Elicitation of Teachers' Mind Frames: An Approach to Optimize Teaching Effectiveness

Laura Menichetti, Università degli Studi di Firenze, Italy
Silvia Micheletta, Università degli Studi di Firenze, Italy

The Barcelona Conference on Education 2025
Official Conference Proceedings

Abstract

Educational research highlights how teachers' characteristics and competencies can significantly impact student outcomes and motivation. International evidence highlights the effectiveness of specific teaching strategies. However, the widespread adoption of these strategies faces several challenges. On the one hand, there is cultural resistance to making classroom behaviours visible through practices such as lesson study and microteaching, as well as to accepting peer feedback. On the other, teachers' mental frameworks and deeply rooted beliefs often shape their teaching decisions, operating implicitly and hindering the application of evidence-based practices. The present study is based on the administration of a validated scenario-based questionnaire designed to identify teachers' behaviours in relation to competencies and strategies recognized as effective. The sample comprised more than 850 teachers, either currently employed in the profession or undergoing training. Data analysis revealed that many teachers do not align their practices with scientifically supported teaching strategies. Despite years of experience and university-level training, teachers' mental frameworks often remain resistant to change and, in some cases, even strengthen over time. Although minor improvements were observed with increased experience, substantial shifts in teaching practice were rare. This finding underscores the urgent need for professional development programs that are not only informative, but also foster reflection, enabling the achievement of tangible outcomes. Such programs should aim to promote knowledge of evidence-based strategies while also addressing and transforming teachers' implicit beliefs. Ultimately, the research emphasizes the importance of integrating both research-backed teaching strategies and a deeper exploration of teachers' mental frameworks into professional development initiatives.

Keywords: teachers' beliefs, evidence-based education, professional development

Introduction

For decades now, aiming to improve academic learning and ensure the highest level of success for pupils and students of all ages, educational and teaching research has undergone a strong push towards rigorously applied and documented strategies and the synthesis of the resulting findings. From this perspective, Evidence-Based Education (EBE) constitutes a crucial reference, actively engaging on two fronts: on the one hand, promoting effective teaching based on research evidence, and on the other, encouraging the conduct of scientific studies according to explicit protocols (Mitchell & Sutherland, 2020).

Nowadays, thanks to this movement, we can understand the methods, strategies, and, more generally, the contextual – and personal – conditions that foster learning and academic success. Among these elements, the key role played by the teacher certainly stands out (OECD, 2025; Yoon et al., 2007). Scientific research has clearly highlighted how crucial ensuring the highest quality of teacher training is to achieving students' learning objectives. Improving learning through teacher education certainly means training them with the EBE movement in mind, that is, researching and documenting scientific evidence, but also – and above all – encouraging them to constantly examine the impact of their actions, evaluating it in light of established objectives and, if necessary, reconsidering their choices (Hattie & Yates, 2013). This second focus is crucial: in seeking the impact of their actions, teachers are forced to question themselves personally, but above all, to question their own mental frameworks, that is, their way of thinking and acting professionally.

To improve teachers' expertise, it is not enough to work on the level of knowledge and skills; it is also necessary to bring out and consider tacit components (Calvani & Trinchero, 2019; Polanyi, 1966). Indeed, every teacher – whether in pre-service or in-service – approaches teaching with their own repertoire of more or less explicit knowledge about what "good teaching" means and how to behave in certain situations, also in relation to their experiences, for example, in school, to models observed as students, or to models observed during their internships or the practice with other colleagues. To promote the adoption of new models, old ones must be investigated and deconstructed.

This research aims to identify the mental frameworks of two groups of teachers, one pre-service and one in-service, in order to compare them, on the one hand, with research evidence and, on the other, internally, with each other. The research questions that guided this study are the following:

- RQ1. How are the mental frameworks of teachers (pre-service and in-service) aligned with research evidence in pedagogy and teaching?
- RQ2. Are there internal differences between the groups of pre-service and in-service teachers?

The research was conducted through the administration – in person, digitally – of a questionnaire, the Effective Teaching Questionnaire.

The Research

The Effective Teaching Questionnaire (ETQ)

The Effective Teaching Questionnaire (ETQ) is a questionnaire designed to be used during the initial phase of a teacher training program, for participant self-assessment and for the trainer's contextual analysis. The resulting discussion helps to highlight stereotypes, bad practices, and misconceptions. The questionnaire has been validated in previous research with over 1,240 pre-service and in-service teachers (Calvani et al., 2021a; Menichetti et al., 2019) and has subsequently been used in further, uncontrolled courses for research purposes. It incorporates the key elements of effective teaching derived from scientific research evidence and aims to highlight the knowledge, attitudes, opinions, and mental frameworks – usually implicit in daily practice – possessed by teachers in relation to the teaching-learning process (Calvani, 2014; Calvani & Trinchero, 2019).

The questionnaire consists of a series of scenarios in which participants are asked to express their level of agreement with various statements or decisions. This method, widely established in educational research, allows respondents to be involved in realistic and practice-relevant contexts, encouraging them to make decisions that can be compared with those of industry experts (Crandall et al., 2006). The context of the scenarios and their structure are carefully defined by gathering testimonials from qualified professionals, with the aim of constructing meaningful, non-trivial, paradigmatic situations capable of authentically highlighting the participants' actual skills.

The dimensions considered in the Effective Teaching Questionnaire are considered crucial to the teaching-learning process: (i) the planning dimension, (ii) the cognitive dimension, (iii) the evaluation-formative dimension, and (iv) the management dimension (Calvani, 2014). Each of these dimensions is based on theoretical references widely validated by scientific research, presented in a concise manner in Table 1.

Table 1
The Four Dimensions of the Questionnaire and Their Main Theoretical References

Dimension	Focus	Main references
Design	Project design internal coherence between objectives and assessment and evaluation tools, but also between activities, tools, materials, strategies and times, and the role and guidance of the teacher	Gagné (1965), Merrill (2002) and Rosenshine (2009)
Cognitive	Cognitive load and the structuring of knowledge	Ausubel (1968) and Sweller (1988)
Formative-evaluative	Feedback and formative assessment	Hattie & Yates (2013) and Hattie & Timperley (2007)
Management	Classroom management (from the organization of spaces to communication methods, and from the management of behavioural problems to the responses given to the specific needs of students with special educational needs)	Gordon (1974) and Simonsen et al. (2008)

The design dimension encompasses all elements related to the planning of educational and teaching interventions, namely their internal coherence between objectives and assessment and evaluation tools, but also between activities, tools, materials, strategies, and timeframes, and the role and guidance of the teacher. The main theoretical references adopted in this dimension are the Instructional Design models of Gagné (1965), Merrill (2002), and Rosenshine (2009). The cognitive dimension examines concepts related to cognitive load, learning in the strict sense, or the structuring of knowledge. The main theories taken into consideration are Sweller's (1988) cognitive load theory and Ausubel's (1978) theory of meaningful learning.

The formative-evaluative dimension, on the other hand, concerns aspects related to feedback and formative assessment, crucial elements for ensuring progress in the learning process and the achievement of objectives. The reference literature can be summarized in the studies by Hattie and Yates (2013) and Hattie and Timperley (2007).

The management dimension, finally, concerns all elements of classroom management, from spatial organization to communication methods, from behavioural problem management to the specific needs of students with special educational needs. In this dimension, the main references are Gordon's (1974) theory of communication and effective teacher-student relationships and the effective classroom management practices emerging from the systematic review by Simonsen and colleagues (2008).

Each of the four dimensions features a series of items, all presented in the form of scenarios, illustrating typical and highly practical classroom teaching situations. For each scenario/item, four possible arguments/solutions are provided, with which the teacher is asked to express their level of agreement on a Likert scale, from "not agreeable" to "fully agreeable".

The questionnaire exists in two versions, an extended one, composed of 86 items, and a short one, composed of 38 items, divided between the four dimensions as illustrated in Table 2 (Calvani, 2014; Calvani et al., 2021a; Calvani et al., 2021b; Menichetti et al., 2019).

Table 2
The Division of the Items According to the Four Dimensions in the Two Versions of the ETQ

Dimension	**ETQ long version (86 items)**	**ETQ short version (38 items)**
Design	21	10
Cognitive	21	9
Formative-evaluative	20	8
Management	24	11
TOT.	**86**	**38**

This study used the short version of the Effective Teaching Questionnaire. Compared to the original, this version has a 5-point Likert scale. On the four-point scale, 1 corresponds to "not agreeable", 2 to "not very agreeable", 3 to "somewhat agreeable", and 4 to "fully agreeable". A fifth option, "I don't know", was added.

Results

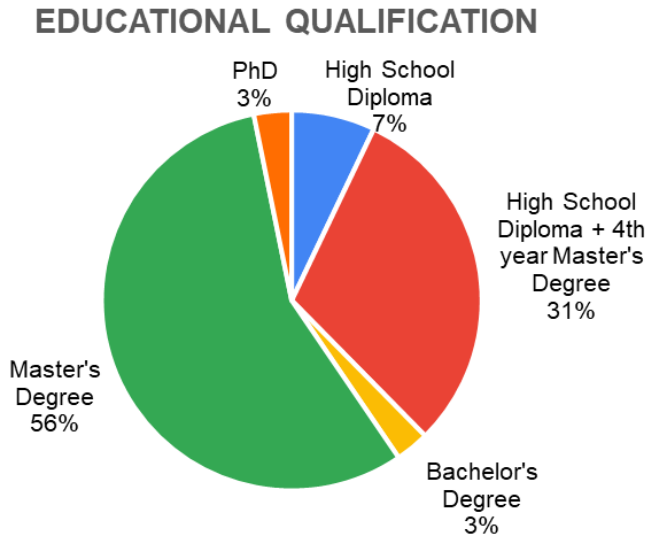
The Sample

The sample involved in this study consists of 872 people. Of these, 266 are students enrolled in the Master's Degree in Primary Education (fourth-year students of the five-year master's degree program, the entry point to the teaching profession in preschool and primary school), and 606 are students enrolled in the Specialization Course for Support Activities, a postgraduate training program aimed at training special education teachers, those who, in the Italian school system, are assigned to classes with students with certified disabilities.

The sample is made up of just over half (56%) master's degree holders (essentially the majority of teachers training to become special education teachers) and 38% secondary school graduates (Figure 1). Of these, 31% are fourth-year students in the master's degree program in Primary Education Sciences, and 7% are teachers enrolled in the Specialization Course for Support Activities, i.e., support teachers in training. Finally, 3% have a bachelor's degree and another 3% hold a PhD.

Figure 1

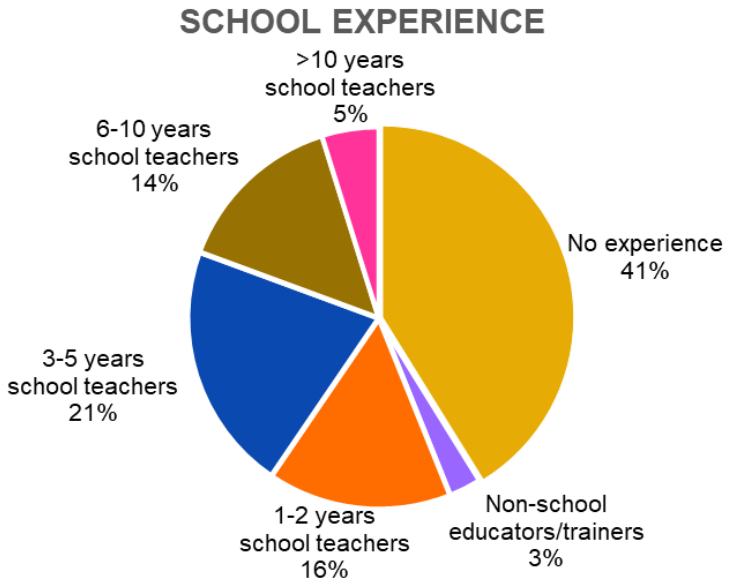
Education Qualification of the Sample



The sample, in close accordance with their professional aspirations and level of education achieved, presents notable differences in relation to previous teaching experience in schools of all levels.

Figure 2

Previous School Experience of the Sample



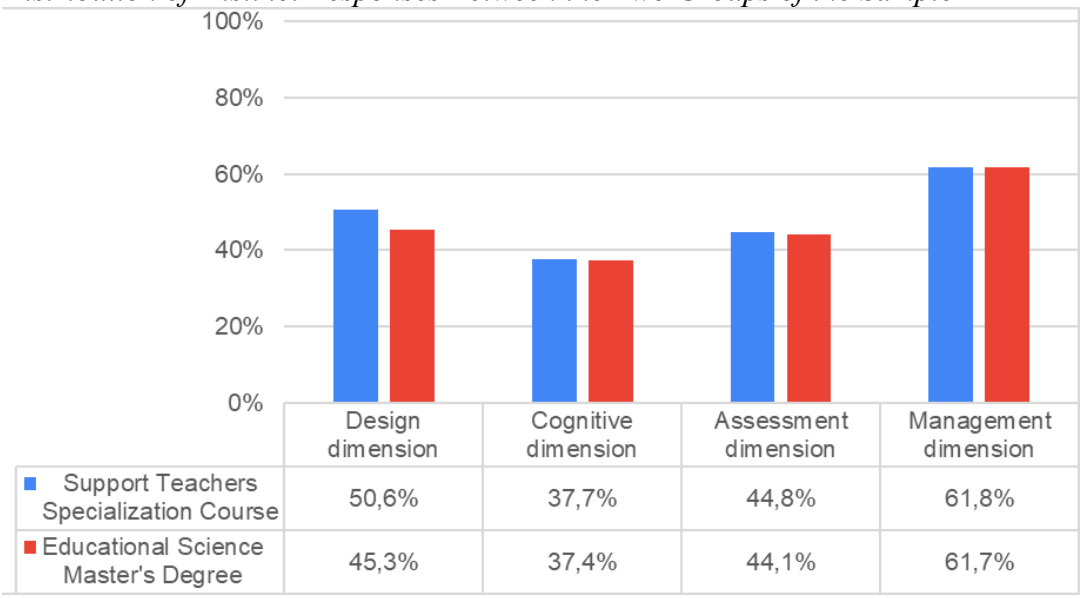
Most participants (41%) stated they had no previous teaching experience in schools (0 years of teaching), 21% had 3 to 5 years of teaching experience, 16% had 1 to 2 years of experience, 14% had 6 to 10 years of experience, 5% had more than 10 years of experience, and the remaining 3% stated they had experience as trainers/educators/teachers but outside of the school world (in public or private companies, or independently) (Figure 2). Overall, the sample was split in two: 44% of the participants in the research had no previous experience in the school world, while the remaining 56% had previous experience in schools, albeit of varying and significant duration (from 1 to over 10 years).

Results of Research on Teachers' Beliefs

The results of the research conducted using the Effective Teaching Questionnaire show a poor overall alignment with the responses expected from the effective teaching model. Both groups of teachers involved – those in their fourth year of the degree course in Primary Education Sciences and those training to become support teachers – obtained low levels of agreement: in several cases around 50% (between 37.4% and 50.6%), and in only two situations slightly above 60% (specifically: 61.7% and 61.8%) (Figure 3).

Figure 3

Distribution of Distinct Responses Between the Two Groups of the Sample



	Design dimension	Cognitive dimension	Assessment dimension	Management dimension
Support Teachers Specialization Course	50,6%	37,7%	44,8%	61,8%
Educational Science Master's Degree	45,3%	37,4%	44,1%	61,7%

The graph in Figure 3 highlights the cognitive dimension as the most critical with respect to alignment with evidence-based research, obtaining percentages of agreement with the model defined as effective, a few points lower than 40% (specifically: 37.7% in the group of teachers in training on the Specialization Course for Support Activities and 37.4% in the group of teachers in training on the Master's Degree in Primary Education Sciences). The dimension that, however, seems to achieve the best alignment for both groups is the managerial one, with percentages approaching 62% (specifically: 61.8% in the group of teachers in training on the Specialization Course for Support Activities and 61.7% in the group of teachers in training on the Master's Degree in Primary Education Sciences). The evaluation outcomes were similarly aligned between the two groups of teachers involved in the study, reaching 44.8% among trainees in the Specialization Course for Support Activities and 44.1% among trainees in the Master's Degree in Primary Education. In these three dimensions, no significant differences emerged between the two groups of teachers. The only dimension showing a difference greater than a few percentage points was the design dimension, where, it can be hypothesized, classroom teaching experience can play a crucial role in learning, understanding, and applying effective practices recognized by scientific research.

Discussion

The samples of pre-service and in-service teachers examined cannot be considered representative because they belong to a single university, however, the results recorded following the administration of the Effective Teacher Questionnaire are consistent with previous surveys (Calvani et al., 2021a; Menichetti et al., 2019).

The findings from this study lead us to recognize teachers' evident and persistent resistance to systematizing change, that is, to integrating, embracing, and applying the scientific evidence learned and studied in training programs. The low level of agreement found – between 37.4% and 61.8% - still denotes a significant distance from the effective teaching model described in the reference literature. Within this framework, two elements – opposite, but clearly interconnected – highlight a significant critical issue.

From the perspective of student self-assessment, revealing an initial cognitive conflict between what regularly occurs in school and what evidence indicates is effective is the first step towards scientifically grounded education: at least on a theoretical level, certain acquisitions must be consolidated, before the ability to implement them must be tested in the field through internships (Federighi & Boffo, 2014). Furthermore, training – both for students in the fourth year of the Master's Degree in Primary Education Sciences and for those enrolled in the Specialization Course for Support Activities – does not seem to be able to dismantle many of the false beliefs that often circulate in the world of education and training.

Conversely, the experience of some in school contexts seems to validate and reinforce certain practices, even if they are based precisely on the false beliefs mentioned above. The models that students repeatedly observe in their internships appear more resilient and difficult to deconstruct, enjoying stronger protection and dissemination, linked to cultural heritage (Menichetti & Piccioli, 2022).

Moreover, unlike what happens in other sectors, teaching is a profession that everyone has already seen practiced in their school careers of the past, when they sat at school desks, and for which there are models that everyone internalizes from childhood. Furthermore, culturally, the teaching profession has often been assimilated to a vocation, for which innate characteristics seem to be more necessary than professional training and the acquisition of principles resulting from scientifically conducted research: stereotypes, even years after previous surveys, remain difficult to dispel (Menichetti et al., 2019).

Conclusions

The findings presented in this study highlight the urgent need to radically rethink and reform teacher training courses. The complexity of the skills defined in the profiles of education and training professionals requires the adoption of learning promotion methods other than traditional ones – essentially characterized by the predominance of the verbal channel and a transmission-based approach – to better promote practical application opportunities that integrate active simulation and role-play experiences with opportunities for professional reflection, driven by feedback given and received from peers and/or an expert mentor.

Scientific research in this field has long supported teacher training methods that are based precisely on the recurrence of these key elements: examples include lesson study and microteaching, which have garnered significant evidence of effectiveness (Hattie, 2023). These methods, by reducing the intrinsic challenges of the teaching profession – for example, time constraints or student numbers – and promoting frequent and meaningful opportunities for collegial discussion, aim to gradually develop complex skills, such as planning, communication, or management, while also encouraging the acquisition of the appropriate mindset for lifelong professional development.

This study, focusing on the differences in results between the two groups of teachers in the reference sample, opens up potential further lines of research. These include: (i) an in-depth study of the individual questionnaire items, aimed at identifying any specific items that generated the greatest difficulties for the participating teachers and initiating a discussion on what makes them particularly critical, and (ii) the identification of any differences within each sample group, such as in relation to years of professional experience, year of university studies, etc., by answering questions such as: are there differences among in-service teachers between

those with few or many years of experience? Are there differences among students in training between those who have no teaching experience and those who do?

Acknowledgements

Within a shared vision, authorship is attributed as follows: paragraphs “The research” and “Results” to Laura Menichetti; paragraphs “Introduction”, “Discussion”, “Conclusions” to Silvia Micheletta.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Ausubel, D. P. (1968). *Educational Psychology. A cognitive view*. Holt, Rinehart & Winston.

Calvani, A. (2014). *Come fare una lezione efficace* [How to give an effective lesson]. Carocci.

Calvani, A., Marzano, A., & Miranda, S. (2021a). Formazione degli insegnanti alla didattica efficace. Come orientare l'osservazione e il cambiamento delle pratiche in classe? [Training of teachers in effective teaching. How to orient the observation and the change of practices in the classroom?]. *Formazione & Insegnamento*, *XIX*(1), 599–621.

Calvani, A., Marzano, A., & Morganti, A. (2021b). *La didattica in classe. Casi, problemi e soluzioni* [Teaching in the classroom: Cases, issues and solutions]. Carocci.

Calvani, A., & Trinchero, R. (2019). *Dieci falsi miti e dieci regole per insegnare bene* [Ten false myths and ten rules for teaching well]. Carocci.

Crandall, B., Klein, G., & Hoffman, R. (2006). *Working minds: A practitioner's guide to cognitive task analysis*. MIT Press.

Federighi, P., & Boffo, V. (2014). *Primaria oggi. Complessità e professionalità docente* [Primary school today. Complexity and teacher professionalism]. Firenze University Press.

Gagné, R. M. (1965). *The condition of learning*. Holt, Rinehart & Winston.

Gordon, T. (1974). *T.E.T.: Teacher Effectiveness Training*. Addison-Wesley Longman.

Hattie, J. (2023). *Visible learning: The sequel. An updated synthesis of over 1,200 meta-analyses relating to achievement*. Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81–112.

Hattie, J., & Yates, G. C. (2013). *Visible learning and the science of how we learn*. Routledge.

Menichetti, L., Pellegrini, M., & Gola, G. (2019). Cornici mentali e stereotipie didattiche nella formazione degli insegnanti [Mind frames and misconceptions in teachers' training]. *Formazione & Insegnamento*, *17*(1), 351–374.

Menichetti, L., & Piccioli, M. (2022). Docenti in formazione per attività di sostegno e loro consapevolezza delle competenze acquisite [Teachers in training for support activities and their awarness of the skill acquired]. *Pedagogia Oggi*, *20*, 188–199.

Merrill, M. D. (2002). First principles of instruction. *Educational Technology, Research and Development*, *50*(3), 43–59.

Mitchell, D., & Sutherland, D. (2020). *What really works in special and inclusive education: Using evidence-based teaching strategies*. Routledge.

Organisation for Economic Co-operation and Development (OECD). (2025). *Unlocking high-quality teaching*. OECD Publishing.

Polanyi, M. (1966). *The tacit dimension*. Anchor Books.

Rosenshine, B. (2009). The empirical support for direct instruction. In S. Tobias & T. M. Duffy (Eds.), *Constructivist instruction* (pp. 213–232). Routledge.

Simonsen, B., Fairbanks, S., Briesch, A., Myers, D., & Sugai, G. (2008). Evidence-based practices in classroom management: Considerations for research to practice. *Education and Treatment of Children*, *31*(3), 351–380.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, *12*(2), 257–285.

Yoon, K. S., Duncan, T., Lee, S. W. Y., Scarloss, B., & Shapley, K. L. (2007). Reviewing the evidence on how teacher professional development affects student achievement. *Regional Laboratory Southwest.*