accurately score the PTs' narratives. Following Good et al. (2006) and Peguera-Carré et al. (2023) proposals, levels 2 and 4 are not described, which allows for an intermediate assessment.

PTs structure and write their narratives taking into account these items. University tutors support them in answering these items by

providing them with various guiding questions for each item. The narratives' structure has four parts, starting with a description of the situation, where they contextualise the educational situation to facilitate an understanding of it (Peguera-Carré et al., 2021). Here, PTs include the classroom climate, an explanation of the learning activity being developed, the intervention design, the methodology and the resources needed. Secondly, they provide argumentation for the intervention with theoretical frameworks and evidence about the practice. Thirdly, PTs provide a more in-depth explanation, giving a critical interpretation of their practice to identify the most relevant elements, strengths and weaknesses. Also, they reflect on their decisions, the competencies mobilised, and possible alternatives for future interventions. The last part of the narratives could be considered a cross-cutting element, since it involves formal aspects such as linguistic accuracy, and citations and references of the theoretical frameworks used in the narratives.

2.3. Procedure and data analysis

This study was conducted in accordance with the recommendations of the Declaration on Bioethics and Human Rights (UNESCO, 2009). Prior to analysing the PTs' narratives with SCAN, permission was sought from all subjects in relation to data collection and analysis. Additionally, all data was anonymised beforehand, following the guidelines set out in the European Code of Conduct for Research Integrity (ALLEA, 2023).

All 1560 narratives were analysed by university tutors (n = 9) using SCAN, all of whom were tutors for the practicum of the PTs in the sample. These tutors had previously expressed their agreement to participate in the study and to perform analysis of the narratives. To ensure reliability, tutors who participated in this analysis had at least 5 years of experience as university tutors. In addition, four of the university tutors participated in the design and validation of the original instrument and all tutors attended a seminar prior to the analysis to share and establish a common understanding of the items of the instrument. During this seminar, tutors also performed specific training in the use of the SCAN instrument, where different examples of high, medium and low level narratives were analysed. Thus, the university tutors involved in this study were trained for the scoring of the narratives with the instrument to reach an interrater reliability. An iterative process involving multiple rounds of evaluation was conducted to assess the aforementioned narratives and discuss the application of each SCAN item. If there were cases of discrepancy, university tutors discussed the interpretation to reach an agreement. By the final round, a consensus superior to .80 was achieved. The data were collected using a five-point Likert-type scale, through which university tutors were asked to assess the included items.

The factor dimensionality of the eight-item version of SCAN was evaluated using Exploratory Factor Analysis (EFA). EFA was implemented to evaluate the three-factor structure of the instrument. The Kaiser–Meyer–Olkin (KMO) sample adequacy test and Bartlett's test of sphericity were used as indicators of EFA adequacy, where the KMO value should be above .70 and Bartlett's test of sphericity should be significant (Tabachnick & Fidell, 2019). In accordance with the literature on the topic, items with low communality (<.20) and low factor loading (<.40) were eliminated (Child, 2006; Costello & Osborne, 2005). The factors were extracted using the maximum likelihood method with the correlation matrix among the items as input data. The criterion for selecting the number of extracted factors was an eigenvalue greater than 1. An oblique (Oblimin) rotation was employed, allowing for the correlation of the latent factors.

Confirmatory Factor Analysis (CFA) was applied to the data obtained from the SCAN instrument. This model was specified with three correlated latent variables corresponding to the Description and Comprehension, Professional Transformation, and Documentation dimensions. Each of the three latent factors was measured with its corresponding items. Normality assumptions were met for all the items in the evaluated instrument, with skewness and kurtosis values being less than 1. Model

evaluation was conducted using the χ2 value, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardised Root Mean Square Residual (SRMR). Low and non-significant values in the χ2, values above .90 in the CFI and the TLI, and values below .09 in the RMSEA and the SRMR are generally considered indicative of an acceptable fit with the observed data (Hu & Bentler, 1999). The CFA model was estimated using the maximum likelihood method in SPSS software.

3. Results

3.1. Exploratory factor analysis (EFA)

The overall EFA findings suggest a consistent factor structure of the instrument. The factor structure was therefore very clear and consistent with the SCAN instrument theoretical underpinnings. EFA goals were (a) to generate a range of items to represent the construct, and (b) to examine the factorial structure and reliability of SCAN.

The Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity indicated that the data were suitable for conducting EFA; the KMO value was .876 and Bartlett's test of sphericity was significant (p < .001). The minimum communality value was .589 (Classroom intervention), and this model explained 67.38 % of total variance. All factor loadings are shown in Table 1.

Thus, from a multidimensional perspective, the SCAN instrument consists of three main dimensions: Description and Comprehension, with four items; Professional Transformation, with two items; and Documentation, with two items.

The first factor, Description and Comprehension, focuses on the classroom situation and the contextual characteristics, as well as what learning situation is taking place, when it is happening and how it is being developed, and the reasons or justifications that PTs give for their intervention in the classroom. Also, written expression is considered in this factor (e.g., educational terminology, adequacy and clarity of ideas, synthesis and grammatical accuracy).

The second factor, Professional Transformation, consists of Teaching competencies and Development opportunities. In other words, PTs describe the skills they mobilise during their teaching interventions. In this sense, they should show a critical vision to identify improvement opportunities, setting goals and educational paths for their professional development.

The third factor, Documentation, comprises the teaching evidence or complementary materials included to document the learning situation (e.g., didactical resources, learners' productions or evaluation reports), establishing a consistent and relevant narrative connection. Also, this factor takes into account the references used in the narratives (e.g., the literature, the theoretical frameworks, the mobilised concepts, and theories employed) to contrast their teaching practice in a relevant way.

3.2. Confirmatory factor analysis (CFA)

Following on from EFA, CFA was conducted to validate the structural dimensions assessed by the instrument's scales and confirm their alignment with the extracted factors. A measurement model consisting of observed variables (items) and latent factors (dimensions) was estimated. CFA was performed using AMOS v.18, requiring complete data for all items. Cases with missing data were therefore excluded. Model fit was evaluated using specific indices (Table 2): ratio between chi-square test (χ²; Satorra & Bentler, 2001) and degrees of freedom, with a value less than 3; Comparative Fit Index (CFI; Bentler, 1990), the value of which must be greater than .90; Root Mean Square Error of Approximation (RMSEA), which must be less than .80 (Bentler, 1998); and Standardised Root Mean Square Residual (SRMR; Hu & Bentler, 1999), which must also be less than .80.

CFA of SCAN confirmed the factor structure identified by EFA, which was also aligned with the conceptual structure of the scale and its previously mentioned dimensions. Comparative data of the initial and final fit models are presented in Table 2. As can be seen, the PCMIN/DF indicated a reasonable goodness of fit. Also, incremental fit indices (IFI, TLI, CFI) were acceptable with values greater than .90, while the overall RMSEA and the SRMR were both adequate with values of .07 and .02, respectively.

Table 2
Indices and fit criteria for the assessment of the model's fit.

Index	Acronym	Fit Criterion	Factors	
			Initial	3 Factors
Relative χ², (χ²/df)	PCMIN/DF	≤2 adequate ≤3 acceptable ≤5 reasonable	7.452	4.83
Comparative Fit Index	IFI	1 perfect	.949	.97
	TLI	≥.95	.915	.94
	CFI	excellent ≥.9 acceptable	.948	.97
Root Mean Square Error of Approximation	RMSEA	≤.05 adequate	.091	.07
	LO90		.076	.05
	HI90	≤.08 acceptable	.106	.08
Standardised Root Mean Square Residual	SRMR	≤.05 adequate ≤.1 acceptable	.0388	.02

CFA indicated that the model's fit and the factor loading were adequate. Fig. 1 shows that the minimum loading was .50 for Written expression in Factor 1 and Teaching evidence in Factor 2, and the maximum was .83 for Argumentation in Factor 1. The correlations between the three factors are high, especially between Factor 1 and 3, and Factor 2 and Factor 3.

Table 1
Factor loadings in the rotated component matrix.

Item	M	SD	Skewness	Kurtosis	Communality	F1 Description and Comprehension	F2 Professional Transformation	F3 Documentation
Written expression	3.19	0.97	−1.23	1.19	.384	**.772**	.061	.151
Contextualisation	3.19	0.86	−1.05	1.08	.531	**.746**	.266	.157
Classroom intervention	2.90	0.88	−0.83	1.07	.621	**.619**	.455	.227
Argumentation	2.75	0.98	−0.64	0.12	.581	**.574**	.432	.270
Development opportunities	2.42	1.04	−0.21	−0.59	.507	.373	**.802**	−.058
Teaching competencies	2.24	1.35	−0.37	−1.02	.453	.147	**.738**	.297
Teaching evidence	2.59	1.34	−0.78	−0.50	.360	.349	.030	**.818**
References	2.19	1.19	0.22	−1.13	.391	.075	.511	**.623**
Cronbach's alpha						.779	.662	.485

NOTE: M = Mean; SD = Standard Deviation.

4. Discussion

This work focused on the validity of the SCAN assessment instrument in pre-service teacher education. The results are reviewed according to the three statistical factors resulting from the SCAN instrument validation process, detailing the coherence and pedagogical approach behind the factorial associations.

In relation to the first factor (F1), Description and Comprehension, PTs focus on providing initial contextualised data about their teaching interventions. In order to narrate their professional experiences, in accordance with the studies by Zhou et al. (2023) and van Es et al. (2017), they tend to use the description of the context and the argumentation, which they themselves construct and set out in their narratives (Contextualisation and Argumentation items). The PTs describe the classroom situation, taking into account the *Environment* reflection level (Korthagen, 2004), by referring to the classroom climate, the instructional content, the organisation of space, the materials and scaffolding, among other aspects they consider relevant for understanding the scenario. Likewise, they place particular emphasis on their own actions, as in the *Behaviour* reflection level (Korthagen, 2004), and those of the students as a communicative exchange in instruction and learning. The university tutors provided different guiding questions to the PTs to support them in structuring narratives (Tripto et al., 2016) and their reflection process in each item of the SCAN. For example, for the Contextualisation item, one of the questions provided was "Do I take into account the variables of time, the organisation of the classroom, the diversification of materials, the relational climate … ?". In addition, in this description, they often highlight thematic focuses that capture their attention and reasoning. On the one hand, there is an explanation that aims to be objective about the events that took place (Classroom intervention item) and, on the other, a personal interpretation consistent with the description (Gibbs, 1988), adopting their own viewpoint, related to their experience and their theoretical knowledge base. The PTs have the opportunity to highlight elements of the situation, typically those aspects that are more problematic, to improve their understanding. They may also express some hesitation in applying professional and specific knowledge, as they have yet to become fully embedded in the professional culture or the community of practice (Lave & Wenger, 1991). Regarding the Argumentation item, two different examples from the PTs' narratives are provided. PT1 places an opinion without specific arguments and theoretical foundation:

'I think this is a great experience for this early age group, as it allows them to learn and see very well different procedures, to address issues of importance to children and to exemplify a common habit among them, and better comprehend the importance of cleaning their hands.' (PT1)

In contrast, PT2 describes an intervention decision taking into account the literature and providing the reference:

'I also proposed that they make the drawings and operations on a sheet of paper. As Wu & Rau (2019) tell us, drawing in mathematics perfects the precision in what the boys and girls mean and what they want to say about the process.' (PT2)

As highlighted in the literature, this description and comprehension of the classroom intervention should include one's own educational experience, but also the reinforcement of these ideas based on different sources of reliable information (Leroux & Portelance, 2018; Resch & Schrittesser, 2023). Moreover, the importance of having high-level writing skills also appears in this first factor (Written expression item), where the length and subjective information that PTs tend to use in their narratives is greater than when they focus on other elements or parts of the texts. Norman and Spencer (2005, p. 26) stated that "when entering teacher education programs, teacher candidates have numerous opportunities to write both inside and outside of school and have been exposed to a variety of pedagogical approaches".

The second factor (F2), Professional Transformation, shows the need to pick up on the problematic objects present in F1 with the purpose of analysing not only the elements that comprise them, but also their relationships. This responds to the need for new knowledge that favours a change of perspective and, sometimes, of action (Development opportunities item), since "teachers can decide how to improve their instruction in ways that support learning only if they attend to how the students responded to their instruction and interpret […] the ideas and actions their students expressed" (Arias et al., 2024, p. 3). Thus, this factor is aligned with Gibbs' reflective cycle (1988), which considers the phases *Conclusion* and *Action plan* on the practice, and Korthagen's (2017) proposal, which considers creating alternative methods of action. In relation to this item, two different examples from the PTs' narratives are provided. PT3' excerpt shows a low level of accuracy in the development opportunity outlined: 'An area for improvement was that I lacked some confidence in leading the class and maintaining its fluency, but the session remained under control at all times.' (PT3)

In contrast, PT4' narrative proves a development opportunity based on the specific intervention and providing information about what happened during its development:

'Reflecting on this last session, I have observed different weaknesses during the development of the intervention […] I need to improve my control of time. In this case, I gave too much prominence to a group, making the second have less time to work properly and achieve the contents worked to draw the conclusions of the session.'(PT4)

In this second factor, it is also relevant that, in their narratives, the PTs address the change or transformation they make in the course of this narrative inquiry about the professional situation described. This involves going beyond the context, pedagogical events and experiences to focus on their professional development (Hanna et al., 2020). With this purpose in mind, as Du Plessis and Dreyer (2024) and Trillo-Alonso et al. (2017) expressed, PTs must critically reflect on the teaching competencies they have mobilised and developed in their teaching practice (Teaching competencies item). For example, for the Teaching competencies item, one of the questions provided was "How do I identify and express a critical view on the competencies and/or resources mobilised, and those I should have mobilised?". This assessment allows them to identify which acquired competencies are perceived as strengths, as well as those seen as areas for future improvement (Fernández-Díaz et al., 2016). As seen in other studies, PTs reflected on a teaching situation of their practicum and identified strengths, weaknesses and possible successful teaching strategies that they could apply in their future teaching situations (Barth-Cohen et al., 2018; Burhan-Horasanlı & Hart, 2024). Thus, F2 exemplifies the transformation discussed by various authors (Alsina, 2017, 2018; Peguera-Carré et al., 2021; Wald et al., 2012; Ward & McCotter, 2004) as a manifestation of a better understanding of teaching performance.

The third factor (F3), Documentation, shows consistency in the presentation of the sources and processes used to reach explanatory ideas and alternative courses of action. Consideration of documentation promotes a more coherent discourse with the resources and materials consulted. Likewise, it enables self-perceptions of professional performance to be contrasted with the implementation displayed in the classroom (Özaşkın-Arslan et al., 2024). On the one hand, contributions such as students' work, classroom materials, photographs or videos illustrating a pedagogical event experienced in the classroom, among other practice-based evidence (Teaching evidence item), could be pivotal in supporting and enriching narratives about PTs' professional practice (Saiz-Linares & Ceballos-López, 2021; Wai-Yan et al., 2021). About this item, two different examples from the pre-service teacher are provided. Fig. 2 shows a final product of the students, where they measured the sugar contained in each kind of product. Fig. 3 illustrates a buoyancy lesson with the data collection made with daily life items.

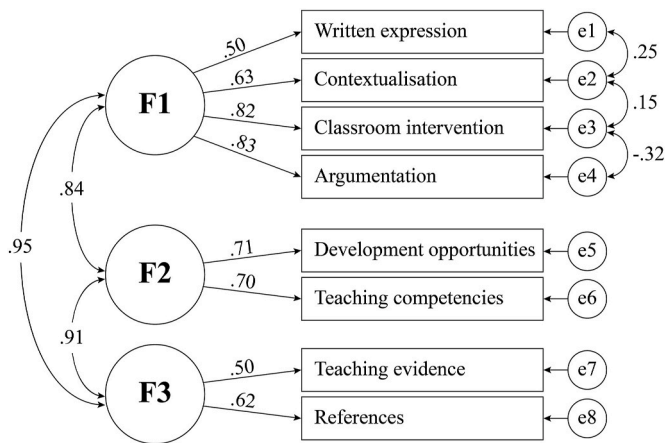On the other hand, the References item of the third factor facilitates

Fig. 1. Confirmatory Factor Analysis of the SCAN instrument
NOTE: Standardised Factor Loadings and Latent Factor Correlations were significant at p < .001. Factor 1 (F1) is called Description and Comprehension; Factor 2 (F2), Professional Transformation; and Factor 3 (F3), Documentation.

Fig. 2. Classroom material included in PT5′ narrative.

Fig. 3. Photograph included in PT6′ narrative.

the integration of theory derived from theoretical frameworks and scientific research into PTs' professional practice. For example, for the References item, one of the questions provided was "How do I argue my actions/performance from the theoretical frameworks? What implicit beliefs or theories may have influenced these actions?". There is abundant literature emphasising the importance of connecting theory with practice; authors ranging from Dewey (1904) to more contemporary researchers have extensively explored this research direction (Allen & Wright, 2014; Kim & Hannafin, 2008; Leroux & Portelance, 2018; Resch & Schrittesser, 2023). By way of example provided by Bernstein's work, a PT in the third year of a Bachelor's programme, after acknowledging difficulties in vocabulary among his students, claimed to understand better the relationship between the richness of vocabulary and the families' living conditions following a conversation with his school

mentor about it and reading a text on the sociology of education.

To sum up, the three factors—Description and Comprehension, Professional Transformation, and Documentation—are highly correlated (Fig. 1), which allows the adequacy of SCAN to be confirmed for the assessment of PTs' reflective narratives within their teacher education. All three factors offer an integrated approach to the PTs' professional development. F1 highlights how PTs contextualise their teaching interventions, combining factual descriptions with personal interpretations, emphasising written expression and argumentation. F2 reflects the transformation they are experiencing by critically analysing their teaching practice, identifying areas for improvement and developing new pedagogical perspectives. F3 stresses the importance of basing these reflections on specific evidence and theories, connecting practice with scientific knowledge to enrich their narratives.

5. Conclusions

In this study, the need to construct and validate an *ad hoc* instrument to analyse PTs' narratives derived from their specific training during curricular internships was addressed. The SCAN instrument responds to this need in pre-service teacher education, and EFA and CFA confirmed and validated its clear and consistent three-factor structure: Description and Comprehension, Professional Transformation, and Documentation. In addition to this validation, the present study has made it possible to integrate these quantitative results with qualitative ones, through examples and excerpts from the PTs' narratives.

One of this study's main contributions is the relevance that the instrument gives to the competencies of the institution's curriculum. PTs' particular experience must be contrasted with the competencies of the curriculum. By doing so, the competencies gain value as a useful reference point for assessment of their professional development. A second contribution is the consistency shown in the third factor, which requires PTs to provide evidence of practice and theoretical frameworks. Incorporating such evidence of the situation into the reflections is meaningful in terms of reaching an understanding of that situation, and also of the possible responses or alternative courses of action. Therefore, it is not only about considering theoretical sources, but also about observable facts and their documentation. Moreover, using the SCAN instrument assists university tutors to realise if PTs are connecting the theoretical explanations of concepts developed in the university lessons with their professional practice, and it also could help them to have evidence of their practicum to provide more specific guidance and mentorship (Soto-Lillo & Quiroga-Lobos, 2021).

The evaluation of the narratives from PTs' teaching practice has several significant implications for teacher education. It helps students organise their reflections within a clear structure (Tripto et al., 2016), and the incorporation of evaluation instruments like SCAN into teacher training could equip future PTs with self-reflection frameworks for their practice, enabling them to question and integrate changes into their instructional methods (Wald et al., 2012; Ward & McCotter, 2004). It promotes inquiry and reflection, and developing metacognitive skills (Alt & Raichel, 2020; Lang, 2018). Additionally, the SCAN instrument also opens up the possibility of self and peer-assessment, as it fosters a shared understanding of narrative evaluation by the faculty and the PTs themselves.

The present study has several limitations, but it also leads to future research opportunities. Firstly, the SCAN instrument enables self-assessment, but this study does not present a comparison between tutor assessments and self-assessments. A future study focused on this possibility could provide further insights into the development of reflective competencies among future teachers, highlighting potential gaps, and divergences in perception. Specifically, this could also lead to describing how PTs experience narratives, how they use the instrument, and what is their perception about its usability in comparison with the tutors' perception. Secondly, the lack of a comparative study that assesses the reflective methodology implemented through written

narratives, including a group with the use of the SCAN instrument and another without, limits the understanding of how this variable affects PTs in terms of reflexivity and professional practice. To address these limitations, future research should focus on conducting comparative studies between different university institutions and employing various methodologies, with or without SCAN, to analyse the possible factors that may influence the development of narratives and to obtain a broader and more detailed view of the instrument's impact. Thirdly, the lack of specific data on the impact of dual training also restricts the evaluation of the instrument's effect on the integration of theoretical and practical learning. The analysis of the impact of dual training on PTs' reflexivity and professional practice could be fundamental to ensuring the effective integration of theoretical and practical learning. Thus, implementing an experimental study with a control group that does not participate in dual training, but does use SCAN, could provide valuable data on this variable. Additionally, the use of the SCAN instrument within a dual system opens up new possibilities for potential studies focusing on how PTs apply the instrument in their daily professional practice, and also on the perceptions and use of the instrument by host institutions and school mentors, as well as other educational agents involved in the internship. This could help to ascertain possible improvements in SCAN's implementation and use.

CRediT authorship contribution statement

Maria Carme Peguera-Carré: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jordi L. Coiduras-Rodríguez:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Investigation, Funding acquisition, Conceptualization. **Andreu Curto-Reverte:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Robert G. Valls-Figuera:** Writing – review & editing, Visualization, Validation, Software, Methodology, Formal analysis.

Funding

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Jordi L. Coiduras-Rodriguez reports financial support was provided by Government of Catalonia Agency for Administration of University and Research Grants. Maria Carme Peguera-Carre reports writing assistance was provided by University of Lleida Institute of Languages. Maria Carme Peguera-Carre reports a relationship with University of Lleida that includes: funding grants. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

Data availability

Data will be made available on request.

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