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Mapping the feedback landscape: a systematic review of research on feedback sources, methods, and technologies in preservice teacher education

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Feedback is widely recognized as a cornerstone of effective teacher education that functions as a critical bridge between conceptual knowledge and instructional practice. In the context of preservice teacher education, feedback supports teacher candidates' development of instructional competence by providing targeted suggestions for improvement. Although existing literature offers insight into various feedback practices, there remains a lack of holistic synthesis examining how feedback is sourced, delivered, and mediated through technology. This systematic literature review, guided by Hattie and Timperley's (2007) Feedback Model, analyzed 45 peer-reviewed empirical studies published between 2014 and early 2025. Findings revealed that the most studied feedback type by source is instructor-provided feedback ($n = 25$), followed by peer ($n = 8$), mixed-source ($n = 8$), and technology-only feedback ($n = 2$) and that written feedback is the most studied feedback method. Although some studies employed advanced technologies such as video annotations, AI simulations, and real-time coaching tools, most of the reviewed studies did not report using any specific technology to support feedback. This finding suggests the field's ongoing interest in studying relatively traditional feedback methods despite the potential of value of peer feedback and the availability of scalable, interactive, and cost-effective feedback technologies.

KEYWORDS

feedback, preservice teacher education, technology, peer feedback, AI in
highereducation, systematic review

1 Introduction

Feedback, defined as any type of response to a student's attempt at enacting a practice or completing a task, is widely recognized as a central component of effective teacher education that serves as a bridge between theoretical learning and practical teaching competence (Hattie and Timperley, 2007; Shute, 2008). In preservice teacher education, feedback plays a critical role in helping teacher candidates (TCs) refine instructional strategies, develop self-efficacy, and foster reflective practice (Hattie and Timperley, 2007; Scheeler et al., 2004). As teacher preparation programs continue to evolve in response to technological, pedagogical, and societal changes, understanding how feedback is designed, delivered, and perceived by TCs has become increasingly important (Henderson et al., 2019).

1.1 Feedback in preservice teacher education

The individual studies that exist in the literature show that the feedback provided to TCs comes from various sources including university supervisors, faculty, mentor teachers, and even peers. [Borko et al. \(2008\)](#) suggest that instructor feedback remains the most common and influential since it offers authoritative insight grounded in instructors' deep pedagogical expertise and practical experience. Peer feedback, though less prevalent, has also been shown to encourage collaboration and critical thinking while promoting the co-construction of knowledge amongst TCs ([Topping, 2009](#)). Emerging studies also explore how combining instructor and peer feedback can create a richer, more balanced perspective for teacher candidates ([Okumu et al., 2024](#); [Carless and Boud, 2018](#)). However, no systematic review of literature yet exists to examine trends across instructor, peer, and combined feedback studies.

In terms of feedback methods, oral and written feedback are commonly used approaches across teacher education coursework and fieldwork ([Henderson et al., 2019](#)). Oral feedback can be developed quickly and used for formative purposes, so it is often immediate. [Henderson et al. \(2019\)](#) further argue that oral feedback can be dialogic, supporting formative learning through question-posing and question-answering in real-time teaching contexts. Written feedback, on the other hand, offers permanence, specificity, and the opportunity for asynchronous reflection ([Brookhart, 2017](#)). As such, individuals providing summative written feedback can have the opportunity to pause, construct meaningful statements, and share them with mentees or students at a time when the TC is able to focus on the feedback. The integration of both modes—referred to as mixed feedback—is gaining traction as an effective strategy for deepening TC reflection and uptake ([Brookhart, 2017](#); [Mahoney et al., 2018](#)). Moreover, the specific nature of how best to provide mixed feedback in ways that maximize the value of written and oral feedback requires further study ([Mahoney et al., 2018](#)).

[Johnson et al. \(2023\)](#) note that the use of technology in delivering feedback has expanded rapidly, especially in blended and online programs. They further assert that even as the COVID-19 pandemic-related disruptions have all but disappeared, many education programs continue to include online courses with synchronous or asynchronous formats. In addition to being used in online courses, technology can be integrated into face-to-face coursework to support the provision of high-quality automated feedback and to support instructors with large teaching loads for whom providing one-on-one feedback for every student is not possible. Tools such as video annotation platforms, AI-driven simulations, and digital coaching systems enable more interactive and personalized feedback experiences ([Bondie and City, 2024](#); [Cutumisu, 2018, 2019](#)). Despite this potential, [Mahoney et al. \(2018\)](#) suggest that many teacher education programs still rely heavily on traditional forms of feedback, and the integration of advanced feedback technologies remains unclear.

In sum, although numerous studies have investigated feedback in teacher education, the available literature is limited to individual factors such as source, type, or effectiveness, without producing a comprehensive synthesis across dimensions. Moreover, few reviews investigate how feedback is provided to TCs even though feedback is central to their growth as they exist in the learner-to-practitioner transition. Herein, we note that reviewing the published literature

cannot establish the nature of the feedback TCs receive most or least often since only a tiny fraction of the work of teacher education ever appears in peer-reviewed studies. Most teacher preparation occurs outside of researched spaces; however, for teacher educators to effectively adopt novel feedback practices, there must be existing models from the research literature on which they can draw. Knowing which feedback practices are most studied serves as a pulse check for the focus of the field. Given the richness of feedback as a teaching aid and the increasing position of technology, a systematic examination of how feedback is being built and experienced by TCs is both timely and critical.

1.2 Theoretical framework: Hattie and Timperley's feedback model

This systematic literature review is informed by [Hattie and Timperley's \(2007\)](#) Feedback Model, which offers a comprehensive framework for explaining the purpose, focus, and quality of feedback within teaching contexts. According to the model, effective feedback answers three main questions: Where am I going? (i.e., setting out learning goals), How am I going? (i.e., informing learners of current performance), and Where to next? (i.e., offering guidance for subsequent growth). The model further defines four levels of feedback: task-level (with regard to correctness or quality of a specific task), process-level (with regard to strategies used to complete a task), self-regulation-level (with regard to the development of metacognition and learner control), and self-level (with regard to individual self-praise, which is mostly considered to be the weakest).

This model aligns with the objectives of the current review, which are to make sense of how preservice teachers are given feedback in teacher education programs. Hattie and Timperley's model helps to interpret the purpose of different modes of delivery (e.g., oral, written, or combined) by asking whether they serve performance correction (task-level), strategic improvement (process-level), or reflective growth (self-regulation-level). The model also addresses the aspects regarding the types of feedback preservice teachers receive such as formative vs. summative, evaluative vs. descriptive, instructor vs. peer or technology mediated. Additionally, technologies or tools used in giving feedback can be evaluated regarding their capacity to facilitate feedback that is timely, targeted, and consistent with one or more of the model's levels of feedback. In this manner, Hattie and Timperley's model provides a substantive framework for classifying and examining the rich array of feedback practice encountered in the literature. It ensures that this review goes beyond simple classification to evaluate the pedagogical function and developmental impact of feedback on improving preservice teachers' teaching abilities and reflective practice.

1.3 Purpose

The purpose of this systematic literature review is to examine and synthesize empirical studies that investigate how feedback is delivered to TCs within teacher education programs. Specifically, the review aims to explore the sources of feedback (e.g., instructors, peers), the methods of feedback delivery (e.g., oral, written, mixed), and the technologies used to support feedback practices. By describing patterns and variations across these dimensions, the review seeks to identify the areas

of interest in the existing research literature on feedback as they relate to TCs' instructional competence, self-efficacy, and professional growth.

1.4 Research questions

RQ1: In published research from 2014–2025, how is feedback provided to preservice teachers, and what impact if any does this feedback have on preservice teacher learning?

RQ2: In published research from 2014–2025, what types of feedback (e.g., formative, summative, peer, instructor, technology delivered) are given to preservice teachers?

RQ3: In published research from 2014–2025, what technologies are used to facilitate feedback for preservice teachers?

2 Methods

To ensure the relevance, quality, and focus of the studies included in this systematic literature review, specific inclusion and exclusion criteria were established. Studies were eligible for inclusion if they focused explicitly on TCs as the primary participants and examined feedback that was provided to them by either instructors (e.g., university faculty, mentors, cooperating teachers) or peers. Studies investigating feedback provided by TCs to their own students (e.g., K–12 pupils) were excluded since the review centered on feedback received by TCs as part of their formal teacher preparation.

Only peer-reviewed journal articles were included to maintain academic rigor, and only studies published in English were included. While conference materials and academic book chapters were initially considered, these reports ($n = 34$) were excluded during the full-text screening phase. Furthermore, all studies had to be published within the last 10 years (2014– and early 2025) to ensure contemporary relevance. Regarding geographic scope, the review included studies conducted in the United States and other parts of North America. Since teacher education practices vary by nation and local policy context, studies conducted in Europe, Asia, Africa, Australia, or the Middle East were excluded to maintain regional focus and consistency.

Several exclusion criteria were applied to refine the scope further. Articles that did not involve preservice teachers or that focused on in-service teachers, K–12 students, or administrators were excluded. Studies were also excluded if they addressed feedback that was self-directed (e.g., self-evaluations or reflections by TCs). Additionally, the review excluded publications such as magazine articles, blogs, editorials, literature reviews, meta-analyses, and other non-empirical or non-peer-reviewed content. Together, these criteria ensured that the final pool of studies directly addressed the review's focus on empirically based feedback practices provided to preservice teachers by instructors or peers in formal teacher education settings.

2.1 Databases and search strategy

In this study, we used EBSCOhost advanced search functionality to ensure a comprehensive search of relevant

literature as it allows researchers to simultaneously search multiple databases with a single click. This functionality specifically enabled us to search across all 116 EBSCOhost databases specialized in education, educational technology and other related fields with just one string combination and in one click. Some of the key databases included ERIC, Education Source, APA PsycInfo, APA PsycArticles, Science and Technology Collection, among others. Additionally, we also searched for supplementary articles from Google Scholar for articles that might not have been captured in the initial search.

2.2 Keywords and string combination

Using Boolean operators and field specific filters such as the publication date, region or country of study, peer-reviewed status, and language that allowed for precise targeting of studies that aligned with our inclusion and exclusion criteria. The keywords used in the operation included feedback, teacher candidates, strategies and their associated synonyms. Below is a sample truncated string combination used in the study:

((Feedback) AND (Teacher candidat OR preservice teachers OR student teachers OR prospective teachers OR novice teachers OR education students OR Teacher education) AND (Strateg* OR intervention* OR method* OR techniques OR model* OR framework* OR approach* OR practice* OR procedure* OR tool*))*

2.2.1 Screening

A total of 2,228 records were identified for this review, with 2,217 sourced from EBSCOhost and 11 additional records retrieved from Google Scholar. Prior to screening, 1,268 records were removed—323 as duplicates, 711 by automation tools due to ineligibility, and 234 for other reasons such as being unrelated to feedback in teacher education. The records were then downloaded, imported, and organized in Microsoft Excel spread sheets. The references were organized based primarily on the author(s) name, title, date of publication, abstract, study types (qualitative, quantitative, or mixed), source of feedback (instructor, peer, mixed, or tech-based), feedback method (oral or written), technology used, research questions, purpose, and key findings from the study. A total of 960 records were screened at the title and abstract level, leading to the exclusion of 633 studies. Of the 82 studies sought for full-text retrieval, 14 could not be accessed, leaving 68 studies assessed for eligibility. Following full-text review, 20 studies were excluded due to issues such as the use of self-report data only ($n = 4$), non-preservice teacher participants ($n = 11$), irrelevant context ($n = 3$), lack of feedback focus ($n = 2$), or inappropriate study type ($n = 3$). A final total of 45 studies were included in the systematic review. The study selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

3 Results

3.1 Study type distribution

The final set of 45 studies included in this systematic literature review were categorized based on their methodological design, namely, qualitative, quantitative, and mixed methods approach as

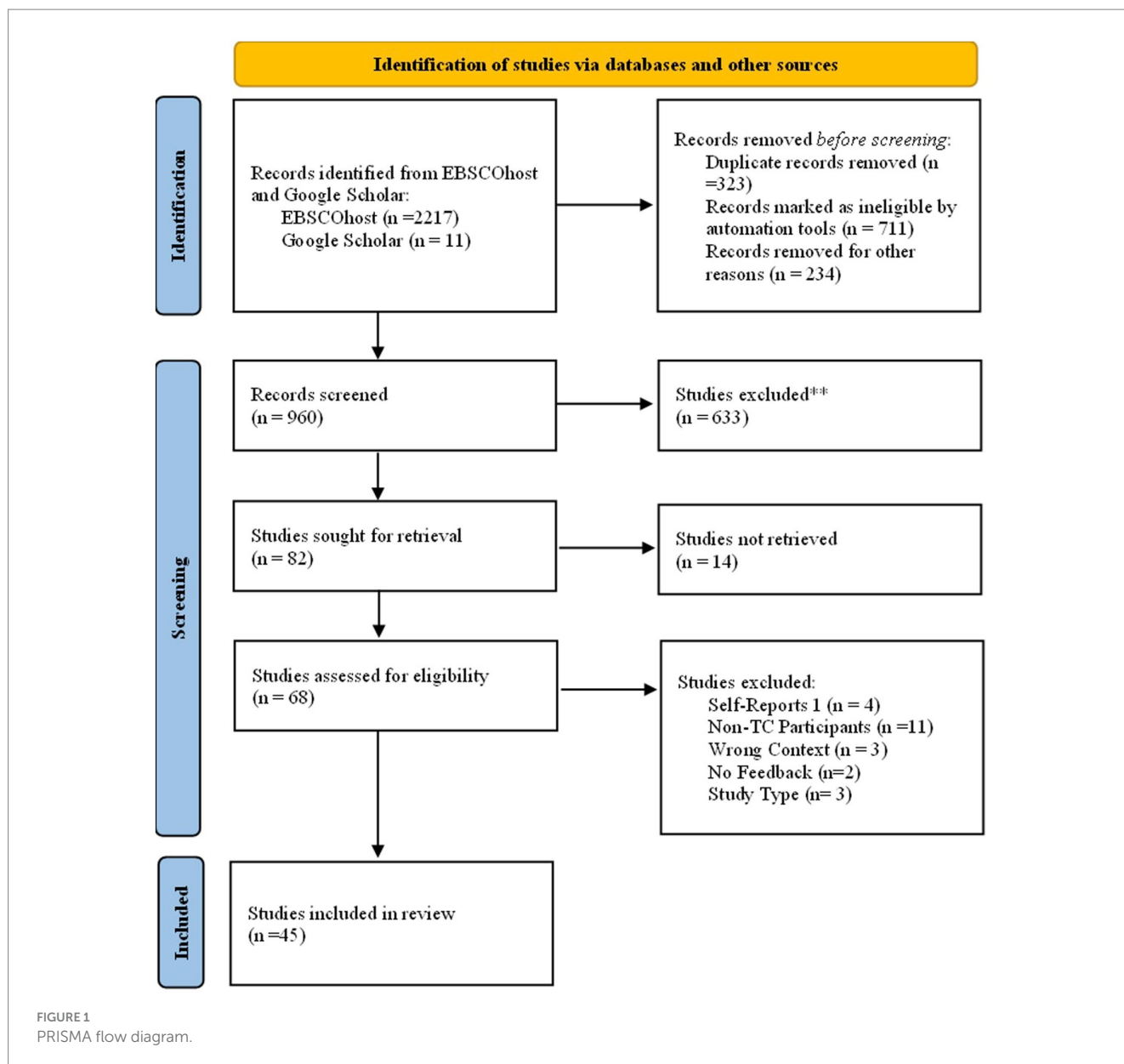


TABLE 1 Distribution of feedback sources by study type.

Feedback source	Qualitative	Quantitative	Mixed	Grand Total
Instructor	8	11	6	25
Peer	5	1	2	8
Mixed (Instructor & Peer)	4	–	4	8
Mixed (Instructor & Technology)	–	1	1	2
Technology only	1	1	–	2
All	18	14	13	45

summarized in Table 1. Among the included studies, qualitative research designs were the most prevalent, accounting for 18 studies. These studies commonly utilized interviews, reflections, case studies, and observational data to explore preservice teachers' experiences with feedback in depth.

Quantitative approaches were used in 14 of the included articles, typically employing experimental or quasi-experimental designs, surveys, and statistical analyses to measure the effects of various feedback strategies on learning outcomes, self-efficacy, or instructional performance. Mixed methods approaches, which combined qualitative

and quantitative data collection and analysis procedures, comprised 13 studies. These studies provided a comprehensive understanding of how feedback was delivered, perceived, and applied by preservice teachers, offering both statistical insights and contextual interpretations. This distribution suggests a balanced integration of methodological approaches in the field of teacher education, with a slight emphasis on qualitative research that highlights the contextual and reflective nature of feedback in teacher education. The use of mixed methods also reflects the complexity of studying feedback practices, which often require both measurable outcomes and narrative exploration.

3.2 RQ1: feedback source categorization

The reviewed studies were categorized based on the primary source of feedback provided to preservice teachers as summarized in Table 1.

The findings show that instructor-delivered feedback was the most commonly studied source in the existing literature, appearing in 25 studies across all methodological types. This category includes feedback provided by university faculty, mentors, and cooperating teachers, and was delivered through both formative and summative mechanisms. Some examples include Barton et al. (2015), Budin (2024), Lee et al. (2024), Thomas et al. (2017), and Kelley et al. (2024), where instructor input was found to play a central role in guiding preservice teachers' instructional practices and reflective learning.

Peer feedback, featured in eight studies, involved preservice teachers evaluating or providing commentary on each other's work, including lesson plans and videos of teaching. This type of feedback was found by these studies authors to encourage collaborative learning, critical thinking, and mutual reflection. Notable examples include Baran et al. (2023), Douglas et al. (2021), and Weaver et al. (2024), where peer-led dialogue and critique was found to support preservice teachers' development of feedback literacy and professional identity.

Another eight studies adopted a mixed-source feedback model, combining input from both instructors and peers. Authors of these studies emphasized a balanced feedback approach, integrating authoritative instructional guidance with peer-driven reflection. Studies such as Akerson and Montgomery (2017), Okumu et al. (2024), and DeSantis et al. (2023) illustrate how dual-source feedback can provide diverse perspectives, enhance metacognition, and promote deeper engagement with teaching practice.

Technology-mediated feedback, either automated or used in combination with human input, was identified in only two studies (Bondie and City, 2024; Cutumisu, 2018) which featured technology-only feedback in which digital platforms or AI-powered systems independently generated feedback. Another two studies (Lyon et al., 2023; Wilson and Yonas, 2024) implemented a hybrid model, where instructors utilized technology platforms to structure, personalize, or supplement their feedback delivery. These cases highlight emerging innovations in teacher education that leverage automation and interactivity to enhance the feedback process.

Overall, the categorization by feedback source demonstrates a continued emphasis in the field on instructor-led feedback as the cornerstone of preservice teacher preparation. However, our findings

suggest that there is some research interest in peer and technology-enhanced feedback models, particularly in programs designed to foster collaboration, reflection, and adaptive expertise. As teacher education increasingly embraces multimodal and learner-centered frameworks, studies incorporating diverse feedback sources will offer more robust support for teacher educators to drive preservice teacher growth.

3.3 RQ2: feedback method categorization

The 45 studies included in this systematic review were categorized according to the primary method of feedback delivery used with TCs. Feedback methods were grouped into three overarching categories: written, oral, and mixed (i.e., both oral and written). Each category is presented with subcategories to reflect the diversity of feedback strategies employed across teacher education contexts. Specific information for each study is compiled in Table 2.

3.3.1 Written feedback methods

Written feedback was the most reported method, featured in 24 of the 45 studies. Written feedback was widely valued for its clarity, permanence, and capacity to support asynchronous reflection. In many cases, written feedback was embedded within digital tools and platforms, allowing for structured, time-stamped comments that preservice teachers could revisit multiple times. Authors of these studies concluded that these approaches not only supported immediate instructional improvement but also facilitated longitudinal reflection and deeper integration of instructor feedback into professional growth. Subcategories of written feedback included the following:

- 1 *Email-based feedback*: Email was frequently used for asynchronous performance feedback. McLeod et al. (2019), Love et al. (2019), and Barton et al. (2015) employed email to deliver detailed, structured written commentary, often following classroom observations or video analysis.
- 2 *Rubric-based written evaluations*: Lyon et al. (2023) used LiveText to align written feedback with structured rubrics embedded in video assessments, helping preservice teachers clearly understand performance expectations and areas for growth.
- 3 *Annotated video comments*: Several studies, including Harper-Hooper et al. (2024), Okumu et al. (2024) Thomas et al. (2017), and Bondie and City (2024), employed video annotation platforms (e.g., GoReact, LiveText) to embed feedback within specific moments of teaching recordings. This method helped TCs contextualize feedback and link it to observable performance.
- 4 *Text messaging and written prompts*: Barton et al. (2019) and Carreon et al. (2024) used SMS and written prompts through discussion forums to deliver real-time or near-immediate formative feedback, particularly in online and blended learning settings.
- 5 *Peer-structured written feedback*: tools like TurnItIn PeerMark (Douglas et al., 2021), PeerWise (Milner-Bolotin et al., 2016), and Google Docs (Lammert and Tily, 2022) were used to

TABLE 2 Included studies' type, feedback source, feedback method, and technology used.

Author(s)	Study type	Feedback source	Feedback method	Technology used (if any)
Akerson and Montgomery (2017)	Qualitative	Mixed (Instructor & Peer)	Mixed [Oral (Co-teaching debrief) and Written (Feedback forms)]	Not Specified
Baran et al. (2023)	Mixed Methods	Peer	Written [real-time video annotations (VEO App)]	Video Enhanced Mobile Observation (VEO) App
Barnes and Falter (2019)	Qualitative	Mixed (Instructor & Peer)	Oral (Video-based Discussion)	Video Recording
Barton et al. (2015)	Quantitative	Instructor	Written (Email)	Email
Barton et al. (2019)	Quantitative	Instructor	Written (Text Messaging)	Text Messaging (SMS)
Blanton et al. (2019)	Qualitative	Instructor	Oral (real-time via Bluetooth earbud)	Bluetooth earbud, webcam, Video conferencing (Zoom, Skype, etc.)
Budin (2024)	Qualitative	Instructor	Oral (post-simulation feedback and real-time coaching)	Technology (TeachLivE™ Mixed Reality Simulation)
Byrd et al. (2025)	Quantitative	Instructor	Written (Emailed Performance Feedback) and Video Annotations	Email and Video Annotations (Swivl)
Carreon et al. (2024)	Quantitative	Instructor	Mixed [Written (Email) and Oral (post-VR simulation)]	Email
Cogliano et al. (2021)	Quantitative	Instructor	Written (digital feedback monitoring assignments)	Feedback monitoring assignments in the LMS
Coogee et al. (2020)	Quantitative	Instructor	Mixed (Oral (real-time feedback via earbuds) post session) and Written (Email)	Email feedback; Bug-in-ear (Bluetooth earbuds) for real-time feedback; SWIVL for video recording (though no mention of annotations)
Cutumisu (2018)	Quantitative	Technology	Tech-based (Automated Tool called Posterlet)	Digital assessment game (Posterlet)
DeSantis et al. (2023)	Mixed Methods	Mixed (Instructor & peer)	Oral [Data-driven oral feedback from the instructor and post-simulation by (peers)]	Mursion® Mixed-Reality Simulation
Douglas et al. (2021)	Quantitative	Peer	Written (TurnItIn Peermark Online Tool)	TurnItIn Peermark for submission and comments
Gardiner (2016)	Qualitative	Instructor	Mixed (Oral when mentors paused to provide feedback) Written (Field Notes)	Not Specified
Gibbons and Farley (2021)	Qualitative	Instructor	Oral (Instructor-led video review)	Video Recording software
Hinojosa (2022)	Qualitative	Instructor	Mixed (Oral (Dialogue) and Written Dialogic Feedback)	Not Specified
Kelley et al. (2024)	Mixed Methods	Instructor	Oral (post-simulation)	Mixed-Reality Simulation
Kennedy and Lees (2016)	Mixed Methods	Mixed (Instructor & Peer)	Mixed [(Oral via voice and audio threads) and written via written narrative feedback]	Video-annotation and upload tools
Lammert and Tily, (2022)	Qualitative	Peer	Written (Written Reflections)	Google Docs storing the reflections
Lee et al. (2024)	Qualitative	Instructor	Oral (post-simulation)	Mursion®/TeachLivE® Simulation
Legette and Royo (2021)	Qualitative	Peer	Oral (post-reflection interview) and Written (reflections)	Not Specified
Lindahl and Baecher (2016)	Qualitative	Instructor	Written (pre-observation feedback) and Oral (post-observation feedback)	Email

(Continued)

TABLE 2 (Continued)

Author(s)	Study type	Feedback source	Feedback method	Technology used (if any)
Long et al. (2019)	Quantitative	Instructor	Oral (one-on-one microteaching preparation sessions)	Video Recording (during microteaching)
Love et al. (2019)	Mixed Methods	Instructor	Written (email feedback)	Email
Lyon et al. (2023)	Quantitative	Mixed (Instructor & Technology)	Written (Video Feedback)	Video Annotations (LiveText App) and Technology (real-time preset feedback checklist)
McLeod et al. (2019)	Quantitative	Instructor	Written (Email + Video Annotations)	Email and Video Annotations
Milner-Bolotin et al. (2016)	Qualitative	Peer	Written (Online via PeerWise)	PeerWise Tool (used to answer, rate, and comment on multiple choice questions created by their peers)
Molina (2021)	Qualitative	Instructor	Mixed [Written (post-assignment) and Oral (one-on-one conference at least twice a semester)]	Not Specified
Nagro et al. (2021)	Mixed Methods	Instructor	Oral [(Bug-in-Ear Coaching/ Bluetooth) and video conference]	Bug-in-Ear, Video Conference and recording tool
Namakula and Akerson (2024)	Qualitative	Peer	Mixed (Oral and written in Video Critiques)	Video (Playback)
Okumu et al. (2024)	Mixed Methods	Mixed (Instructor & Peer)	Written (Video Annotation)	Video annotation tool
Paul et al. (2023)	Quantitative	Instructor	Oral (post-simulation)	Simulation (simulated Learning Environment)
Pecore et al. (2023)	Mixed Methods	Instructor	Oral (post-simulation) + Video (video conference Feedback (Zoom))	Simulation (Virtual Simulation with Avatars) and Video Conferencing (Zoom)
Pennington et al. (2020)	Qualitative	Mixed (Instructor & Peer)	Oral (post-observation)	Field Notes
Bondie and City (2024)	Qualitative	Technology	Tech-based (AI-Powered Simulation)	AI-powered classroom simulator (Teaching with Grace)
Salajan et al. (2016)	Mixed Methods	Peer	Written (wiki comments)	Wiki platform
Sydnor et al. (2020)	Qualitative	Mixed (Instructor & Peer)	Written (Video Annotation + written reflection)	video annotation (GoReact! Video annotation platform)
Thomas et al. (2017)	Mixed Methods	Instructor	Written (Video Annotations and Written texts)	LMS (Canvas) Tools (video annotations & written text commentary feedback)
Walker et al. (2023)	Quantitative	Instructor	Written (Video Annotations)	Video Annotations (LiveText App)
Waychunas (2024)	Mixed Methods	Mixed (Instructor & Peer)	Oral (Reflective Debrief)	Simulation (Non-AI Teaching Simulation) and Video Conferencing (Zoom)
Weaver et al. (2024)	Qualitative	Peer	Oral (post-teaching debrief comments)	Not Specified
Whitney et al. (2025)	Quantitative	Instructor	Oral (during simulation or post-roleplay)	Simulation (Mixed-Reality Simulation (TeachLivE))
Harper-Hooper et al. (2024)	Mixed Methods	Instructor	Written (Video annotations)	Video Annotations (GoReact platform)
Wilson and Yonas (2024)	Mixed Methods	Mixed (Instructor & Technology)	Oral (Real-time Coaching)	Simulations (Mixed-Reality Teaching Simulation Tools)

facilitate written peer feedback, encouraging preservice teachers to evaluate and learn from each other's instructional work.

3.3.2 Oral feedback methods

Oral feedback was reported in 13 studies and was characterized by the authors of these studies as immediacy, interpersonal engagement, and adaptability to the learner's performance in real time. It was especially prevalent in simulation-based contexts and mentoring sessions, where timely correction and scaffolding were essential. Although oral feedback allowed for dynamic and context-rich exchanges, findings from the reviewed studies also suggest that it lacked the permanence and revisability of written feedback. Subcategories included:

- 1 *Post-simulation debriefs*: Kelley et al. (2024), Paul et al. (2023), and Budin (2024) used oral debriefs after simulations (e.g., TeachLivE) to guide preservice teachers in reflecting on teaching moves and classroom management strategies.
- 2 *Microteaching feedback sessions*: Long et al. (2019) described one-on-one verbal coaching sessions during microteaching exercises, offering preservice teachers tailored feedback to improve instructional techniques.
- 3 *Real-time classroom or practicum feedback*: real-time mentoring was used in studies by Blanton et al. (2019), Walker et al. (2023), and Wilson and Yonas (2024), where feedback was delivered on the spot—sometimes through bug-in-ear devices—during teaching practice or classroom simulations.
- 4 *Dialogic verbal exchanges*: studies by Barnes and Falter (2019) and Gardiner (2016) emphasized feedback as a collaborative dialogue, where instructors and preservice teachers engaged in co-reflection rather than directive instruction.

3.3.3 Mixed feedback methods

Eight studies employed mixed methods of feedback, combining the immediacy of oral communication with the depth and permanence of written responses. This hybrid approach was studied as a way to allow instructors to address performance in real time while providing written records for ongoing reflection. In this research, technology often facilitated these multimodal exchanges through platforms that support both audio and textual feedback. Subcategories included:

- 1 *Voice and audio threads combined with narrative feedback*: Kennedy and Lees (2016) used VoiceThread to integrate oral feedback with written narrative responses, fostering multimodal engagement with teaching artifacts.
- 2 *Oral co-teaching debriefs and written reflections*: Akerson and Montgomery (2017) provided verbal co-teaching debriefs followed by written documentation, enabling TCs to process and record insights from live instruction.
- 3 *Dialogic oral feedback with written annotations*: Hinojosa (2022) introduced a feedback model where in-person feedback was paired with reflective written notes, supporting process-level and self-regulatory development.
- 4 *Real-time oral coaching via earpieces and written follow-up*: Coogee et al. (2020) used Bluetooth earbuds for live coaching and followed up with email summaries which offered layered feedback experiences within practicum placements.

- 5 *Written video critiques paired with oral explanations*: Namakula and Akerson (2024) combined instructor-led video critiques with accompanying oral explanations with the goal of enhancing feedback clarity and engagement.

Overall, this analysis found that written feedback was the most studied method in teacher education, followed by oral and mixed feedback strategies. Authors of the reviewed studies concluded that, while written feedback provided clarity and permanence, oral and mixed feedback enabled tailored direction and dialogic reflection. The incorporation of technology, particularly video and audio tools, was also noticeable in mixed and textual feedback formats.

3.4 RQ3: technologies used in feedback delivery

This systematic review examined how technologies were utilized to deliver feedback to preservice teachers across 45 empirical studies. The findings reveal a diverse range of technological tools, from basic asynchronous communication platforms to advanced, interactive simulation systems. Researchers concluded that these tools supported feedback processes in various ways, including enhancing immediacy, enabling asynchronous review, and facilitating multimodal engagement. However, a notable number of studies did not specify any technology use, suggesting ongoing interest in improving traditional face-to-face or analog feedback methods through research. The technologies used were grouped into seven primary categories:

- 1 *Video Annotation and Multimedia Feedback Tools*: video annotation emerged as a commonly used feedback tool (in 9 studies), particularly in contexts requiring performance review, microteaching, or reflective practice. These tools allowed instructors or peers to insert time-stamped comments directly into teaching videos, facilitating specific and actionable feedback. For instance, Lyon et al. (2023) and Harper-Hooper et al. (2024) used LiveText and GoReact, respectively, to align video annotations with rubrics and instructional objectives. Moreover, McLeod et al. (2019) and Thomas et al. (2017) combined video feedback with email or LMS platforms to allow students to revisit feedback asynchronously. More so, Namakula and Akerson (2024), Okumu et al. (2024), and Wilson and Yonas (2024) also incorporated video playback and annotation features for collaborative or instructor-led critiques. Additionally, Bondie and City (2024) employed video simulations within an AI-enhanced tool, adding dynamic, multimodal interaction to performance review.
- 2 *Simulation technologies*: simulation tools, highlighted in seven studies, provided preservice teachers with immersive environments for practice-based learning and performance feedback. These platforms ranged from AI-powered to human-facilitated scenarios and often integrated both oral and written feedback modalities. For instance, Kelley et al. (2024), Budin (2024), and Paul et al. (2023) used mixed-reality environments such as Mursion® and TeachLivE™ to provide oral debriefs following simulated teaching sessions. DeSantis et al. (2023) and Pecore et al. (2023) incorporated simulations combined with peer or instructor-led oral feedback while Wilson and

Yonas (2024) and Waychunas (2024) used simulation platforms for real-time and post-session coaching, supported by video conferencing tools.

- 3 *Email communication tools*: email remained one of the most frequently reported technologies for delivering written feedback as cited in five studies. Its asynchronous nature allowed instructors to provide structured, thoughtful commentaries while offering preservice teachers the flexibility to process feedback at their own pace. Barton et al. (2015), Love et al. (2019), and McLeod et al. (2019) used email to deliver personalized performance-based feedback. Additionally, Carreon et al. (2024) used email as part of a multimodal strategy that also included post-simulation debriefs, while Coogle et al. (2020) used email to follow up on real-time oral coaching sessions.
- 4 *Real-time coaching and live feedback tools*: four studies showed that real-time coaching technologies facilitated immediate, in-the-moment feedback during classroom instruction, simulations, or field placements. These systems supported responsive guidance and fostered rapid improvement. Blanton et al. (2019) and Coogle et al. (2020) for instance, utilized Bluetooth earbuds for bug-in-ear coaching, combined with video conferencing tools for remote support. Nagro et al. (2021) used a bug-in-ear system during virtual practicum experiences whereas Wilson and Yonas (2024) provided real-time coaching via mixed-reality teaching simulations.
- 5 *AI-Driven and automated feedback systems*: only two studies employed AI or automated tools to deliver personalized feedback, reflecting the emerging yet underutilized potential of intelligent systems in teacher education. Cutumisu (2018) used Posterlet, a digital assessment game, to deliver instant, task-specific feedback whereas Bondie and City (2024) implemented Teaching with Grace, an AI-powered classroom simulator that provided performance-based feedback during simulated teaching scenarios.
- 6 *Peer feedback platforms and collaborative tools*: in three studies, collaborative digital platforms were used to enable preservice teachers to engage in peer-to-peer feedback, fostering reflective discourse and shared responsibility for learning. For instance, Milner-Bolotin et al. (2016) used PeerWise, which allowed students to create and comment on each other's quiz questions. Additionally, Salajan et al. (2016) utilized a wiki platform to facilitate ongoing peer feedback through collaborative writing, whereas Baran et al. (2023) used the Video Enhanced Observation (VEO) app to support real-time, peer-driven video annotation.
- 7 *Digital field notes and observation tools*: two studies employed structured observation tools to document and guide feedback in classroom or practicum contexts. Specifically, Pennington et al. (2020) used digital field notes to provide focused, observational feedback whereas Paul et al. (2023) employed tablet-based observation software to deliver targeted feedback during instructional simulations.
- 8 *Unspecified or traditional feedback approaches*: more than half of the studies ($n = 24$) did not clearly report using any specific technology to deliver feedback. These studies often relied on face-to-face dialogue, handwritten notes, or unrecorded oral debriefs, particularly in qualitative or field-based research. For

instance, Akerson and Montgomery (2017), Kelley et al. (2024), Gardiner (2016), Legette and Royo (2021), and Sydnor et al. (2020) all described feedback interactions without indicating the use of digital tools.

Overall, the findings show that while a range of technologies have been introduced to support feedback in teacher education, their use is uneven across literature. Email and video-based tools are the most prevalent, while AI-powered systems, live coaching tools, and peer-review platforms are still emerging. The fact that over half of the studies did not specify any technology use suggests that there is significant room for growth in adopting innovative tools to enhance the effectiveness, accessibility, and personalization of feedback for preservice teachers.

4 Discussion

This systematic literature review examined how feedback is delivered to preservice teachers across diverse teacher education contexts with specific focus on study types, feedback types, sources, and technologies used. We also noted the patterns that emerged when authors of this research noted the impact of this feedback on TC learning.

4.1 Study type distribution

Among the 45 studies reviewed, the methodological distribution consisted of 18 qualitative, 14 quantitative, and 13 mixed methods studies. The prominence of qualitative studies ($n = 18$) suggests an ongoing emphasis on capturing the nuanced, situated, and reflective experiences of preservice teachers as they engage with feedback. These studies commonly employed case studies, interviews, classroom observations, and reflective journaling to explore how feedback is perceived, interpreted, and enacted in practice. For instance, studies like Akerson and Montgomery (2017) and Gardiner (2016) offer insights into how dialogic and formative feedback shapes preservice teachers' evolving instructional identities.

Quantitative studies ($n = 14$), including works by Barton et al. (2015) and Carreon et al. (2024), focused on evaluating the impact of specific feedback interventions on measurable outcomes such as self-efficacy, instructional competence, or academic achievement. These studies often employed experimental or quasi-experimental designs, pre- and post-tests, or survey-based instruments to assess statistical relationships between feedback strategies and learning results. Such evidence is crucial for generating generalizable knowledge and for informing policy or program-level decisions in teacher education. As suggested by Scheeler et al. (2004) and Van den Bergh et al. (2013), the rigor of quantitative inquiry is instrumental in determining the causal effects of feedback on instructional performance.

Mixed methods studies ($n = 13$) represent a substantial portion of the literature and exemplify a growing trend in education research that values methodological integration. These studies, such as Kennedy and Lees (2016), Kelley et al. (2024), and Okumu et al. (2024), combine the explanatory power of quantitative data with the depth of qualitative narratives. Mixed methods designs were particularly

effective for exploring how feedback works in practice and why it produces specific outcomes—thus aligning with calls by [Creswell and Plano Clark \(2017\)](#) and [Mertens \(2023\)](#) for educational research that is both contextually rich and analytically rigorous.

Overall, the methodological diversity found in this review reflects the complexity of studying feedback in preservice teacher education. The integration of qualitative, quantitative, and mixed methods across the reviewed literature enables a more comprehensive understanding of how feedback supports the instructional, cognitive, and reflective growth of preservice teachers. This distribution underscores a robust and evolving research base, with ample methodological scaffolding for future inquiries into effective feedback practices.

4.2 Feedback source categorization

The analysis of feedback sources across the 45 studies reveals a clear predominance of research on instructor-led feedback ($n = 25$) as opposed to research on feedback from other sources. Clearly, instructor feedback, whether delivered by university faculty, cooperating teachers, or mentor supervisors, provides critical scaffolding for instructional decision-making, reflective practice, and the development of professional teaching identity. Prior research has emphasized the pedagogical value of authoritative feedback in early stages of teacher learning ([Borko et al., 2008](#); [Scheeler et al., 2008](#)). Instructors not only model expert teaching practices but also establish feedback norms that preservice teachers may emulate in their future professional contexts.

Although less prevalent, peer feedback was utilized in eight studies and emerged as a valuable tool for promoting collaborative learning and reciprocal reflection. Peer-based models support the co-construction of pedagogical knowledge and foster a sense of shared accountability for learning. As noted in the literature ([Topping, 2009](#)), peer feedback enhances critical thinking and encourages preservice teachers to articulate, evaluate, and defend their instructional choices—skills essential for autonomous professional growth. Examples from [Baran et al. \(2023\)](#) and [Douglas et al. \(2021\)](#) demonstrate that when structured effectively, peer feedback can supplement instructor input and contribute to a more socially mediated learning environment.

A third category, mixed feedback sources ($n = 8$), combines instructor and peer input, offering preservice teachers access to diverse perspectives. This dual-source model reflects an emerging research emphasis on integrated feedback ecologies, where formal and informal feedback loops are woven together to deepen instructional reflection. Through the lens of Vygotskian sociocultural theory, this approach recognizes feedback as a dialogic process situated within communities of practice ([Akerson and Montgomery, 2017](#); [DeSantis et al., 2023](#)). Mixed-source feedback promotes both expert-guided learning and peer-supported meaning-making, supporting teacher candidates in bridging theory and practice through multiple lenses.

Taken together, this analysis reveals a continued research emphasis on instructor-led feedback, accompanied by a less prominent interest in peer and mixed feedback models. While this review cannot establish what type of feedback TCs receive most often, as much teacher preparation happens outside of what occurs in published research, research is needed for teacher educators to develop and share effective practices. Thus, as teacher preparation programs seek to cultivate reflective, adaptive, and collaborative educators, future

scholarly efforts should focus on studying the expanded use of peer-informed and technology-supported feedback practices that align with teacher educators' evolving pedagogical goals and digital learning environments.

4.3 Feedback method categorization

The analysis of feedback methods revealed three dominant approaches used across the 45 reviewed studies: written feedback ($n = 23$), oral feedback ($n = 12$), and mixed feedback ($n = 10$), where both oral and written modalities were integrated. This distribution reflects both traditional and evolving practices in teacher education, shaped by instructional context, technological access, and pedagogical intent.

Written feedback emerged as the most frequently employed method. Authors of studies on written feedback favored written formats for their permanence, structure, and asynchronous flexibility, which allowed preservice teachers to engage with feedback repeatedly and at their own pace ([McLeod et al., 2019](#); [Lyon et al., 2023](#)). These qualities are particularly valuable in supporting reflective practice and long-term instructional planning. [Brookhart \(2017\)](#) emphasized that written feedback enables learners to analyze performance more deeply, reinforcing metacognitive engagement. In teacher education, written formats were often embedded in email, rubrics, discussion boards, or video annotations, offering structured guidance that can be preserved and revisited during instructional development.

In contrast, oral feedback ($n = 12$) emphasized immediacy, personalization, and dialogic interaction. It was frequently delivered during microteaching, real-time coaching, or post-simulation debriefs, allowing preservice teachers to receive formative input while the teaching moment was still fresh. As noted by [Hattie and Timperley \(2007\)](#), task-level feedback delivered immediately after or during performance can significantly enhance instructional correction and skill acquisition. Oral feedback also facilitated relational mentorship, where verbal exchanges supported the development of professional confidence and pedagogical clarity. These methods, while effective in the moment, may lack the archival quality of written formats, posing challenges for long-term reference and documentation.

Mixed feedback methods ($n = 10$) represented a growing trend toward multimodal feedback ecosystems that blend the strengths of both oral and written formats. Studies in this category employed tools such as VoiceThread, Bluetooth in-ear devices, and annotated video commentary to deliver feedback that was both timely and lasting ([Kennedy and Lees \(2016\)](#); [Coogler et al., 2020](#)). These strategies reflect an evolving view of feedback as both relational and reflective, capable of supporting immediate adjustment while also fostering deeper analysis ([Sims and Walsh, 2009](#); [Carless and Boud, 2018](#)). Mixed methods were particularly effective in simulation environments and blended learning contexts, where preservice teachers benefited from layered feedback experiences that reinforced learning through multiple modalities.

The overall diversity of feedback methods observed across studies underscores the need to align feedback strategy with pedagogical purpose. More research that strategically targets the question of how and when to best use different feedback methods, rather than studies that merely describe feedback practices and note their impact, is needed. Oral feedback may be most appropriate for rapid intervention and coaching, while written feedback supports detailed reflection and

planning. Mixed methods offer the potential to bridge these affordances, especially when enhanced by digital platforms. As [Henderson et al. \(2019\)](#) argue, feedback practices must be responsive to learner preferences, technological affordances, and instructional goals. Teacher education programs should therefore consider adopting intentional, multimodal feedback frameworks that offer flexibility, clarity, and personalized support to meet the evolving needs of preservice teachers.

4.4 Technologies used in feedback delivery

The findings from this review reveal limited research attention to the role of technology in delivering feedback to preservice teachers. While 19 of the 45 studies integrated some form of digital tool to support feedback processes, the majority ($n = 26$) did not report any specific technological medium, suggesting a continued emphasis on studying traditional, face-to-face methods such as in-person conferencing, handwritten notes, or oral debriefs. This limited documentation of digital practices indicates a potential gap between technological capability and actual integration in teacher education programs.

Among the studies that did report technology use, video annotation platforms ($n = 9$) and email communication tools ($n = 5$) emerged as the most employed technologies. Their popularity is likely due to their accessibility, affordability, and ease of use, making them suitable for a variety of instructional contexts. More advanced tools, including AI-powered simulations and game-based feedback platforms, were relatively rare but representing promising frontiers in the field. For instance, Teaching with Grace ([Bondie and City, 2024](#)) and Posterlet ([Cutumisu, 2018](#)) employed automated feedback systems to assess teaching decisions in real time, offering individualized feedback without instructor intervention. These approaches resonate with [Shute et al. \(2014\)](#) concept of “stealth feedback”—adaptive, embedded feedback that supports learning in real-time without disrupting workflow. Despite their potential, the adoption of such systems remains limited, possibly due to resource constraints, technical complexity, or limited faculty training in AI and simulation technologies.

In addition, peer-based digital platforms like PeerWise ([Milner-Bolotin et al., 2016](#)) and wiki environments ([Salajan et al., 2016](#)) fostered collaborative, dialogic feedback and emphasized learner agency in the assessment process. These tools align with [Nicol's \(2010\)](#) and [Carless's \(2015\)](#) advocacy for participatory feedback cultures where learners are co-creators of feedback, not just recipients. Despite these promising practices, the fact that more than half of the reviewed studies did not specify any technology use underscores a critical need for greater research attention to practices for the integration of digital feedback tools in preservice teacher education. Future research and institutional policy should focus on identifying low-cost, scalable technologies that support multimodal feedback, while also addressing barriers to adoption such as infrastructure, training, and accessibility.

4.5 Limitations and suggestions for future research

While this systematic review offers a comprehensive synthesis of feedback practices in preservice teacher education, several limitations

must be acknowledged, each pointing toward valuable directions for future research.

First, a key limitation lies in the incomplete reporting within many of the included studies. Although we only included peer-reviewed studies, this did not ensure that every study's methods were sufficiently reported for us to conduct our analysis. Several articles lacked sufficient detail regarding the timing, modality, or technological context of feedback delivery, which restricted the depth of analysis for specific variables such as feedback immediacy or interactivity. Future research should aim for greater transparency in documenting feedback interventions, clearly specifying when feedback was delivered (e.g., real-time, delayed), how it was communicated (e.g., oral, written, digital), and through what tools or platforms. This level of granularity is essential to identify which combinations of feedback timing, format, and delivery mechanisms most effectively support preservice teachers' learning.

Second, although this review excluded research from other global contexts outside of North America. This geographic focus limits generalizability across diverse teacher education systems. Future reviews should consider expanding inclusion criteria to examine how cultural, institutional, and policy differences shape feedback practices internationally, potentially uncovering regionally grounded strategies or innovations that can inform broader practices.

Third, the review was limited to peer-reviewed journal articles, excluding gray literature, dissertations, and practical resources such as syllabi, instructional guides, or instructor-created materials. Yet many feedback practices, particularly those embedded in fieldwork or formative assessments, are not always captured in formal research. Future studies could adopt a document analysis or ethnographic approach to explore these “invisible” practices of feedback that shape preservice teacher development in authentic settings.

Additionally, while this review categorized feedback by source, method, and technology, it did not fully analyze the learning outcomes associated with different feedback strategies due to these inconsistently being reported by the authors of the reviewed studies. More empirical studies are needed to explore the perceived and measurable impacts of feedback on specific teacher outcomes, such as instructional skill acquisition, self-efficacy, and professional identity formation. Longitudinal studies could be particularly valuable in tracing how feedback received during preservice training influences teachers' practice and decision-making in early career stages.

Finally, the findings point to a clear underutilization of advanced technologies such as AI, real-time coaching tools, and simulation platforms. Future research should investigate the scalability, accessibility, and pedagogical efficacy of these technologies across varied institutional settings. Studies should also explore instructors' and candidates' readiness and perceptions of using such tools, which may influence adoption and effectiveness.

4.6 Conclusion and implications

This systematic literature review examined the current landscape of feedback practices in preservice teacher education by synthesizing findings from 45 empirical studies published between 2014 and 2024. Anchored in [Hattie and Timperley's \(2007\)](#) Feedback Model, the

review identified how TCs receive feedback in the published literature, with attention to sources, delivery methods, technology use, and instructional timing.

The findings highlight both progress and persistent limitations. Instructor-delivered feedback remains dominant in studies in teacher education. This has the impact of both reinforcing its role in modeling pedagogical expertise but also signaling an overreliance on a single individual's expertise that may limit peer-to-peer and technology-enabled feedback opportunities. Written feedback also continues to anchor practice in the published literature since it is valued for clarity and reflection. However, the reviewed studies showed that relying solely on written feedback risks narrowing the range of multimodal approaches available to TCs. Most notably, digital tools with the capacity to transform feedback into a scalable, interactive, and personalized process remain largely absent from mainstream study. This underutilization represents a missed opportunity for innovation in teacher preparation at a time when education must adapt to increasingly complex and diverse learning contexts.

Beyond mapping practices, this review exposes urgent questions for the field. The timing, type, and impact of feedback remain underexamined through experimental and quasi-experimental conditions, leaving teacher educators with little concrete evidence about what works best for building TCs' instructional confidence, competence, and professional identity. Addressing these gaps requires research that moves beyond description toward longitudinal and impact-driven studies that capture the lived realities of teacher candidates across institutional and policy contexts.

Ultimately, this review contributes important insights to the literature on teacher education by emphasizing feedback as both a pedagogical tool and a developmental mechanism. Programs that embrace timely, dialogic, and technologically integrated feedback will not only improve instructional preparation but also empower preservice teachers to enter the profession as adaptive, equity-minded, and resilient educators. Feedback should not merely be delivered, it must be designed to engage, challenge, and empower preservice teachers as active participants in their professional learning journey.

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