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What Works in Education?

Using Evidence to Improve Education

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Does permanent training for teachers help to improve students' educational outcomes?

Núria Comas López

Permanent training programs are tools designed to complement initial teacher training, respond to social changes and student needs and transmit the knowledge produced about educational intervention strategies to teachers. Yet are these programs effective? With this review of the evidence, we intend to provide data with a twofold objective: to find out if active teachers' participation in training programs has an effect on children's academic performance and development and to provide clues regarding the characteristics that permanent training programs should have in Catalonia to achieve more prepared and effective teachers.

"For too long, education has been subject to inertia and based on traditions, and educational changes have been grounded in unfounded intuitions and beliefs. The 'What Works' movement irrupts into the world of education with a clear objective: to promote evidence based policies and practices. Ivàlua and the Jaume Bofill Foundation have come together to push this movement forward in Catalonia."

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Using Evidence to Improve Education

Does permanent training for teachers help to improve students' educational outcomes?

Núria Comas López
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Motivation

Teaching staff is a key part of education systems. Many studies point out that the quality of teaching staff has a positive impact on students' academic results and some indicate that this influence could be greatest for underprivileged students [1]. This is why educational administrations around the world strive through various mechanisms and policies to capture, train and retain effective professionals.

Professional development programs in which the teachers participate once they are active are one of these policies. Given the swift changes taking place in societies and education systems in relation to the duration of professional careers, it is logical to surmise that lifelong learning must be a key element in the development of a trained teacher. These programs have a threefold objective: a) to adapt educational practice to new social needs or specific student profiles, b) to transmit and translate new evidence on the effectiveness of educational interventions into practice and c) to complement and update initial training. Additionally, supporting aspects that pose more difficulty for teachers can become a tool to enable experienced teachers to stay in practice [2].

In practice, these are interventions that address very different kinds of content that can be deployed in multiple formats. In our context, participation in courses and seminars has been much more important than the observation of other teachers at the same or other schools, or participation in teacher networks for professional development [3]. At the same time, efforts are being made to promote interventions that take advantage of teachers' experience and more directly address the concerns and specific needs they have to face in their daily work.

Our education system has the challenge of defining a model of permanent training for teachers. In addition, there is very little evidence about the effectiveness of interventions and programs that are underway. Thus, in this review, we turn to international empirical evidence to try to identify what works in the permanent training of teachers, with the aim that educational administrations, school administration teams, training outfits and teachers can make decisions in favor of good outcomes for all students.

What programs are we talking about?

Policies that aim to achieve prepared and effective teachers have pre-existing elements or ones that start right when the professionals arrive at the schools, such as procedures for professional access, selection and hiring, procedures for initial training and induction to teaching and procedures that take place once the teachers are already at the school.

In this second group of actions we find several opportunities for permanent training, usually promoted by educational administrations or school networks, as well as the offerings of different educational organizations, universities or, sometimes, professionals at the schools. These are the subject of the review that we present below.

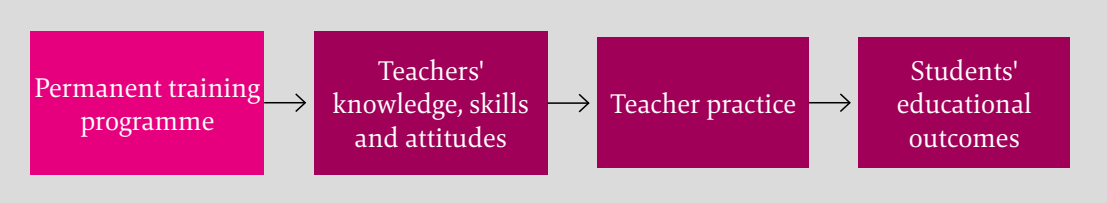
The theory of change of permanent training programs

The scientific understanding of educational activity and the evidence regarding the effectiveness of the various educational approaches, methods and interventions is progressing over time. In a context of changing societies in which educational needs are constantly modulated, it is understood that permanent training programs are a mechanism to guarantee the implementation of new practices that go beyond the production of new knowledge and respond to current needs. In addition, in practice, permanent training often ends up representing a complement to initial training that does not always allow teachers to address or consolidate some essential skills for practicing their profession.

It is understood that permanent training programs are a mechanism to guarantee the implementation of new practices that go beyond the production of new knowledge and respond to current needs.

The general theory on which permanent training programs are based is that, through the activities of which the programs are composed, the teaching staff will acquire certain knowledge, skills and attitudes that they will subsequently apply to the practice of teaching, translating them into specific behaviors and actions. Next, the behavior adopted by the teaching staff is expected to have a positive impact on the students' educational outcome.

Graph 1.
Theory of change of permanent training programs for teachers



Of course, one of the hypotheses that give shape to the theory of the change of training programs has to do with the fact that the educational practices that teachers adopt by virtue of their training can potentially have positive impacts. This is why some authors insist that the content taught in the training must be based on solid and empirically validated educational theories [4].

Types of permanent training programs

Existing programs that aim to strengthen teachers' skills to improve student outcomes have different characteristics, contents and formats. Below we review the main lines in which they are distinguished:

- **Focus or content.** First, programs can place a priority on improving the students' cognitive, socio-emotional or behavioral skills. At the same time, they can be distinguished depending on whether they are aimed at working with students or on other issues, such as working with families or with the community. Among these programs aimed at improving teachers' work with **students** are some with a **generic orientation**, disconnected from specific areas of knowledge (for example, on classroom management strategies or on the psychology of learning), and others that relate to **certain content or subjects**. The latter may address:
  1. **Substantive** subject matter knowledge, such as knowledge about the natural sciences, for example.
  2. **Pedagogical content knowledge**, like about how children learn to read or strategies to teach them to read.

  Cross-cuttingly to this classification, the programs can also be distinguished depending on whether they are aimed at recommending certain teaching strategies (that is, directly affecting teachers' **practice**) or whether they focus on providing knowledge about learning processes from the students (and therefore want to affect teachers' practice by having an impact on their **knowledge**).

- **Integration or separation from professional practice**. Interventions with teaching staff can exclude their daily practice or be integrated into it in some way as part of action-oriented education. In this second group of programs, the application of new pedagogical techniques and the reflection on the results stemming from this intervention can be considered part of it, as can feedback on the teaching activity from other professionals, observations by other teachers and their evaluations, etc.
- **Format and activities included in the program**. The programs can contain a wide variety of components (lectures, face-to-face seminars, joint work with teachers in the same school or other schools, coaching, etc.) that can produce very different combinations. Specifically, there are three aspects that receive prominent treatment in the literature on the matter:
  1. **Presence of individual behavior**. Some programs are characterized by dedicating at least part of the time to the individual attention of teachers by another professional.
  2. **Presence of a group or network component**. Some interventions pay special attention to group study, to building a way for teachers from the same school to work together or to interaction and an exchange of experiences and knowledge among professionals from different schools.
  3. **Virtuality and in-person participation**. The programs can take place exclusively in-person, in a completely virtual way or in mixed formats. In addition to the supply of one-way material (readings, video lessons, etc.) and participation in discussion forums, components that are developed virtually include the use of video to conduct coaching or mentoring sessions.
- **Dosage of the interventions**. In a way quite related to the format, permanent training programs vary in duration (in hours) and in the way that the activities are distributed over time: some have a concentrated format, with sessions held in one day or in one or a few weeks, while other programs take place over months or even years.
- **Profile of the trainers**. While some programs involve expert personnel unrelated to the school where the participants in the school year work, others are based on the expertise of the teachers at the same school. On another level, the trainers' profile may vary according to characteristics such as their professional expertise and their training.

Other actions for professional development

Apart from the training programs that we have just described, there are other active mechanisms and actions that aim to train teachers and fall outside the scope of this review, such as teacher participation in activities related to educational research and innovation. Nor will we examine the incentive structures of education systems here, which prompt or encourage teachers to effectively take part in these activities with time and funding so they can enjoy them with the minimum required participation so they can remain teachers or through teacher evaluation systems and the establishment of criteria to make progress in their professional career [6][1]. All this has an influence on the level of active teachers' motivation and preparation, but this time we will limit ourselves to analyzing the permanent training programs.

Questions influencing the review

Considering the diversity of training programs that can be carried out for active teachers, this review of the evidence aims to answer the following questions: Does teacher participation in permanent training programs improve students' educational performance? What are the most effective programs? That is, what content do they deal with and what format do they have? Which groups of students benefit the most from the fact that teachers participate in this type of program?

Based on the answers to these questions, we can issue recommendations on the permanent training model that makes sense to implement in Catalonia and on the appropriate characteristics and orientation of the programs that comprise it.

Reviewing the evidence

Reviews and meta-analyses considered

Table 1 includes the basic data of systematic reviews of evidence (meta-analyses and narrative reviews) that underpin this review of reviews. These are 10 documents that summarize around 200 evaluations measuring the impact of various interventions that seek to improve teacher skills in students' **educational performance** or in **their socio-emotional or communicative development**.

Some of the reviews and meta-analyses included also analyze these interventions' impact on **teaching practice** in terms of the quality of the teaching activity or interaction with the students. Although our review focuses on the impact that teacher development programs have on student results, we have taken what the included reviews and meta-analyses tell us about these dimensions into account. As we saw in describing the general theory of change of development programs for teachers, these are

1 The first publication of the collection "What works in education?" is dedicated to the effectiveness of financial incentives for teachers as a way to boost student performance [5].

intermediate results that are intended to influence through the programs and are expected to lead to improvement in the students' outcomes. It is worth mentioning that literature that focuses exclusively on how teachers' development programs have an impact on teachers' knowledge or on the quality of their practice is much more abundant. However, since results related to children are not considered, it has not been included in this review.

Table 1.
Systematic reviews and meta-analyses considered

Narrative reviews and metanalyses (N = studies included)	Focus of the permanent training	Population	Dosage	Magnitude of the effect*	Effects based on the features of the programs
Metanalyses					
Basma and Savage (2018) [7] (N = 17)	Improving literacy skills.	Primary school teachers.	Between 10 h and 70 h.	Results in reading: g = 0.23	*Components* • The two programs that have the greatest effects incorporate coaching, focused on reflecting on making teachers think about their practice. *Duration* • Programs running less than 30 hours have greater effects (g = 0.37) than longer ones (n.s.), although this could be due to the higher quality of short program studies.
Blank and De las Alas (2009) [8] (N = 16)	Teaching of science and mathematics.	Pre-school, primary and secondary school teachers.	Average of 91 h, from 2 h to 540 h.	Results in science: d = n.s. Results in mathematics: d = 0.21	*Content* • Programs consistent with the school's pedagogical model and the expectations of the educational administration are more effective (g = 0.32). Those that are not consistent produce negative effects (g = -0.19). *Components* • Mathematics programs with action-based learning opportunities (d = 0.16) are more effective than those that do not incorporate them (n.s.). • Interventions without mentorship (d = 0.16) are more effective than ones with it (n.s.). • Programs that do not include a collaboration network (d = 0.32) are more effective than those that do (n.s.). • Programs that do not include practices (d = 0.10) are more effective than those that do (n.s.). *Grades* • Programs for teaching mathematics are more effective in primary school (d = 0.27) than in secondary school (middle school: n.s.; high school: d = 0.11).

Note: n.s.: statistically insignificant effects; d = standardized mean difference (Cohen estimator); g = standardized difference in averages (Hedges estimator). Values around 0.2 or lower indicate a small effect; values around 0.5, an average effect; values around 0.8 or higher, a great effect) [16].

Source: Author's creation.

Narrative reviews and metanalyses (N = studies included)	Focus of the permanent training	Population	Dosage	Magnitude of the effect*	Effects based on the features of the programs
Metanalyses					
Egert et al. (2018) [9] (N = 36)	Global.	Nursery, pre-school and primary school teachers (0-7 years)	From 4 h to 308 h.	Child development (n = 9): g = 0.14 Quality of the teaching practice (N = 36): g = 0.68 • Programs that also measure child development (n = 9): g = 0.45	*Components* • Programs based exclusively on coaching (g = 1.98) have greater effects on the quality of teaching practice than all other interventions (g = 0.67). *Duration* • Programs that last between 45 and 60 hours (g = 1.93) have greater effects on the quality of teaching practice than shorter or longer ones. Grades, student profile and teacher profile • There are no significant differences for teachers who serve children 0-3 years old, nor for those who serve at-risk children, nor depending on whether the teachers have a university degree or not.
Kraft et al. (2018) [10] (N = 60)	Programs that include coaching for teachers.	Pre-school, primary and secondary school teachers.	20 h or less (22 %) 21-40 h (27 %) 41-60 h (17 %) 60 h or more (17 %) s.d. (18 %)	Academic results (reading, science and mathematics) (n = 31): d = 0.18 Results in reading (n = 26): d = 0.18 Instruction of the teachers (n = 43): d = 0.49	*Components* • Programs that combine coaching with group training are more effective than all other programs. • There are no significant differences depending on whether coaching is carried out virtually or in-person. *Content* • Programs focused on content or specific subjects (d = 0.20) have a greater impact on academic results than generic programs, disconnected from one subject (d = n.s.). *Grade and duration* • There are no significant differences in the effects that the coaching programs have on the different levels of education or on the duration of the program.
Markussen et al. (2017) [11] (N = 33)	Better development of language and/or literacy.	Pre-school teachers (3-6 years).	From 6 to 450 h.	Children's passive vocabulary (n = 5): n.s. Children's phonological awareness (n = 9): g = 0.30 Children's knowledge of the alphabet (n = 11): d = 0.12 Quality in interaction (n = 30): g = 0.59 Quality in the organization of space (n = 16): g = 1.07 Teachers' knowledge (n = 11): n.s.	*Components* • Programs with more than one component are more effective than those that only have one. • Programs that combine group classes with other components have a greater impact on teacher practice than those based only on group classes or those that do not have them. Regarding the format of group classes, programs with seminars or workshops are more effective than those with university classes. • The same goes for the inclusion of coaching: the combination of coaching with other components has a greater impact than programs based only on coaching or those without it. *Duration* • Neither the intensity of the programs (the number of total hours) nor the time during which they take place can explain the differences in their effectiveness by themselves.

Note: n.s.: statistically insignificant effects; d = standardized mean difference (Cohen estimator); g = standardized difference in averages (Hedges estimator). Values around 0.2 or lower indicate a small effect; values around 0.5, an average effect; values around 0.8 or higher, a great effect) [16].

Source: Author's creation.

Narrative reviews and metanalyses (N = studies included)	Focus of the permanent training	Population	Dosage	Magnitude of the effect*	Effects based on the features of the programs
Metanalyses					
					Student profile • The effect on teacher practice is greatest for educators who work with financially vulnerable children.
Salinas (2010) [12] (N = 17)	Teaching of mathematics.	Primary school teachers.	Variable not considered.	Results in mathematics: d = 0.57	*Content* • Programs focused solely on pedagogical aspects for teaching mathematics (d = 1.05) have greater effects than those that combine these aspects with substantive content of the subject (d = 0.26) and those aimed at training teaching staff to apply cooperative learning strategies (d = 0.19).
Scher and O'Reilly (2009) [13] (N = 27)	Teaching of mathematics and/or science.	Primary and secondary school teachers.	One or several school years.	Results in mathematics: • From programs focused on mathematics: g = 0.38 • From programs focused on mathematics and science: g = 0.12 Results in science: • From programs focused on science: g = 0.32 Teachers' attitudes: g = 0.45 Teaching practice: g = 0.63	*Content* • The effect is greater on programs for teaching mathematics that deal with pedagogical and content-related aspects (g = 0.56) than those that only deal with pedagogical aspects (g = n.s.). • In science, the only subtype of programs that identify a positive and significant effect (g = 0.41) combines pedagogical and content-related aspects. *Duration* • Programs focused on mathematics that take place over several years (g = 0.59) are more effective than those that last for one academic year (g = 0.14). Furthermore, there are no significant differences between programs focused on science based on their duration.
Werner et al. (2016) [14] (N = 18)	Improved quality and care and the caregiver's abilities in interaction with children.	Nursery and pre-school teachers (0-5 years).	From 3 h to 194 h.	Child development (communicative and socio-emotional abilities: g = 0.26 Quality of attention to children in the class group: g = 0.39 Teachers' skills in interacting with the children: g = 0.44	*Components* • Programs that include an individual component (g = 0.41) are more effective than programs that do not (g = n.s.). • There are no significant differences regarding whether the program incorporates video or not (as a channel for modelling or to provide feedback). *Content and duration* • There are no significant differences depending on the focus of the program or its duration. *Student profile* • There are no significant differences depending on whether or not the programs are addressed to Head Start teachers (non-compulsory child education for low-income households in the United States).

Note: n.s.: statistically insignificant effects; d = standardized mean difference (Cohen estimator); g = standardized difference in averages (Hedges estimator). Values around 0.2 or lower indicate a small effect; values around 0.5, an average effect; values around 0.8 or higher, a great effect) [16].

Source: Author's creation.

Narrative reviews and metanalyses (N = studies included)	Focus of the permanent training	Population	Dosage	Magnitude of the effect*	Effects based on the features of the programs
Narrative reviews					
Eurofound (2015) [15] (N = 14)	Global.	Nursery, pre-school and primary school teachers (0-7 years).	Variable not considered.	-	*Components* • Short programs consisting of video surveillance of professionals during practice in schools and long-term ones that offer continuous support to the team (pedagogical guidance or coaching in groups for reflection) have a positive impact on child development.
Yoon et al. (2007) [4] (N = 9)	Teaching of language (English), science and mathematics.	Pre-school and primary school teachers.	From 5 h to 100 h.	-	*Duration* • Programs lasting over 14 hours show a positive and significant effect. Shorter ones do not have statistically significant effects.

Note: n.s.: statistically insignificant effects; d = standardized mean difference (Cohen estimator); g = standardized difference in averages (Hedges estimator). Values around 0.2 or lower indicate a small effect; values around 0.5, an average effect; values around 0.8 or higher, a great effect) [16].

Source: Author's creation.

In these 10 reviews, the evidence on programs that seek to train teachers to improve **students' cognitive abilities** is predominant. Specifically, reviews that focus on primary and secondary school place more attention on programs aimed at better development of skills related to literacy, mathematics and science, especially in the last two areas. There is also a sub-group of reviews focused on training professionals who work in the K-7 grades whose interest is concentrated on the development of **communicative and socio-emotional skills**. Finally, one of the reviews focuses on the format of the interventions: this is a review of lifelong learning programs that incorporate a coaching component.

It should be borne in mind that the vast majority of the studies included in these reviews are evaluations of programs in Anglo-Saxon countries, especially in the United States, where there is more of a tradition of evaluating the impact of educational interventions. Only one of the reviews is exclusively devoted to evaluations of programs in European countries [15]. This issue is relevant because active teachers' training needs can vary in different contexts, given that they have a lot to do with elements that vary greatly depending on the education system, such as the initial training received or the requirements to access the teaching profession.

Moreover, the programs evaluated and included in the reviews are not necessarily representative of the type of training that involves active teaching staff both from the same countries where the evidence has been collected and from Catalonia [4] [16] in at least two ways. First, many of the programs have a considerable duration and especially a very intense level of monitoring. Furthermore, the programs are often implemented by the same research groups that evaluate the impacts. However, the programs to which most teachers are exposed, which are led by the administration or the schools or by the various agents that provide training, are much less present.

Despite these limitations, the results of this set of evaluations provide us with key information to identify what types of teacher training initiatives are most effective in prompting improvement in student development and performance.

Do permanent training programs help to boost student's educational outcomes?

Permanent training programs have a slight-to-medium positive impact on students' academic performance.

In general, we can say that permanent training programs **have a slight-to-medium positive impact on students' academic performance** [4] [7] [8] [10] [12] [13]. This effect is similar to the one achieved with the reduction of the student-to-teacher ratio in the classroom and is higher than the effect of having auxiliary teachers.[2] The programs also have a slight-to-medium effect on other outcomes related to the development of children younger than seven years old, such as their **socio-emotional and communicative skills** [9] [14].

According to these programs' theory of change, interventions should have a prior impact to achieve these final effects: the acquisition of knowledge and attitudes by teachers and the **transformation of their practice**. In this regard, virtually all reviews identify positive medium-sized effects, which are therefore higher than the impacts detected in student outcomes [9] [10] [13] [14].

However, several reviews indicate that the vast majority of the evaluations of these programs are based on **short-term** measurements of outcomes. Therefore, we do not know what the effect of these programs is in the medium and long term, meaning that we do not know the extent to which the identified impacts are sustained or to which new ones emerge from them. It could be, for example, that the professionals' adoption of new practices was not sustained over time or that, on the contrary, more time was needed for the effects of these practices to be noticeable in the students.

What types of permanent training programs work best?

Beyond the question of whether programs that aim to strengthen teachers' skills are effective in improving students' educational performance overall, it is worth asking if all programs are equally effective or if they have features that determine greater success in the professionals' acquisition of knowledge and skills and their reflection in the students' results. This is especially relevant if we consider the great variability between the permanent training programs in terms of content, format, duration and other aspects.

2 Education Endowment Foundation. Teaching and Learning Toolkit: https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit.

Area of knowledge

At first, if we look at the area of knowledge in which they want to induce improvement in academic results, we see that the evidence is clearer for math programs (with between slight and medium effects) and literacy (with slight effects) than for science programs, in which the evidence is mixed (with no or slight effects).

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Content

A central factor in the design of permanent training programs is the type of content they incorporate. Unfortunately, there are relatively few reviews of evidence that have analyzed this aspect and those that have addressed it have done so in little detail. Nonetheless, there seems to be consensus that programs aimed at general aspects, separated from a particular subject and substantive content, have a lesser or no effect on academic outcomes [10] [12] [13].

Programs aimed at general aspects, separated from a particular subject and substantive content, have a lesser or no effect on academic outcomes.

Among the generic programs we find, for example, programs to train teachers to implement teaching strategies that are considered valid for all subjects (such as collaborative work or other classroom management mechanisms) and programs aimed at providing general knowledge about the psychology of learning in a way that is unrelated to how skills and knowledge are acquired specifically for each area. In contrast to this type of intervention, **programs that address pedagogical issues relevant to each area of knowledge or skill** (content pedagogical knowledge) are especially effective. These programs could address the process that children should follow to learn how to add and subtract (Box 1) or the strategies that must be followed to teach it to them, for example.

The reviews included do not allow us to conclude clearly if there are differences in the effectiveness of the training programs depending on whether they are aimed at recommending certain teaching strategies or whether they focus on providing knowledge about the students' learning processes [12] [13].

Box 1.
Cognitively Guided Instruction Treatment (United States)

In 24 schools in Madison (Wisconsin, United States), an experiment was conducted during the 1986-87 school year to evaluate Cognitively Guided Instruction (CGI) Treatment, a training program for first-year primary school math teachers [17]. The objective of the program was to help teachers to understand how children develop the concepts of addition and subtraction and give them the opportunity to explore how to use this knowledge for teaching, with a strong focus on problem-solving.

The hypothesis on which the intervention was based was that if teachers were given **knowledge resulting from educational research** on various types of problems, children's strategies for solving them and the way that children's knowledge and abilities related to addition and subtraction would evolve and the teachers would use this information to **change their practice in the classroom**. In addition, the researchers hypothesized that this knowledge would improve teachers' ability to evaluate their students. **Understanding it better had to enable them to adjust their teaching practice** to their problem-solving abilities.

Forty (40) teachers were randomly assigned to two groups: an experimental group (n = 20) that participated in the program, lasting 80 hours, and a control group (n = 20) that received a brief four-hour intervention. The program was developed for four weeks and took place during the teachers' first month of summer vacation. Each week, they were carried out in four days of class for five hours each day:

- In the first 10 sessions, one of the two researchers leading the experiment gave a one-hour **lecture**. Results coming from the research on addition and subtraction were presented in the lessons of the first six days of class and strategies by which these results could be translated into practice were discussed in the following four days.
- In each session there was a seminar guided by a trainer in which teachers **examined various materials** or approaches to the curriculum in small groups and **discussed** how they could be used to apply the content principles transmitted during the sessions.
- The teachers could devote the rest of the time to what they wanted: **reading texts** expressly prepared for the school year that summarized results and possible applications, **watching children's video recordings** on solving problems, **debating** with other participants or with the trainers and examining textbooks, objects to manipulate or other materials.

Participating teachers were required to **design a unit** to teach for the following year, as well as an annual teaching plan based on the principles of CGI. This work could be done **individually or in groups**. Each participant met once a week with one of the trainers to discuss their progress and compare questions and ideas.

Once the four-week training period was completed, a face-to-face meeting was held between trainers and participants during the school year (in October) to discuss implementation of the strategies worked on up to that time. In addition, the participants could consult with one of the professionals throughout the year.

The evaluation was conducted based on the classroom observations of teachers and students over the course of a school year and on analysis of the evolution of children's achievements on standardized tests and other ad hoc tests. Participating teachers largely discussed problem-solving in class, promoted the students' use of a larger number of strategies to solve them, spent more time listening to the students' descriptions of how they solved them and acquired more knowledge about each student's strategies. The program demonstrated a positive effect on students' computing and problem-solving abilities, their self-confidence in these tasks and their mathematical understanding. In some cases, improvement was greater in students that started from a lesser result.

One of the conclusions of Carpenter et al. (1989) [17] is that part of the program's success is rooted in the fact that the knowledge provided to the teachers had to do with the way in which children reason and acquire skills related to a very specific field. They counteract this type of intervention with others that take a more generic approach and only provide general principles on the psychology of learning. To illustrate this, they recall the words of one of the participating teachers: "I have always known that it was important to listen to the students, but I had never known what questions they had to formulate or what to pay attention to."

For further information:

Carpenter, T. P.; Fennema, E.; Peterson, P. L.; Chiang, C.-P. and Loef, M. (1989)."Using Knowledge of Children's Mathematics Thinking in Classroom Teaching: An Experimental Study," in *American Educational Research Journal*, vol. 26, no. 4, pp. 499-531.

Finally, an important and scarcely explored question is the **consistency between the content of the training and the educational context** in which the teachers and the students they support find themselves. In one of the included reviews, we analyze whether there is any relationship between the effectiveness of the training program and the fact that it is roughly consistent with: a) the curriculum or the learning objectives established by the school of the participating teachers and/or the educational administration's standards of learning or performance, b) the daily activities of the school and the teaching staff and c) the teaching practices and knowledge required for the specific functions of the teaching staff. Thus, it seems that training congruent with several of these aspects has a greater impact, while training that is not aligned with any of these dimensions leads to negative effects on student performance [8].

Box 2.
The role of school leadership in permanent training for teachers

In a review of the effect of school administrations' practices on student achievements, Robinson (2009) [20] identified that the type of actions with the greatest impact (d = 0.84) that can be carried out by the administration teams has to do with **the promotion of continuous training for professionals and their participation in this training**. Thus, administration teams' involvement in professional development activities as trainers, as students or in both roles is related to higher educational outcomes.

There are several ways in which these two elements are related. First, it is plausible to expect that leadership teams with a strong pedagogical role that are active in defining a training strategy for their teams and even play a role as trainers will ensure that the training **is properly integrated into the school's practice and objectives**. Furthermore, the administration teams that participate actively in the permanent training for the teachers can access greater knowledge of the conditions required to achieve and sustain improvements in the students' learning [20]. Therefore, they are in better circumstances to evaluate with the teaching staff **whether it is necessary to implement changes in the school's organization to support transformation of its practice** (regarding the evaluation or the organization of time, space or human resources, etc.).

For further information:

Robinson, V. M. J.; Hohepa, M. K. and Lloyd, C. (2009). *School Leadership and Student Outcomes: Identifying What Works and Why: Best Evidence Synthesis Iteration (BES).* Wellington, New Zealand: Ministry of Education.

It should be noted that while the evidence on the training programs for active primary and secondary school teachers that have been included in this review of evidence is mainly related to interventions that aim to strengthen students' cognitive abilities, we also know that teacher training can be effective in other areas. Thus, behavioral and attitudinal programs that include training for teaching teams about the meaning and methodologies of the programs increase their impact [21].

Format

The relationship between the type of design and the components that determine the permanent training programs and their effectiveness is probably the aspect that has attracted the most attention in research on these programs.

Almost all the reviews indicate that programs that include a coaching component are more effective than all others.

Almost all the reviews indicate that programs that include a **coaching** component are more effective than all others. Notably, an important part of the cumulative evidence on coaching programs for teachers comes from evaluations of programs that seek to train teachers to promote the development of language and literacy [10] like, for example, Classroom Links to Early Literacy (Box 3) and the Heidelberger Trainingsprogramm zur frühen Sprachförderung in Kitas (Heidelberger Training Program for Early Support for Speech Development in Nursery School and Pre-School), which has been taught since 2007 at the Zentrum für Entwicklung und Lernen (Development and Learning Center) in the city of Heidelberg, Germany [22] [23].

Beyond the area of specific knowledge, the attributes that are associated with the coaching programs and that appear to be the keys to their effectiveness are: a) the possibility of having spaces for **thinking about one's own professional practice**, b) (immediate or delayed) **feedback** from an expert and c) a certain continuity in **monitoring**, which helps to consolidate the practice. This monitoring by an expert professional is conducted virtually in part of the programs, using video both for the coach to observe the classroom and for broadcasting his/her feedback or for discussion with the teacher later. Interventions that are carried out virtually are effective at the same level as face-to-face interventions [10] [14].

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Although some reviews note that interventions based on coaching or other individual training formats may be most effective even when this is the only component [9] [14], others indicate that the combination of group sessions (more focused on acquiring new knowledge) and individual interaction (focused on thinking about implementing it) is the most successful formula [10] [11]. Types of group sessions with a workshop or seminar format could have a greater impact than university classes, probably because they allow for more **action-based learning opportunities** [11].

Box 3.
Classroom Links to Early Literacy (United States)

The Classroom Links to Early Literacy program exemplifies interventions that combine group training consisting of transmitting content with individual monitoring integrated into professional practice in the form of coaching. It is a program implemented and evaluated in the United States with the support of the National Center for Educational Research and is aimed at teachers and students of the Head Start program (non-compulsory education for children of low-income families).

In order to improve children's outcomes in reading comprehension, the program sought to train teachers **in the use of some strategies in the classroom** that research had previously proven to be effective in order to **improve the children's abilities in oral language, in recognizing spellings and in phonological awareness.**

The program, which lasted one semester, consisted of an initial face-to-face two-day seminar (16 hours) followed by seven expert coaching sessions, which took place every 15 days.

- In addition to transmitting content, the **seminar** sought to establish a link between coaches and teachers. This is why the coaches were the ones who led the sessions. Moreover, some time was spent in the seminar on a group discussion between the coaches and the teaching staff that each had been assigned in order to understand the situation and context in which every teacher worked.
- The goal of the **coaching** was to provide individual feedback to the teachers to improve certain practices. The coach observed a specific practice, previously agreed with each teacher (for example, the use of questions to guide conversation for reading a book with a large group of children). Next, he wrote a report to the teacher that listed aspects of the correctly implemented practice in question and recommendations to improve it. The trainer could also provide other resources, such as descriptions of written activities and demonstrations (face-to-face or video).

In the study by Powell et al. (2010) [24], 42 teachers of a sample of 73 were randomly assigned training and their results and those of their four-year students were compared with those of the 31 teachers and respective students who formed part of the control group. The intervention showed an impact (between moderate and large) on teacher training and a (smaller) effect on most children's results (knowledge of letters and word formation based on sounds and writing).

In addition, the study compared two ways to implement coaching. Part of the teaching staff had a face-to-face relationship with the coach, while the other had a virtual one.

- In **face-to-face or in-person** mode, the coach observed the class activities for 90 minutes, which had been previously organized jointly with the teacher to get the most out of it. They later met for a half hour to discuss the coach's feedback.
- In **virtual** mode, the teachers sent a 15-minute recording to the coach. The feedback was received through a software program that enabled the teacher to see certain snippets of the video with the coach's comments associated with each snippet. Moreover, these participants had a gallery with 97 video examples lasting two to three minutes and accompanied by brief textual summaries with the keys to each video, as well as a repository of articles.

Although better results are observed with face-to-face or virtual coaching in some cases, the analysis allows us to conclude that both formats were effective in improving teachers' practices and children's outcomes. This result is promising in relation to the possibilities that the virtual implementation of coaching can have when thinking about cost-effective solutions to scale up permanent training programs.

For further information:

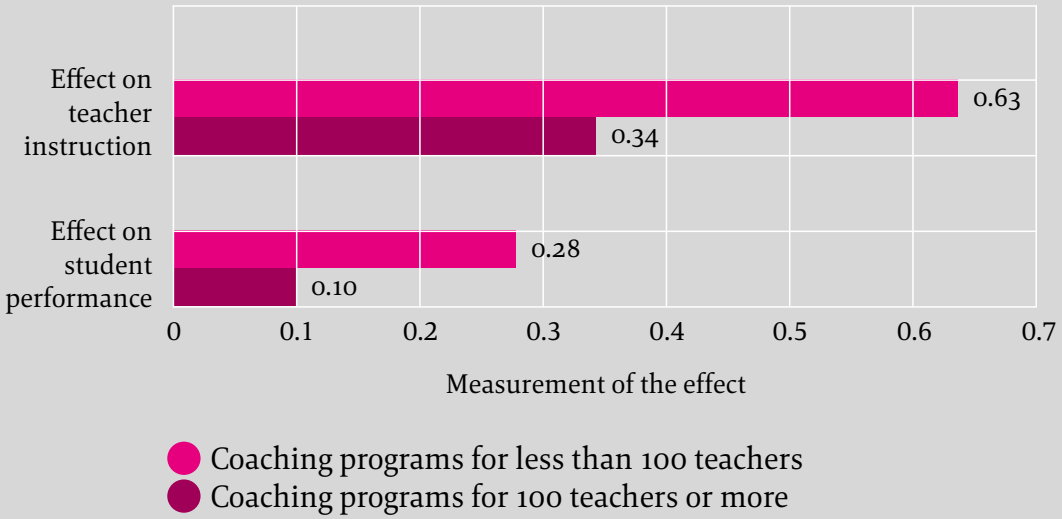
Powell, D. R.; Diamond, K. E.; Burchinal, M. R. and Koehler, M. J. (2010). "Effects of an Early Literacy Professional Development Intervention on Head Start Teachers and Children". *Journal of Educational Psychology*, vol. 102, no. 2, pp. 299-312.

Professional Development in Early Reading (Classroom Links to Early Literacy): *https://ies.ed.gov/funding/grantsearch/details.asp?ID=341*.

Box 4.
Challenges in the extension of coaching programs

A common problem when scaling up any educational intervention is that there may be a loss of quality on the path between the implementation of a pilot program and the extension of a program to a more real context of larger scope. The impossibility of granting the same level of resources means that the components that make the program effective are no longer guaranteed.

Indeed, Kraft et al. (2018) [10] identify a relationship between the size of coaching programs and their effectiveness. They compare the results of two types of studies: those involving less than 100 teachers (who associate themselves with the implementation of programs in a very controlled way) and those in which 100 teachers or more participate (which identify with less controlled programs, implemented in more diverse contexts). The larger programs have an effect on teacher practice and a much lower effect on educational performance.



In this context, it is essential to understand **the activities, elements or characteristics that make coaching a successful intervention**. This is the conclusion of the experiment by Cabell et al. (2011) [25], which in order to broaden the range of action of a face-to-face coaching program, expanded the group of trainers with staff with less experience and training, reduced the frequency of contact and offered feedback in writing. This resulted in a lack of program effectiveness. Although no conclusions can be drawn from this study on the relationship between certain components and the effectiveness of coaching, it shows the need to be careful in scaling up the programs and in accumulating evidence in this regard.

Kraft et al. (2018) [10] indicate that one of the great difficulties undoubtedly lies in **having a sufficient number of coaches** with the right experience and training for local teachers' needs. Thus, if part of the most skilled and experienced teaching staff is withdrawn from educational practice in order to perform coaching for other teachers, the students may lose out. Some options that have been implemented to solve this include pairing teachers with different qualities and abilities, so that they can support each other, or incorporating a coaching component in the teachers' inspection and evaluation systems. Carrying out coaching virtually, using video, could be another cost-effective solution to extend this type of training (Box 1).

For further information:

Kraft, M. A.; Blazar, D. and Hogan, D. (2018). "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence". *Review of Educational Research*, vol. 88, no. 4, pp. 547-588.

Cabell, S. Q. et al. (2011). "The Impact of Teacher Responsivity Education on Preschoolers' Language and Literacy Skills". *American Journal of Speech-Language Pathology*, vol. 20, no. 4, pp. 315-330.

Duration

The evidence is not clear about the length or extent of the time of the interventions recommended to be effective.

The evidence is not clear about the length or extent of the time of the interventions recommended to be effective. Some analysts suggest that there could be a linear and positive relationship between the duration of the programs and their effectiveness: thus, longer interventions [4] that take place over longer periods of time have the potential to be more effective [13]. At the same time, there is also evidence indicating that interventions of medium length (45-60 hours) may be more effective than shorter or longer ones [9].

However, it seems that the duration could identify other characteristics (the type of activities carried out, opportunities for monitoring and consolidation of the acquired knowledge, etc.), since in other reviews the duration of the program appears irrelevant in relation to effectiveness [10] [11] [14].

Profile of the trainers

Though the literature recognizes that it is a matter of interest [10] [16], the reviews included have not directly analyzed the differences in the impact of the interventions based on the trainer's profile, making it difficult to make statements about the effect attributable to this variable.

Are permanent training programs equally effective for all student and teacher profiles?

Teachers' development programs are shown **throughout all levels** of education, from K-3 up to secondary school. The only review that explicitly compares the effectiveness of the programs at the various levels of education, focused on interventions for teaching mathematics, concludes that programs aimed at primary school teachers are more effective than those aimed at secondary school teachers [8].

The available evidence does not allow us to state whether programs have a differentiated impact on educational performance or children's development based on their socio-economic status. However, thanks to the three reviews on permanent training programs for professionals for grades K-7, we know that these programs do have a **positive influence on the practice of teachers that cater to vulnerable students** [9] [14] (Box 3) and that they could even have a greater impact on this sub-group of teachers [11]. As such, everything seems to indicate that these types of programs have a special potential for teachers who work with children in disadvantaged situations.

Finally, we have little evidence about the effectiveness of programs for different teacher profiles. We only know that for teachers working in grades K-3 and K-6, the effect that participation in training has on the quality of their practice does not

vary depending on their level of education (university or not) [9]. However, we do not know if teachers with different levels of experience take advantage of or get the same benefits from participation in permanent training programs.

Summary

This review has focused on the effectiveness of permanent training for teachers, a key mechanism within existing professional development programs. The collected evidence indicates that permanent training programs have a positive effect on students' educational outcomes. It also concludes that the effect of these programs is greater on teacher practice than it is on students' academic performance. Thus, changes in the quality of teaching practice need to be of a certain magnitude to produce an impact on students' results.

The evidence does not allow us to conclude with much clarity or detail what the concrete characteristics are that make permanent training effective. Nevertheless, we do have some indications. It seems that the duration of the training is not particularly determinative of how effective the programs are. However, some aspects linked to the design of the programs, such as interventions that use action-based learning mechanisms, are more effective. In particular, training in which opportunities for reflection on the participants' own practice are provided and/or application of the content is monitored, such as coaching-based interventions, get remarkable results.

The connection with practice is also a relevant feature in the content plan that is addressed during training. Thus, the pedagogical content must be related to specific skills and knowledge so that teachers transfer it to their exercise and so it has an impact on the students' outcomes. In addition, despite being a seldom studied aspect, it seems that if the training is not aligned with the teachers' and students' educational context (in terms of the school and the location), then the intervention not only fails to achieve a positive impact on students, but can even be counterproductive.

Finally, there is very little evidence in relation to the differential effects of permanent training for different profiles of students and teachers. However, we know that the practice of teachers working with vulnerable students is equally boosted by participation in lifelong learning programs and could even benefit from them to a greater extent.

Table 2.
Strengths and weaknesses of permanent training programs for teachers

Strengths	Weaknesses
• Permanent training produces a slight to medium-size positive impact on academic performance. • It has an effect of similar magnitude on the socio-emotional and communicative skills of children younger than seven. • Programs that contextualize pedagogical knowledge (how the student learns and what teaching strategies are needed for specific content) are more effective than those with a general approach. • Training that is consistent with the practices and objectives of the school and the education system as a whole achieve greater effects. • Programs that incorporate action-based learning are more effective. In particular, those with a coaching component (both face-to-face and virtual) stand out for their good results. • Permanent training has a positive influence on the practice of teachers who work with vulnerable students. It could be even more effective for these teachers.	• The evidence is clearer for math and literacy programs than for science programs, in which it is mixed (with null or minor effects). • Substantial changes in teachers' practice are needed to achieve an impact on students' results. • There is little evidence about the type of content that must be addressed in the training to achieve a greater impact. • Training that is not aligned with the teachers' and students' daily lives, nor with the standards set out by the school and the administration, shows negative effects. • Implementing large-scale coaching-based programs is a challenge due to the high cost and the difficulty in having a sufficiently well trained group of trainers. • We do not know if programs have a differentiated impact on children's educational performance based on their socio-economic situation. We also do not know what the profile of the most effective trainer is and if the impact of the programs varies depending on the characteristics of the participants.

Source: Author's creation

Implications for practice

Having a body of teachers prepared to respond to the challenges and needs raised by the education system at all times is a challenge that must be addressed in a comprehensive way, with a strategic vision that consistently integrates the mechanisms of initial training and training to access the profession, permanent training, teacher assessment systems and instruments that regulate teachers' professional careers. In this set of tools, permanent training plays a central role in bringing the teaching staff up to date and connects it to educational research and everyday challenges. The review of evidence that we now conclude enables us to issue some recommendations addressed to educational administrations, schools and training organizations.

- At the outset, we must ensure that **the planning for the permanent training is based on the schools' curricular objectives and the specific needs of their students**. This is why administration management teams should adopt an active role as promoters, designers or trainers within the programs. The commitment to internal training in schools that has taken place in recent years is precisely in line with giving prominence to the schools to lead their own training processes. However, this school autonomy must be framed within a strategy that ensures the

availability of sufficient resources and planned, balanced and guaranteed quality training to provide.

- Regarding the format of the permanent training programs, **we must promote and prioritize interventions that allow a link with teachers' tasks and responsibilities and turn schools into a learning opportunity**. This can be translated into different fields and through different strategies, which will surely differ in validity depending on the purpose and content of each training module. Thus, it seems that action-based learning strategies such as in-class observation of other teachers, feedback from expert professionals, the planning of teaching units based on student needs, discussion and study in groups of teachers, etc., are practices that can be effective if they are organized around a consistent guiding thread. It is especially important to provide professionals with opportunities and time to reflect on their own practice and to adapt and apply what they have learned.

It is especially important to provide professionals with opportunities and time to reflect on their own practice and to adapt and apply what they have learned.

- In this sense, we should tend to conceive training actions as **processes in which the reception of content is only one element integrated into a broader cycle** that also includes a diagnosis of needs, as well as the design, implementation and evaluation of new actions. This cycle may or may not be part of the professional development program, but it definitely must be integrated into a process led by the same school. In any case, it is desirable that permanent training programs provide for a support mechanism, such as coaching, which facilitates the transfer of knowledge to practice.
- In order to be able to achieve truly transformative training, it is imperative that the **design of content be based on the highest quality evidence of the effectiveness of educational strategies and interventions** for students. Not only that, but at least for training teachers in some subjects, it seems that we need to nurture the curriculum with knowledge of how students acquire certain skills and concepts. In this sense, any complementary initiative that facilitates the connection between research and educational practice helps to move towards a context that supports the use of evidence to design educational programs.
- Equally, **teachers must be equipped with tools and resources to evaluate the implementation of educational practices** (based on structured observations, video recordings, etc.). We must also **make it easier for impact assessments to be carried out** (through agreements with university research groups or other evaluating organizations). From a system perspective, it is essential to evaluate programs that are implemented, putting more emphasis on formats and approaches for which we have less evidence of effectiveness and doing everything possible to identify which components guarantee that training programs are transferred to practice and are triggered by improvement in children's educational outcomes.
- All of this requires that **teachers and management teams be prepared to**

successfully complete their professional development once they are active. Thus, as part of the initial teacher training programs, it would be necessary to work as a priority objective on the skills associated with permanent training itself. After completing the training that allows access to the profession, teachers must be aware of the need to continue to be trained throughout their professional career and to have acquired different abilities to do so: to reflect on their own practice and evaluate it, to be up to date on and understand the most rigorous educational research and to apply the results in designing educational programs.

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