REVISTA INTERNACIONAL DE FORMAÇÃO DE PROFESSORES

Evaluation of continuous teacher training focused on student learning: Reviews and proposals

Avaliação da formação continuada do professor com foco na aprendizagem do aluno: Revisões e propostas

Evaluación de la formación continua del profesor enfocada en el aprendizaje del alumno: Revisiones y propuestas

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Abstract: Continuous teacher training is essential for improving pedagogical practices and, consequently, student learning. However, few studies directly investigate the impact of such training on student performance. The main issue addressed in this article is how to effectively assess the impact of continuous teacher training on student learning, considering the various factors that influence the educational process. The methodology used was an integrative systematic review based on the PRISMA model, analyzing 14 studies on continuous training and its effects. The analysis identified that mixed methodologies, combining theory and practice, promoting collaboration among teachers, and using quantitative data (such as IDEB and SPAECE), are the most effective. As a result, a structured continuous training framework was proposed, with clear steps to assess its impact on student learning. The proposal includes continuous monitoring and the use of external evaluations, offering a methodological pathway to improve both pedagogical practice and academic outcomes.
Keywords: Continuous teacher training. Evaluation. Professional development.

Resumo: A formação continuada de professores é essencial para melhorar práticas pedagógicas e, consequentemente, a aprendizagem dos alunos. No entanto, poucos estudos investigam de forma direta o impacto dessa formação no desempenho discente. A principal problemática deste artigo é como avaliar eficazmente o impacto da formação continuada na aprendizagem dos alunos, considerando os múltiplos fatores que influenciam o processo educativo. A metodologia utilizada foi uma revisão sistemática integrativa baseada no modelo PRISMA, que analisou 14 estudos sobre formação continuada e seus efeitos. A análise identificou que metodologias mistas, que combinam teoria e prática, promovem colaboração entre professores e utilizam dados quantitativos (como IDEB e SPAECE), são as mais eficazes. Como resultado, foi proposta uma estrutura de formação continuada com etapas claras para avaliar o impacto na aprendizagem dos alunos. A proposta inclui acompanhamento contínuo e uso de avaliações externas, oferecendo um caminho metodológico para aprimorar a prática pedagógica e os resultados acadêmicos.
Palavras-chave: Formação continuada. Avaliação. Desenvolvimento profissional.

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Resumen: La formación continua de los profesores es esencial para mejorar las prácticas pedagógicas y, por ende, el aprendizaje de los alumnos. Sin embargo, pocos estudios investigan directamente el impacto de dicha formación en el rendimiento estudiantil. La problemática principal de este artículo es cómo evaluar eficazmente el impacto de la formación continua en el aprendizaje de los alumnos, considerando los múltiples factores que influyen en el proceso educativo. La metodología utilizada fue una revisión sistemática integrativa basada en el modelo PRISMA, que analizó 14 estudios sobre formación continua y sus efectos. El análisis identificó que las metodologías mixtas, que combinan teoría y práctica, promueven la colaboración entre profesores y utilizan datos cuantitativos (como el IDEB y el SPAECE), son las más eficaces. Como resultado, se propuso una estructura de formación continua con etapas claras para evaluar el impacto en el aprendizaje de los alumnos. La propuesta incluye un seguimiento continuo y el uso de evaluaciones externas, ofreciendo un camino metodológico para mejorar tanto las prácticas pedagógicas como los resultados académicos.
Palabras clave: Formación continua. Evaluación. Desarrollo professional.

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Introduction

Continuing teacher training is a fundamental aspect of education, aimed at improving teaching practices and significantly improving student learning. However, a comprehensive review of the literature reveals a worrying gap: there is a lack of studies that directly investigate the impact of this training on student learning. This absence represents a considerable challenge for educators, managers, and researchers seeking to assess the real effectiveness of educational interventions.

The difficulty in finding robust analyses of the correlation between continuing education and learning is largely due to the complexities and dynamics present in the school environment. Evaluating the impact of training programs requires an approach that considers several interconnected variables, such as the socio-economic context, the particularities of the students, school infrastructure, and teaching methodologies. This tangle of factors makes it difficult to isolate and measure the specific contribution of continuing education, which poses a significant methodological challenge. In addition, the impact of continuing training is not always immediate, often only manifesting itself in the medium or long term. This requires longitudinal studies and continuous monitoring, something that usually comes up against the limitations of resources, technical and operational capacity, and time (Guskey, 2000).

In short, due to its multifaceted nature, education implies that changes in student performance are the result of a combination of internal and external factors to the school, making it difficult to attribute the results directly to continuing education programs. Despite these barriers, it is essential not to overlook the importance of investigating this area. Given the significant investment of time and resources on the part of institutions and the teachers themselves, it is essential to develop studies that provide effective subsidies to evaluate the contributions of continuing education to student learning.

Given this gap in the literature, this article sets out to investigate *the evaluation of continuing teacher education with a focus on student learning*, exploring both existing theoretical reviews and proposing new methodological approaches for evaluating these programs. The central problem lies in how to effectively measure the impact of continuing training on student performance, considering the multiplicity of factors that influence the teaching-learning process. By addressing this issue, the article seeks to make a significant

contribution to the field by suggesting more effective ways of evaluating educational interventions, with the aim of subsidizing policies and pedagogical practices that promote real and continuous improvement in education.

Method

This study starts with an integrative systematic review guided by the PRISMA model (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*), as proposed by Moher *et al.* (2009). This approach was chosen because of its ability to synthesize and integrate various studies in a rigorous and organized way, allowing for a critical analysis of continuing teacher education with a focus on student learning. The PRISMA model is recognized for ensuring transparency in all stages of the review, from the literature search to the final inclusion of the articles analyzed. The choice to use an integrative systematic review, following the PRISMA method, is justified by the need for a broad and rigorous approach that allows us to identify gaps in the literature and, at the same time, propose evidence-based solutions. The use of tables to organize the data makes it easier to visualize the information and compare the studies, while the PRISMA flowchart guarantees the replicability of the study and the clarity of the inclusion and exclusion criteria. This methodological rigor is essential for the study to achieve its main objective: to understand and propose ways of evaluating continuing teacher training, always with a focus on the direct impact on student learning.

Given this context, after carrying out an integrative literature review, this study goes further by critically analyzing the findings of the selected studies and based on this analysis, proposing a framework for evaluating continuing teacher training with a focus on student learning. This proposal is presented in the final table, derived from the evidence found in the studies reviewed, and aims to fill gaps left by the research found.

Thus, the methodological process of this article followed five steps: (1) survey of descriptors and search in databases, (2) application of the PRISMA model to screen and select articles, (3) qualitative analysis of the included studies, (4) evaluation of the methodological robustness of the selected studies, and (5) construction of a practical evaluation proposal based on the analyzed results. Each of these stages is described in detail below, demonstrating their organization's logic and contribution to the problem under investigation.

Identification of Studies

The first stage consisted of searching for the descriptors and databases that would guide the research. Broad descriptors such as "continuing education" and "assessment" were used to avoid excluding relevant studies. The search was carried out in four databases: CAPES PERIÓDICOS, SCIELO, BDTD, and ERIC, totaling 737 records found. Chart 1 below shows the distribution of the articles identified by the database and the descriptors used, allowing a clear view of the volume of studies consulted, and the data sources used. This strategy allowed for a broad and comprehensive search, which is essential for a quality integrative systematic review.

Chart 01: Descriptors searched in the databases researched

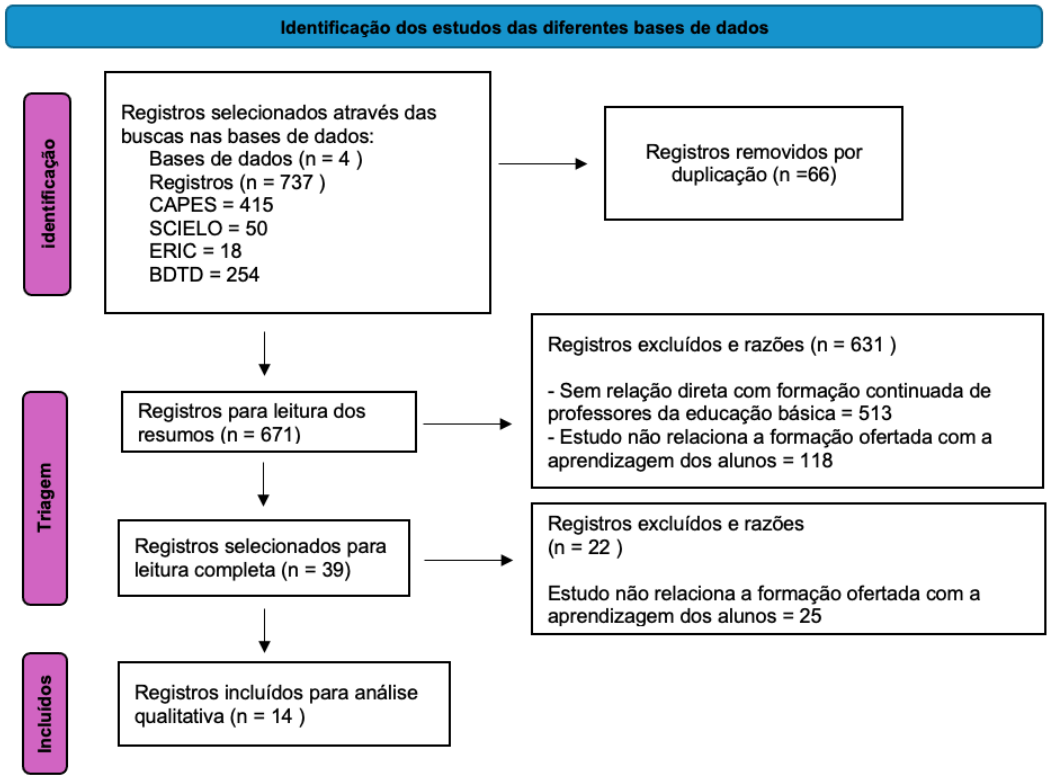
Bases	Articles	Descriptor	Field
CAPES	415	Continuing education AND evaluation	Any field
SCIELO	50	Continuing education AND evaluation	Any field
BDTD	254	Continuing education AND evaluation	Any field
ERIC	18	Inservice Teacher Education AND Program Evaluation	Any field and filtered with Peer Review.
CAPES	415	Continuing education AND evaluation	Any field
TOTAL	**737**		

Source: Produced by the authors.

Screening and selection of studies

Next, the PRISMA flowchart was applied, as shown in Figure 1, also shown below. This methodology was followed to organize the screening process and exclude irrelevant studies. The flowchart follows three stages: identification, screening, and inclusion. Initially, the 737 records were analyzed, 66 duplicate articles that were found in more than one database were removed, resulting in 671 articles that went on to read the abstracts. At this stage, 631 articles were excluded because they did not deal directly with the relationship between continuing teacher training and student learning. A complete reading was carried out on 39 articles, of which 25 were excluded, as can be seen in Figure 1, leaving 14 studies included for qualitative analysis. The rigorous application of the PRISMA method is essential to ensure that only the studies most pertinent to the problem listed here are analyzed, increasing the results' reliability and ensuring the data's relevance to the proposed topic.

Figure 01: Result of PRISMA analysis



Source: Made by the authors using Moher's methodology *et al*. (2009).

Qualitative analysis of included studies

The 14 studies selected have been organized in Chart 2 (below), which presents a detailed qualitative analysis of the articles found. For each article, the following aspects were listed: title, type of study, instrument used, population studied, sample, and country where the research was carried out. This table was created to make it easier to understand the different methodological approaches and contexts in which the studies were carried out, allowing us to identify common patterns and characteristics that impact the evaluation of continuing education about student learning.

Analysis of methodological robustness

Subsequently, the selected studies were evaluated for the robustness of their methodologies and sampling, and the results were organized in Chart 3 (below). This table details the critical analysis of the robustness of the studies in terms of the methodology used, type of sampling, data collection instruments, and results achieved. The construction of this table is crucial to identify which studies present the most reliable, comprehensive, and generalizable data, serving as a basis for the proposed analysis of continuing education programs that are always focused on student learning.

Proposed stages for evaluating continuing training

Based on the analysis of the literature as commented on so far, we have drawn up a proposal of stages for the construction of an evaluation of continuing training with a focus on student learning, as described in Chart 4 (below). The proposal offers a methodological path for evaluation, aimed at aligning continuing education with the real pedagogical needs of teachers and improving students' academic performance. Although this proposal is derived from existing literature and was designed based on a critical evaluation of the methodology of such studies, it has not yet been tested in the field as it is here, and the next step is to verify its effectiveness and efficiency. Future studies will focus on validating this proposal in real school environments to provide practical input for the formulation of educational policies and continuing education programs.

Study characteristics

The 14 studies selected address the relationship between continuing education and student learning, some directly and others more indirectly. They cover various regions of Brazil, with one study coming from the United States, which includes more than 40 schools participating in a continuing education program. Studies vary in terms of methodology, being qualitative, quantitative, or mixed, and using a wide range of instruments to collect data. Based on the descriptors used in the search, it is difficult to find research that explicitly reflects on the impact of continuing education on student learning. Many studies focus on the central importance of continuing education, while others are exclusively dedicated to evaluating the programs

themselves, without considering their effects or potential impacts on student learning. These studies were excluded because this work focuses on those that, at least indirectly, establish a relationship between continuing teacher training and student performance. These characteristics are detailed in Chart 2 (below), which presents a qualitative analysis of the 14 studies selected, highlighting aspects such as the type of study, the population investigated, the collection instruments, and the geographical and educational contexts involved.

Chart 02: Qualitative analysis of the studies in the Integrative Review

1. Author/Year: Silva; Arrais; Moreira (2019)
Title: *A formação de professores e a matemática no PNAIC.*
Type of study: Qualitative.
Instrument used: Student notebooks, school assignments, observation of continuing education courses.
Study population: Literacy teachers and 1st-grade students.
Sample used: The 1st-grade teacher and some of the students in her class.
Country: Brazil.

2. Author/Year: Carneiro (2021)
Title: *Avaliação externa no estado de Mato Grosso e a formação continuada dos professores de língua portuguesa: desafios para uma educação de qualidade.*
Type of study: Qualitative.
Instrument used: Document analysis, online questionnaire.
Study population: Portuguese language teachers from the third cycle of elementary school (eighth grade) in the state of Mato Grosso.
Sample used: 28 elementary school Portuguese language teachers from public schools located in nine municipalities in the state of Mato Grosso.
Country: Brazil.

3. Author/Year: Ferreira; Silva (2020)
Title: *Formação continuada de professores alfabetizadores: um estudo em três municípios do marajó/PA.*
Type of study: Qualitative.
Instrument used: Literature review, documentary analysis, questionnaire application.
Study population: Literacy teachers from the municipalities of Breves, Melgaço and Portel.
Sample used: Six literacy teachers, six schools and 336 students.
Country: Brazil.

4. Author/Year: Gomes; Vidal (2021)
Title: *Formação continuada e resultados no IDEB: o que dizem os questionários contextuais de diretores e professores do Saeb/2017.*
Type of study: Quantitative.
Instrument used: Contextual questionnaires.
Study population: Principals and teachers from 20 municipal school networks in Ceará.
Sample used: 295 principals and 2,853 teachers.
Country: Brazil.

5. Author/Year: Barbosa (2020)

Title: *Formação continuada frente à adoção do currículo mínimo: uma avaliação dos professores de matemática e língua portuguesa da regional noroeste fluminense.*
Type of study: Qualitative.
Instrument used: Questionnaire with closed and open questions.
Study population: Portuguese language and math teachers from the northwest region of Rio de Janeiro.
Sample used: 53 teachers from the 9th grade of elementary school and the 1st grade of secondary school.
Country: Brazil.

6. Author/Year: Schmidt; Souza (2019)
Title: *Formação de professores alfabetizadores pelo programa pacto nacional de alfabetização na idade certa: reflexões sobre avaliação realizada por municípios.*
Type of study: Qualitative.
Instrument used: Documentary research and interviews.
Study population: Municipalities of the Laguna Region (AMUREL) in the south of the state of Santa Catarina.
Sample used: Five municipalities (1 large, 2 medium, 2 small).
Country: Brazil.

7. Author/Year: Bonotto; Scheller; Lima (2020)
Title: *Modelagem (matemática) e modelagem na educação: reflexos na e da formação continuada.*
Type of study: Qualitative.
Instrument used: Field diaries, audio recordings, written records.
Study population: Basic education math teachers.
Sample used: 16 teachers and 12 students.
Country: Brazil.

8. Author/Year: Silva (2021)
Title: *O ensino e a aprendizagem da matemática e a teoria dos campos conceituais na formação continuada de professores.*
Type of study: Qualitative and quantitative.
Instrument used: Pre-test, post-test, recorded training sessions, and researcher notes.
Study population: Teachers and students from the 3rd year of elementary school.
Sample used: 20 teachers and 52 classes of students (control and experimental groups).
Country: Brazil.

9. Author/Year: ALFERES; MAINARDES (2019)
Title: *O pacto nacional pela alfabetização na idade certa em ação: revisão de literatura.*
Type of study: Literature review.
Instrument used: Document review, analysis of 64 research papers.
Study population: Research published on PNAIC from 2013 to 2016.
Sample used: 64 jobs.
Country: Brazil.

10. Author/Year: Morescho; Delizoicov (2020)
Title: *Pacto nacional pelo fortalecimento do ensino médio (PNEM): a formação continuada na Gered de Chapecó, SC.*
Type of study: Qualitative.
Instrument used: Semi-structured interviews.
Study population: Teachers from 10 state public schools.
Sample used: 12 study guides.

Country: Brazil.

11. Author/Year: Nascimento *et al.* (2023)
Title: *Reverberações da formação continuada nos indicadores educacionais de uma escola pública estadual cearense.*
Type of study: Qualitative.
Instrument used: Document analysis, observation.
Study population: Math teachers and third-grade students at a public school in the state of Ceará.
Sample used: 164 students and 3 math teachers.
Country: Brazil.

12. Author/Year: Did you know (2020)
Title: *Sistema de avaliação do rendimento escolar do município de Marília (SAREM): uso dos resultados na política educacional.*
Type of study: Qualitative.
Instrument used: Bibliographical and documentary research.
Study population: Municipal schools in Marília.
Sample used: Data collected by the Department of Education.
Country: Brazil.

13. Author/Year: Mihaly; Opper; Greer (2022)
Title: *The impact and implementation of the Chicago collaborative teacher professional development program.*
Type of study: Quantitative.
Instrument used: Literature review, analysis of administrative data, lesson observation, questionnaires.
Study population: Schools in the Chicago area.
Sample used: 40 schools in three school districts.
Country: United States.

14. Author/Year: LOPES; COSTA (2020)
Title: *Um olhar sobre a formação continuada de professores na rede municipal de Recife, PE.*
Type of study: Qualitative.
Instrument used: Documentary analysis of the action plan/2018, evaluation forms, trainer reports.
Study population: Teachers from Recife's municipal network.
Sample used: 4th and 5th grade teachers, 25 classes/month.
Country: Brazil.

Source: Prepared by the authors.

Based on the analysis of the studies presented in Table 2, it was possible to explore in greater depth how each study addressed the challenges of correlating teachers' continuing education with student learning. Below, we summarize the main conclusions of each study, highlighting the relationship established between continuing education and student performance and whether this relationship was investigated directly or indirectly. The diversity of approaches offers a broader understanding of the impacts and implications of continuing education in improving educational outcomes, contributing significantly to advancing knowledge in the field of education.

Analysis of findings: Does training affect learning?

According to Silva, Arrais, and Moreira (2019), the continuing education of literacy teachers, despite being considered fundamental by the parties analyzed, did not have a significant impact on student learning. The analysis of the students' notebooks revealed that math teaching continued to focus on numbers and basic operations, failing to adequately address other concepts essential for mathematical development, which were the focus of the continuing education. As a result, teachers' pedagogical practices have not undergone significant changes, which has limited the impact of continuing education on students' intellectual progress.

On the other hand, according to Carneiro (2021), continuing education has had a significant impact on teaching practice. In her study on external evaluation in the state of Mato Grosso, she found that the training offered to Portuguese language teachers through the Diagnostic Evaluation of State Public Education (ADEPE) contributed to their professional development and improved their pedagogical approaches. However, the direct relationship between continuing education and student learning was not conclusive. The study highlighted the need for greater teacher involvement in assessment policies and better alignment between assessment and the content taught in the classroom. Despite this, there was an improvement in the Basic Education Development Index (IDEB) in 2016, when the final years of elementary school achieved a score of 4.4, surpassing the target of 4.2 set by the government.

Ferreira and Silva (2020) investigated the continuing education of literacy teachers in the municipalities of Breves, Melgaço, and Portel in the context of the National Pact for Literacy at the Right Age (PNAIC). The study revealed significant limitations in the positive impact of this training, both on teaching practice and improving students' literacy. The research showed that training was characterized by a utilitarian approach and a lack of adequate working conditions, such as infrastructure and pedagogical resources, resulting in a weakened teaching practice that was ineffective in promoting educational progress among students.

Gomes and Vidal (2021), in their study *Formação continuada e resultados no Ideb: o que dizem os questionários contextuais de diretores e professores do Saeb 2017*, reveal significant differences in the supply and quality of continuing education between the municipalities with the highest and lowest IDEB results. The analysis of the contextual questionnaires indicated that, in the municipalities with the best results, continuing training

tends to be more aligned with teachers' needs, resulting in a more positive impact on teaching practice and school management. In contrast, in the municipalities with the lowest results, training is less frequent and less effective, which reflects a reduced impact on educational practices. The authors suggest that this difference stems from the fact that in the best-performing municipalities, training is conceived on the basis of real, previously identified demands, while in the lowest-performing municipalities, this articulation is less effective, either due to the insufficient quality of the training or the lack of an adequate survey of demands. Although it is possible to infer that continuing education in municipalities with higher IDEB scores is related to some extent to the quality of the training, the authors point out that it is not possible to categorically state a direct relationship between continuing education and improved student learning.

Barbosa (2020) argues that the continuing education for math and Portuguese language teachers in the northwest region of Rio de Janeiro, offered through the SEEDUC/CECIERJ agreement, significantly impacted the implementation of the Minimum Curriculum in state schools. The training courses were designed to fill gaps in teachers' knowledge, enabling them to apply the curriculum more effectively in the classroom. The evaluation of the teachers who participated in the training indicated improvements in pedagogical practice and teacher confidence, reflecting positively on student learning.

Schmidt and Souza (2019) evaluated the continuing education of literacy teachers through PNAIC, and the participants, including local coordinators and study advisors, considered the program to be successful. However, no evidence was found that this training has been consolidated as an effective public literacy policy, since the municipalities have not turned it into a public policy. With regard to the contribution to student learning, the survey indicated, through the participants' testimonies, that there was a perception of a positive impact. Teachers mentioned the use of large-scale assessments such as the ANA, reports, and the SIMEC platform for monitoring. However, there were no systematic evaluations carried out by the municipalities to prove significant changes in student performance, based only on reports and observations of the pedagogical practices adopted by teachers.

Bonotto, Scheller, and Lima (2020) evaluated the continuing education of math teachers, highlighting positive results, especially in integrating new modeling practices in

education. The students showed significant progress in understanding the concept of density and reorganizing their initial representations. However, the research also identified difficulties for students in applying this knowledge to ratio and proportionality problems, indicating that there are still challenges in transferring learning to other mathematical areas. These results suggest that, despite the progress made, there is room for improvement in continuing education in order to guarantee a comprehensive and effective application of the concepts taught.

The thesis entitled *O ensino e a aprendizagem da matemática e a teoria dos campos conceituais na formação continuada de professores,* by Silva (2021), explores the continuing education of mathematics teachers, based on Gérard Vergnaud's Theory of Conceptual Fields and the RePARe spiral method. The research, carried out with 20 3rd-grade elementary school teachers in Canoas, compared the performance of classes whose teachers took part in the training meetings with control classes. The results showed that continuing education had a positive impact on the students' learning, as evidenced by the improvement in math problem-solving strategies.

The study by Alferes and Mainardes (2019), entitled *O Pacto Nacional pela Alfabetização na Idade Certa em ação: revisão de literatura*, aims to analyze and synthesize the existing literature on the implementation of PNAIC. The research addresses the main challenges and successes of the program, highlighting the importance of continuing education for literacy at the right age. The authors conclude that, despite the difficulties encountered, PNAIC has contributed to improvements in teaching practice and, in some cases, in student performance in reading and writing, according to implementation reports and teachers' perceptions, which shows an indirect relationship between training and the perception of improved learning.

Morescho and Delizoicov (2020) investigated the impact of the continuing training offered by the National Pact to Strengthen Secondary Education (PNEM) and concluded that it had a significant positive effect on teachers' pedagogical practice and, according to the study guides, also on students' learning. The advisors reported that the training provided by the PNEM gave value to the individualities of the students, promoting greater engagement and participation in the educational process. Changes in teaching and assessment methodologies

have encouraged a more humanized and collaborative approach, resulting in a general perception of improvement in student learning.

Nascimento *et al*. (2023) carried out a study on the impact of continuing training on the educational indicators of a state public school in Ceará. There, they concluded that this training can improve teachers' repertoire of specific, didactic, and pedagogical knowledge when aligned with teachers' needs. The result was more qualified classes, which reflected positively on the students' learning. The study identified a direct correlation between continuing education and improved student performance, as demonstrated by the SPAECE assessments. Comparing the diagnostic assessment with the official one, there was a reduction in the number of students at the "Very Critical" level from 54% to 32% and an increase in the "Intermediate" level from 9% to 23%.

Sabia (2020), in her article *Sistema de avaliação do rendimento escolar do município de Marília (SAREM): uso dos resultados na política educacional*, analyzes how this tool guides school management, influences the pedagogical project, directs the work of teachers and, according to the author, promotes a restricted view of quality based on student performance. On the other hand, the teachers' statements indicate that SAREM has had a positive impact on continuing education, with unanimous agreement in the surveys carried out, showing that the system's results are effective in guiding pedagogical actions.

Mihaly, Opper, and Greer (2022), in their article *The impact and implementation of the Chicago collaborative teacher professional development program*, analyze a collaborative professional development program in Chicago, evaluating its impact on teaching practices and student performance. The results indicate significant improvements in collaboration between teachers and in the use of innovative teaching practices, reflecting positively on student performance in various subjects. The study directly evaluates continuing education, measuring its impact on students' grades and participation.

Lopes and Costa (2020) state that continuing education is essential to strengthen the teacher's identity and give new meaning to pedagogical practice. The qualitative research, which evaluated the training of 4th and 5th-grade teachers over five months, showed that, despite some limitations, the teachers evaluated the meetings positively. They perceived a good articulation between theory and practice and reported a positive impact on the students'

learning, applying the discussions and exchanges of experiences in their classes. The study suggests that continuing education makes a significant contribution to teachers' professional development, directly impacting the quality of teaching and student learning.

Analyzing the evidence found and its basis

The complexity of the school environment makes it challenging to assess the impact of continuing education on student learning directly. Various factors, such as the socio-economic context, student profile, school conditions, and teaching methods, influence the educational environment, making it difficult to isolate the specific effect of continuing teacher training. This interaction between multiple elements represents a major methodological challenge. Of the 737 initial records, only 14 studies remained that met the PRISMA analysis criteria. However, after analyzing the results and the main findings, it became clear that not all of them had an adequate methodology for establishing a clear relationship between teacher training and student performance. Therefore, Chart 3 below was drawn up to organize and classify these 14 studies on continuing education, taking into account the robustness of their methodologies and their ability to measure the direct impact on student learning. Analyzing the robustness of the studies is a fundamental factor for the reliability of the results and helps us propose an evaluation path that can cover most of the continuing training that takes place. All 14 studies were evaluated on the basis of the types of methodology used (qualitative, quantitative, mixed) and the instruments used to collect data (questionnaires, external evaluations, observations).

Studies that used mixed or quantitative methods, such as student performance data obtained from external assessments (IDEB, SPAECE), were classified as highly robust. Thus, highly robust studies are those that collect empirical data, such as test scores and standardized assessments, providing a solid evaluation of the impact of continuing education. These surveys offer more objective evidence, measuring the impact of training in a concrete and reliable way. The classification of high robustness does not imply an exclusive valuation of quantitative methods or standardized exams, but rather the recognition that these data provide an objective basis for complementing the analysis of educational impacts. The use of empirical data seeks to ensure a more complete and balanced understanding of the teaching-learning process, without disregarding the qualitative and contextual aspects that are also fundamental to an integral education. Thus, the

aim is not to reduce educational complexity to numbers, but to enrich the analysis with multiple perspectives that can contribute to more informed and effective pedagogical decisions. For example, the study by Mihaly, Opper, and Greer (2022), which evaluates a collaborative professional development program in Chicago, stands out for using a mixed methodology and including student performance data, which lends robustness to its conclusions. Similarly, the study on continuing education in a public school in Ceará, which uses data from the SPAECE, is classified as robust, as is the research on IDEB results, which analyzed the impact of continuing education programs.

Studies of medium robustness, on the other hand, are characterized by their reliance on teachers' perceptions without the support of sufficient quantitative data. Although these studies use mixed methodologies, the absence of quantitative evidence to directly measure student performance limits the strength of the conclusions. An example of this is the study on continuing education in PNAIC, which, despite addressing teachers' perceptions, does not present robust empirical data to verify the direct impact on learning.

Finally, the studies with low robustness are based almost exclusively on perceptions or questionnaires, without the use of quantitative data, such as the results of external or other evaluations, which are essential for measuring the direct impact on learning. One example is the research on continuing education in municipalities in Marajó/PA, which uses interviews with teachers, but does not collect quantitative data that relates education to improved student performance (the main objective of any education, by the way). Another example is the study on the SAREM system, which focuses on school management practices, but does not provide sufficient quantitative evidence on the impact of continuing education on learning.

Chart 03: Analysis of sampling methodology and level of robustness

1. Author/Year: Mihaly; Opper; Greer (2022) **Title:** *The impact and implementation of the Chicago collaborative teacher professional development program.* **Summary of critical analysis:** The mixed methodology and the inclusion of student performance data make the conclusions about the positive impact robust and reliable. **Robustness level:** High.
2. Author/Year: Nascimento *et al*. (2023) **Title:** *Reverberações da formação continuada nos indicadores educacionais de uma escola pública estadual cearense.*

Summary of critical analysis: The inclusion of quantitative data (SPAECE) strengthens the conclusions about the positive impact of continuing education.
Robustness level: High.

3. Author/Year: Gomes; Vidal (2021)
Title: *Formação continuada e resultados no IDEB: o que dizem os questionários contextuais de diretores e professores do SAEB 2017.*
Summary of critical analysis: The use of IDEB data strengthens the conclusions, although the positive impact is only observed in specific contexts.
Robustness level: High.

4. Author/Year: Silva (2021)
Title: *O ensino e a aprendizagem da matemática e a teoria dos campos conceituais.*
Summary of critical analysis: This doctoral thesis presents a very detailed analysis and uses a mixed approach (qualitative and quantitative) with data collected from pre- and post-tests carried out in 3rd-grade classes. The results show a direct impact on student learning based on the practical application of Conceptual Fields Theory.
Robustness level: High.

5. Author/Year: Silva; Arrais; Moreira (2019)
Title: *A formação de professores e a matemática no PNAIC.*
Summary of critical analysis: The study is based on teachers' perceptions and does not present quantitative data to prove a direct impact on student learning.
Robustness level: Average.

6. Author/Year: Carneiro (2021)
Title: *Avaliação externa no estado de Mato Grosso e a formação continuada dos professores de língua portuguesa: desafios para uma educação de qualidade.*
Summary of critical analysis: The study uses a mixed-methods approach, but the lack of quantitative data on student performance weakens the conclusions.
Robustness level: Average.

7. Author/Year: Barbosa (2020)
Title: *Formação continuada frente à adoção do currículo mínimo: uma avaliação dos professores de matemática e língua portuguesa da regional noroeste fluminense.*
Summary of critical analysis: The conclusions are based on teachers' perceptions and do not provide quantitative data on student learning.
Robustness level: Average.

8. Author/Year: BONOTTO; SCHELLER; LIMA (2020)
Title: *Modelagem (matemática) e modelagem na educação: reflexos na e da formação continuada.*
Summary of critical analysis: The study offers insights into changes in teaching practices, but does not provide quantitative data on student learning.
Robustness level: Average.

9. Author/year: Morescho; Delizoicov (2020)
Title: *Pacto nacional pelo fortalecimento do ensino médio (PNEM): a formação continuada na Gered de Chapecó, SC.*
Summary of critical analysis: Based on teachers' perceptions, without including quantitative data to directly evaluate the impact on learning.
Robustness level: Average.

10. Author/year: **Schmidt; Souza (2019)**
Title: *Formação de professores alfabetizadores pelo programa pacto nacional de alfabetização na idade certa: reflexões sobre avaliação realizada por municípios.*
Summary of critical analysis: The study evaluates the implementation of the PNAIC program based on qualitative data and analysis of teachers' and managers' perceptions. Quantitative data on the direct impact on student learning is lacking, which weakens the conclusions.
Robustness level: Average.

11. Author/year: Ferreira; Silva (2020)
Title: *Formação continuada de professores alfabetizadores: um estudo em três municípios do Marajó.*
Summary of critical analysis: The study is predominantly qualitative, based on interviews and teachers' perceptions. There is no collection of quantitative data that directly correlates training with student performance, limiting the robustness of the conclusion.
Robustness level: Low

12. Author/year: Alferes; Mainardes (2019)
Title: *O pacto nacional pela alfabetização na idade certa em ação: revisão de literatura.*
Summary of critical analysis: The study is based on questionnaires and literature reviews with no quantitative data on student performance.
Robustness Level: Low.

13. Author/year: Did you know (2020)
Title: *Sistema de avaliação do rendimento escolar do município de Marília (SAREM): uso dos resultados na política educacional.*
Summary of critical analysis: The focus of the study is on school management practices, without providing sufficient quantitative evidence on the impact on student learning.
Robustness level: Low.

14. Author/year: Lopes; Costa (2020)
Title: *Um olhar sobre a formação continuada de professores na rede municipal de Recife, PE.*
Summary of critical analysis: The study is qualitative and does not include data on the direct impact on student learning, but is based solely on teachers' perceptions.
Robustness level: Low.

Source: Prepared by the authors.

Proposal for a training evaluation method

By analyzing all the studies selected here, it was possible to identify the most effective elements and, based on this, propose a continuing education prototype (Chart 4) that integrates measuring the impact on student learning as a relevant aspect of the process. The following proposal aims to create an ongoing training project that meets both the pedagogical needs of teachers and the need to measure the impact of this training on student performance. We prioritize the most robust methodologies, which balance theory and practice, promote

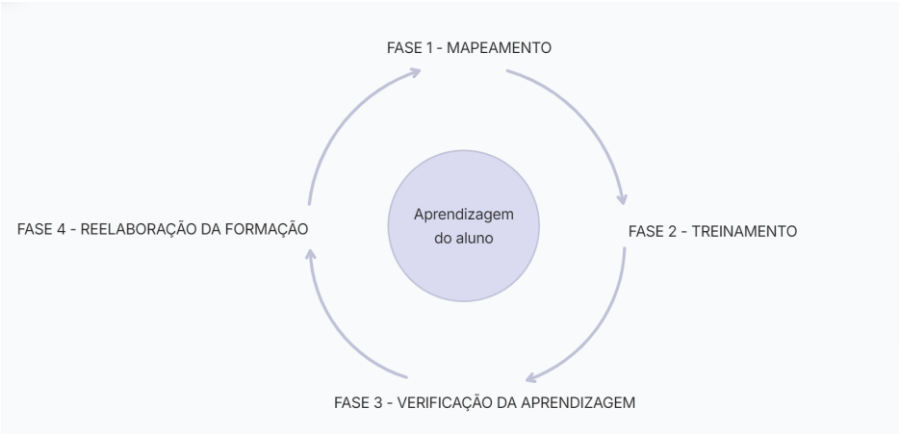
collaboration between teachers, and use external assessments to measure students' academic performance.

The proposal divides the training process into well-defined stages, describing how each phase can be implemented to ensure quality and accurate evaluation of the effects of this training on student learning. Essential components of this proposal include the implementation of tutoring and continuous monitoring, combined with the analysis of data from external assessments such as IDEB and SPAECE. These measures make it possible not only to improve teaching practice but also to have a direct impact on student performance, establishing a constant feedback loop between training, teaching practice, and educational results.

Continuous cycle of teacher training

Ongoing teacher training is an essential part of ensuring continuous improvement in the quality of teaching and, above all, success in student learning. With the student and their learning at the center of the process, this continuous training cycle can be structured in four major phases that repeat themselves in a constant feedback movement, always aimed at adjusting and perfecting teaching practices and achieving the desired objectives. Below, we detail the four main phases, and their respective stages, which range from the initial mapping of learning needs to verify the impact on student performance, culminating in the re-design of the training (see Figure 2).

Figure 02: Continuous training cycle proposal[3]



Source: Prepared by the authors.

Each phase above is better explained as follows.

Phase 1 - Mapping Learning Needs

This initial phase is dedicated to surveying and analyzing pedagogical needs, from the point of view of both students and teachers. Here, the motivating questions are: (1) what do the students need to know? (2) What do they already know? In addition, the role of the teacher and the school structure are questioned, seeking to identify the aspects that need to be improved in order to guarantee effective student learning. Based on this diagnosis, objectives and essential competencies are established so teachers can effectively guide students through their learning journeys. This phase is subdivided into two stages: in stage 1, the *Pedagogical Needs Survey* will be carried out, and in stage 2, the *Definition of Competencies and Objectives* of the training program will be produced. After that, you can move on to phase 2, which will take care of the training itself, as follows.

[3] Translation from right to left: Phase 1 - Mapping; Phase 2 - Training; Phase 3 - Learning verification; Phase 4 - Training redesign.

Phase 2 - Teacher training (alignment for student learning)

In this phase, the focus is on practical teacher training, ensuring that the competencies defined in the previous phase are developed and that teachers are prepared to apply them effectively in the classroom. This is as much about the content itself as it is about didactics. The teacher must have these two gaps filled, if they exist, so that learning can take place effectively. In this context, collaboration between teachers and ongoing mentoring are key elements. Thus, stage 3 is aimed at *Theoretical-Practical Content*, while stage 4 focuses on conducting *Collaborative Training*, which puts teachers in contact with each other.

Phase 3 - Checking Student Learning Improvement

In this phase, the focus is on evaluating the impact of the pedagogical changes aimed for in the previous phases. Progress in student and teacher performance is verified through quantitative and qualitative evaluations, as well as analysis based on the results of external evaluations. The training is reviewed and adjusted based on these results to restart the improvement cycle. Within this, in stage *5, Continuous Monitoring and Tutoring*, there is constant observation and analysis to ensure that the teaching practices adopted are having a positive impact on student learning. In stage 6, *Quantitative and Qualitative Evaluation*, the aim is to understand in both qualitative and quantitative terms whether the learning process has taken place as expected at the start of the training (and defined in the first stages). If possible, step 7 compares the growth of the students surveyed, within the logic of *the Use of External Assessments (IDEB, SPAECE, etc.)*.

Phase 4 - Re-elaboration of Training

After phase 3, the process enters the final evaluation, review, and reworking phase. This phase is crucial to ensure that teachers' ongoing training is in line with the necessary changes detected in the assessment of student learning. In step 8, the *comparison of before and after results* is made, and in step 9, the *periodic review and adjustments to the training are made.* After these steps, it can be said that we have reached the end of the implementation program and the actual evaluation of what was proposed (phase 4). Teaching practices are adjusted and optimized based on the results observed, closing the cycle of continuous improvement. At this

point, the cycle returns to phase 1 for a new mapping of learning needs, ensuring that the process is always up-to-date and geared to the real demands of the students.

The continuous cycle explained

The cycle of continuing teacher training is configured as a dynamic and continuous process, which places the student at the center, with learning being monitored and adjusted at each stage. Each phase aims to ensure that teaching evolves in a way that more effectively meets students' needs, promoting high-quality education and concrete results, as exemplified in the image below. To enable the implementation of these steps, the table below provides details, including the definition of the proposals, the implementation methods, and the main Key Performance Indicators (KPIs) for monitoring.

Chart 04: Training cycle and evaluation of the teaching-learning process

PHASE 1 - MAPPING LEARNING NEEDS
Stage 1 - Pedagogical needs assessment **What is the proposal:** Identify teachers' knowledge and skills gaps and difficulties in the classroom, with a focus on how these gaps affect student learning. **How to execute: A**pply questionnaires, conduct interviews with teachers, students, and parents, and observe classes to identify students' learning difficulties and how the teacher is addressing these issues. To check whether the teachers have mastered the content and teaching practices. **KPIs:** *KPI 1.1: P*ercentage of students reporting difficulties with content (interviews or questionnaires). *KPI 1.2:* Degree of correlation between the gaps identified in teachers and the difficulties presented by students (measured by observation and performance analysis). *KPI 1.3:* The percentage of parents who perceive that their children are having difficulties with the content validates the survey carried out in class. —— **Stage 2 - Defining competencies and objectives** **What is the proposal:** Establish the competencies that teachers must develop to ensure that students achieve the learning objectives. **How to implement:** Based on the diagnosis of the students' difficulties, and the teachers' previous knowledge and knowledge of didactics, define the specific competencies that the teachers need to master to ensure that the students are able to overcome the difficulties listed in phase 1 **KPIs:**

*KPI 2.1: D*egree of alignment with the Matrix of Competencies with the National Common Curriculum Base (BNCC).
KPI 2.2: Percentage of parents and guardians engaged in the planning process.
*KPI 2.3: E*valuation of expectations about the impact of training among managers and coordinators.

PHASE 2 - TEACHER TRAINING
(ALIGNMENT TO STUDENT LEARNING)

Stage 3 - Theoretical-practical content

What's on offer: To offer training that combines up-to-date pedagogical theory with applicable practices that favor student learning. The training should cover content, methodological, and didactic aspects, with the aim of making up for the shortcomings identified in phase 1 of the process.

How to implement: Structure training modules that integrate teaching strategies directly aimed at the main challenges faced by students (mapped out in phase 1).

KPIs:
KPI 3.1: Percentage of teachers who demonstrate understanding of new teaching practices during training.
KPI 3.2: Attendance and active participation of teachers in training.
KPI 3.3: Percentage of teachers who identify the relationship between new practices and the expected impact on student learning.

Stage 4 - Collaborative training

What is the proposal: To create collaborative spaces between teachers, also involving the pedagogical team and the school community, to discuss solutions focused on student learning and deliberated in phase 1 as essential for academic improvement.

How to implement: Form study groups and involve the school community (parents, staff, managers) in meetings to discuss how to support students in the learning process.

KPIs:
KPI 4.1: Percentage of teachers who report that they are implementing collaborative solutions discussed during training meetings.
KPI 4.2: Degree of teacher participation in collaborative meetings and exchange of experiences (measured by attendance lists and participation records).
KPI 4.3: Number of collaborative teaching strategies applied by teachers.

PHASE 3 - CHECK FOR IMPROVEMENT IN STUDENT LEARNING

Stage 5 - Ongoing monitoring and mentoring

What is the proposal: To offer constant monitoring and mentoring to ensure that the pedagogical practices adopted are having a positive impact on student learning, as mapped and defined with metrics in phase 1.

How to do it: Assign tutors to follow the students' performance and monitor the teachers' application of the practices, offering continuous feedback to both students and teachers.

KPIs:
KPI 5.1: Percentage of students who show continuous progress in assessments, reflecting the effectiveness of new teaching practices. Progress in the teacher's theoretical and didactic knowledge of the content to be taught.
KPI 5.2: Frequency of feedback from tutors on the impact of practices on student learning and the teacher's correct teaching practice (correlating the two ends).
KPI 5.3: Percentage of parents who report an improvement in their children's school performance after continuous monitoring.

Stage 6 - Quantitative and qualitative evaluation

What is the proposal: To evaluate the effectiveness of training based on the academic results of students and the perceptions of students, teachers, parents, and the community.

How to implement: Apply qualitative questionnaires to teachers, students, and parents, as well as use quantitative evaluations (students' academic performance) to measure the impact.

KPIs:
KPI 6.1: Percentage of students showing progress in quantitative assessments (tests).
KPI 6.2: Degree of student satisfaction with the teaching process (questionnaires).
KPI 6.3: Percentage of parents reporting improvements in students after training.

Stage 7 - Use of external assessments (IDEB, SPAECE)

What is the proposal: The results of external evaluations should be used to measure the impact of training on student progress.

How to carry out: Compare the results of external assessments (IDEB, SPAECE) before and after the training, focusing on how this reflects the student's progress.

KPIs:
KPI 7.1: Percentage of students who improved their grades in external assessments after the training.
KPI 7.2: Degree of student involvement in the learning process based on the results of external assessments.
KPI 7.3: The percentage of schools showing progress in external assessments, indicating a direct impact on learning.

PHASE 4 - RELABORATION OF THE TRAINING

Step 8 - Comparison of before and after results

What is the proposal: To analyze the students' results before and after the training, ensuring that the training has had an impact on the students' performance.

How to run: Compare students' academic performance data, analyzing progress from the beginning to the end of the training cycle.

KPIs:

KPI 10.1: Percentage of students making progress in benchmarking. *KPI 10.2:* Rate of improvement in student's behavior and participation in class after the training. *KPI 10.3:* Percentage of parents reporting positive changes in their children's school performance. **Stage 9 - Periodic review and adjustments to training** **What's on offer:** Adjust training based on feedback from students, parents, teachers and the community, ensuring that it remains relevant and effective. **How to implement**: Periodically review the content of the training based on the evaluations and perceptions of the stakeholders involved. **KPIs:** *KPI 11.1:* Revisions to training content based on student results and feedback from parents. *KPI 11.2:* Percentage of students who report feeling more prepared after the training adjustments. *KPI 11.3:* Percentage of parents and community who perceive improvements in student learning.

Source: Prepared by the authors.

From the synthesis presented in the table above, it was possible to extract the best practices from each study, resulting in a guide that highlights the indispensable points when designing a continuing education program and, especially, in its evaluation with a focus on the student's academic results. This guide offers clear guidelines for structuring training that meets teachers' pedagogical needs, while ensuring that the impact on student learning is rigorously evaluated and measured throughout the process.

Final considerations

This article started with a clear problem: *how to effectively measure the impact of continuing teacher training on student learning, taking into account the multiplicity of factors that influence the teaching-learning process*. Based on an integrative systematic review and the analysis of 14 studies, we sought to understand and propose a robust evaluation methodology that considers both teachers' pedagogical needs and students' academic results.

The findings show that the most effective methodologies for evaluating continuing education are those that balance theoretical and practical approaches, promote collaboration between teachers, and use empirical data (such as external assessments like IDEB and SPAECE) to measure the impact on learning. The proposal presented in this study structures a methodological path divided into clear stages, which not only improve the quality of the

training, but also make it possible to evaluate the effect of this training in the classroom objectively.

However, this study has some limitations. Firstly, most of the studies analyzed have not been tested in the field, which limits the generalizability of the results. In addition, many of the studies that use qualitative methodologies lack empirical data to support their conclusions, which reveals the need for greater integration between qualitative and quantitative data in future research. Another limitation is the lack of longitudinal evaluations, which would make it possible to observe the long-term effects of continuing education on students' academic results.

Given these limitations, the next steps include validating the proposal presented in real school contexts, with the aim of testing its effectiveness and efficiency. To do this, it will be necessary to conduct longitudinal studies that follow teachers over time, measuring the impact of their training on students' academic performance in a consistent way. Furthermore, it is essential to encourage the use of mixed methodologies and the collection of quantitative data in future evaluations to enrich the analysis and generate more robust conclusions.

Finally, although this study has made progress in understanding the best practices for continuing education, the effective evaluation of this process remains a challenge, requiring continuous efforts on the part of educators, managers, and researchers. The use of robust methods, the combination of qualitative and quantitative data, and the application of external evaluations are promising ways to ensure that continuing teacher training actually contributes to improving teaching and learning in schools.

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