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Exploring Formative Feedback in Virtual Primary Education: Towards a Conceptual Structure

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Abstract

Formative feedback is a key resource for promoting learning among primary school students. In virtual environments, it gains greater relevance as it intervenes at different stages of the educational process, highlighting the need to understand how teachers perceive it, apply it, and which factors condition their pedagogical practice. The objective of this study was to understand how primary school teachers conceive and implement formative feedback in virtual contexts and, on that basis, to develop a conceptual structure that synthesizes their experiences. A qualitative exploratory approach was adopted, grounded in grounded theory, which included semi-structured interviews with 65 teachers from 15 educational institutions in the Tacna region of Peru. Data analysis was supported by Atlas.ti 23 software and involved the identification of emerging categories through open, axial, and selective coding processes. The findings indicate that teachers understand feedback as a comprehensive pedagogical process oriented toward formative assessment, progressive improvement of learning, capacity development, and student-centered support. The study also identified that strategies perceived as more effective were those related to interactive and personalized use of diverse resources, whereas less effective strategies were linked to approaches primarily focused on grading. In conclusion, a conceptual structure of virtual formative feedback is proposed, which articulates cognitive, socio-emotional, and techno-pedagogical dimensions. This structure also describes the factors that influence feedback, its types, the purposes attributed by teachers, and the student-centered approach. The study contributes both to the foundations of pedagogical practice and to future research in primary education.

Keywords:

Formative Feedback, Virtual Teaching, Primary Education, Grounded Theory, Conceptual Structure.

Introduction

Formative feedback is presented in the educational context as the information provided to the student in order to improve their performance and reduce the gap between their current level and the level that is expected or desired to achieve (Brandmo & Gamlem, 2025; Brown et al., 2023). Formative feedback can be defined as the type of

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feedback that continuously and specifically attempts to help the student carry out their learning process, unlike summative feedback, which only pursues the moment of the final grade (Anijovich & Cappelletti, 2020; Chand & Pillay, 2024). That is why it is considered one of the most powerful didactic methods to improve learning since it generates self-regulation, critical reflection, and greater involvement of the student (Black & Wiliam, 2018; Moya-Muñoz et al., 2025).

In primary education, the characteristics of child cognition require strategies that adjust to the needs of students. Recent studies show how formative and process-centered feedback increases motivation, understanding, and autonomy at early ages (Brandmo & Gamlem, 2025; Imaicela Vega et al., 2025). Clear and constructive feedback not only contributes to correcting errors but also contributes to self-regulation and meaningful learning (Casa-Coila et al., 2022; Moya-Muñoz et al., 2025). This is the argument that reaffirms the need to address the design of this type of strategies with the cognitive and emotional specificities of students at this level of studies (Paz-Perea et al., 2024). On the other hand, the design and systematization of conceptual structures of formative feedback adapted to the virtual primary environment remains an important gap in current educational research.

Several studies have agreed that formative feedback is a powerful mechanism that contributes to enhancing learning. In basic education, particularly in primary education, its impact is strengthened when these strategies are adapted to the cognitive, motivational, and affective characteristics of children, as demonstrated by studies within the framework of inclusive and differentiated education (Töllner et al., 2025).

Regarding the resources that facilitate feedback, a repertoire of strategies has been developed that combines oral, written, graphic, and digital modalities. Thus, Kusairi (2020) developed a feedback system based on isomorphic items, which proved to be effective in providing automatic responses differentiated according to individual or group levels. Likewise, other findings show that automated feedback through technologies tends to be ignored by students (mainly in the early grades) when it is not contextualized or when pedagogical dialogue is absent (Maier & Klotz, 2025).

As a consequence of the experience during the COVID-19 pandemic, various forms of virtual teaching were strengthened at different levels of the educational system, including primary education. This transformation, driven by the health emergency, gave way to the virtual modality which continues to be implemented today. However, the transition to virtual environments brought with it important challenges in the application of formative feedback, mainly at the level of primary education. Among the main difficulties are unequal access to technological resources, the reduction of immediate interactions between teachers and students, the limited training of teachers in the pedagogical use of digital platforms, and the increase in their workload (Altmann & Arnold, 2024; Casa-Coila et al., 2022).

Added to this is the persistent digital divide, the lack of strategies adapted to the virtual environment, and the limited teacher preparation to sustain effective feedback processes (Imaicela Vega et al., 2025; Moya-Muñoz et al., 2025). These conditions reduce the frequency and quality of feedback, affecting its equity and formative impact on basic education students (Brandmo & Gamlem, 2025). In response to this situation, several studies have highlighted the need to strengthen teacher training in digital competencies and active methodologies in order to ensure the continuity of the feedback cycle even in non-face-to-face contexts (Paz-Perea et al., 2024). In this scenario, the practice of formative feedback in virtual primary education remains limited and inconsistent, revealing the urgency of investigating how it is actually being implemented in teaching practice.

However, despite the extensive evidence on the benefits of feedback, there is a scarcity of studies examining how primary school teachers implement formative feedback in real virtual environments and what tensions they face in this process. Although some studies acknowledge progress in the integration of digital feedback tools, others warn that superficial or technical use, without solid pedagogical criteria, limits its transformative potential (Vilca et al., 2022). This study arises from the need to understand in greater depth how primary school teachers confront the challenge of applying formative feedback strategies in virtual environments. Gaps still persist regarding its effective implementation in daily practice, especially in contexts where distance education was adopted in response to exceptional circumstances and required teachers to adapt rapidly. In this sense, the purpose of this work is not to once again demonstrate the usefulness of feedback (an aspect already widely documented), but to investigate how teachers carry it out in real scenarios, what obstacles they encounter, and with what resources or strategies they seek to overcome them.

The research is also justified because there is currently no validated conceptual model that organizes formative feedback in virtual basic education from the teachers' perspective. The existing theoretical frameworks are usually general in nature or focus on higher educational levels, without addressing the particularities of the primary level nor the tensions that emerge when transferring face-to-face practices

to digital environments. Hence, the generation of situated knowledge is essential for capturing teaching experience and translating it into a pertinent, flexible, and pedagogically sound conceptual structure.

The study gains practical relevance because it seeks to provide an organized foundation that guides both reflection and pedagogical decision-making, as well as teacher training in virtual settings, and leads to higher-quality pedagogical practice in distance learning processes in primary education. By highlighting the real exaperiences and limitations of teachers, the research aims to become a resource for the design of educational policies, training programs, and technological tools aligned with the dynamics of the virtual classroom at this level.

Therefore, the objective of this study is to understand how primary school teachers apply formative feedback in virtual environments, identify the factors that condition its effectiveness, and, based on these experiences, construct a conceptual structure that organizes and explains these practices.

Method

Design

This study was conducted using a qualitative approach with a grounded theory design, with the purpose of understanding how primary school teachers conceive of and implement formative feedback strategies in virtual environments. Since the phenomenon under study is scarcely documented from a contextualized perspective, the design allows for the construction of categories and a conceptual structure based on the analysis of the data collected (Strauss & Corbin, 2002). This approach proved particularly suitable for capturing the complexity of the phenomenon, giving priority to teachers' voices, their concrete experiences, and their pedagogical strategies. The systematic tradition of grounded theory proposed by Strauss and Corbin was adopted, which involved the use of constant comparative analysis and the development of analytical memos during conceptual construction. Although grounded theory usually employs theoretical sampling, in this study it was not possible to implement it fully due to field constraints, which is acknowledged as a methodological limitation. The research was carried out in a context where many schools have maintained or combined virtual teaching formats without implementing a feedback model adapted to the primary level.

Participants

The sample consisted of 65 practicing teachers at the primary education level, belonging to 15 educational institutions in the Tacna region, Peru. The selection was carried out through convenience sampling, taking as criteria a minimum of five years of professional experience and the management of techno-pedagogical tools applied to virtual teaching. It should be noted that the Tacna region is recognized for its achievements in learning (it ranks first in Peru in learning achievements) and for the progressive use of educational technologies in basic education. The variety of virtual experiences of the teachers contributed to the collected data, allowing the identification of both common patterns and singular tensions in the use of virtual formative feedback.

Instrument

The main instrument for data collection was the semi-structured interview, as it allows for an in-depth exploration of teaching practices and teachers' perceptions regarding virtual formative feedback. The script was constructed based on a review of the literature and the research objectives. It was organized around four key areas: definition of formative feedback, strategies used, factors that influence its application, and types of feedback utilized. This thematic openness led to the emergence of a conceptual structure on virtual formative feedback in primary education during the analysis.

The interviews were conducted in coordination with the principals of the participating educational institutions and were carried out in person, adapting to the availability of each teacher. Informed consent was requested prior to the interview, ensuring anonymity and confidentiality of the information provided. The responses were recorded in audio and field notes. The interview instrument included open-ended questions to facilitate flexible exploration and encourage the free narration of the interviewees' experiences. These questions were designed based on the literature and research objectives, addressing general aspects of virtual formative feedback and allowing for the subsequent identification of emerging categories during the analysis. The interviews were conducted in Spanish, lasted an average of 35 to 50 minutes, and were recorded with the participants' permission. They were then transcribed verbatim and reviewed through cross-checking to ensure accuracy and fidelity in the records. Some guiding questions included: How would you define virtual formative feedback? What feedback strategy do you consider effective in the virtual teaching you have conducted? What factors do you attribute to the inability to provide good feedback in virtual teaching? And what types of feedback do you usually use when addressing virtual teaching?

Analysis

The analysis of the data was conducted following the guidelines of grounded theory with support from Atlas.ti 23, which ensured coherence and methodological

rigor (Ahmed et al., 2025). It began with open coding, which allowed the identification of expressions and key terms used by teachers to define and describe virtual formative feedback. Subsequently, through axial coding, the codes were grouped and related, giving rise to categories that represent fundamental dimensions of this pedagogical practice, such as its purpose, its procedural nature, the student-centered approach, and its connection with competency development. Finally, through selective coding, the categories were integrated to produce an emerging central category that synthesizes teachers' conceptions of formative feedback in virtual primary education environments.

The coding process was carried out independently by two researchers, who later compared and agreed upon the categories to strengthen the reliability of the analysis. Likewise, qualitative rigor strategies were applied, such as peer debriefing and internal consistency review of the category system. The process was complemented with the criteria of Miles and Huberman (1994), which include data reduction, data display, and verification, in order to reinforce the systematic nature and internal validity of the analysis.

Results

Emerging teacher conceptions from open coding

In this section of the qualitative analysis, those words were outlined and identified allowing us to reach an understanding of how teachers considered formative feedback in the teaching–learning process in virtual environments, based on the terms that were selected (extracted) through the use of open coding and that, as noted previously, were contextualized with representative quotes that allowed us to interpret the meanings that the participating subjects had given to the pedagogical practice. This analysis included a word cloud and its categorization to identify the open codes.

Figure 1.
Word cloud generated from teachers' definitions of formative feedback

Note: Own elaboration in Atlas.ti. Responses to the question: "How would you define formative feedback?"

The word cloud was created from teachers' responses to the question: How would you define formative feedback? The most frequently repeated answers reveal central notions when conceptualizing this pedagogical strategy within the context of virtual basic education. Words such as feedback, formative, evaluate, objectives, achievements, and performance show an understanding oriented toward monitoring learning and guiding students toward clear educational goals. On the other hand, words such as support, constant, strengthening, reinforcing, and process suggest that teachers conceive feedback as a continuous and personalized process aimed at facilitating the progressive development of competencies. The presence of words such as reflection, motivates, learned, and positively indicates the value placed on the formative and motivational component, which is related to improved performance and the establishment of meaningful learning. Likewise, the emphasis on child, activities, and development reiterates the existence of a student-centered conception, consistent with the usual practices of primary education in virtual environments. Similarly, the results presented here constitute the basis for identifying emerging conceptual categories, which will be described below.

Contextual analysis of keywords in teachers' definitions of formative feedback in virtual teaching

As part of the open coding, keywords of high recurrence and conceptual value were identified, extracted from the responses to the question: "How would you define formative feedback?" These expressions allowed a deeper exploration of the meanings attributed by teachers to this practice in the context of virtual teaching. Below is presented the contextual analysis of these keywords, accompanied by representative quotes.

The analysis of the key words associated with the definitions provided by the teachers makes it possible to identify the central elements that structure their understanding of formative feedback in virtual environments. The most frequent expressions show that teachers do not conceive feedback as a one-time or exclusively corrective action, but rather as a process linked to continuous evaluation, the verification of learning, and pedagogical support.

Similarly, terms such as children, achievements, reflection, and improvement indicate that feedback is oriented toward individual progress and active student participation, revealing a markedly student-centered conception. This repeated presence of notions related to process, competencies, and learning objectives allows for the delineation of the initial meaningful cores from which the analytical categories developed in the following stages of the analysis were constructed.

Axial categorization of teachers' perception of formative feedback

At this stage of the qualitative analysis, the previously identified open codes were grouped to construct categories that articulate the meanings teachers assign to formative feedback. The grouping was carried out based on recurrent patterns observed in the open codes, whose constant comparison made it possible to identify conceptual connections among them. This axial coding strategy allowed the establishment of relationships between emerging concepts and delineated four dimensions that structure teachers' practices and conceptions in virtual environments: the purpose of feedback, its procedural nature, the student-centered focus, and the link with competence development. These categories constitute the interpretive core of the phenomenon under analysis and form the central interpretive framework at this stage of the analysis.

Table 1

Keywords, representative quotes, and contextual interpretation of formative feedback in virtual teaching

Keyword	Literal teacher quote (age, gender, experience)	Contextual interpretation	Suggested open code
Evaluate	"Nowadays feedback is given more because of the pandemic, and we have to evaluate the criteria in attitudes, emotionally descriptive values." (Female teacher, 33 years old, 9 years of experience)	Feedback is related to a comprehensive evaluation that considers attitudinal and emotional aspects, beyond technical knowledge.	Comprehensive evaluation of learning
Competencies	"Well, I would say that formative feedback is to reinforce based on the competencies worked through open questions." (Female teacher, 26 years old, 5 years of experience)	Feedback is used as a tool to consolidate specific competencies through active strategies.	Reinforcement of competencies in virtual environments
Performance	"It is a series that is generated from the children's performance, in order to achieve the learning objectives." (Female teacher, 52 years old, 13 years of experience)	Feedback is a sequence oriented toward progress based on the analysis of student performance.	Performance-based feedback
Children	"It is a process of reflection that motivates children to create new productions and to identify their achievements." (Female teacher, 27 years old, 3 years of experience)	The focus is on students as active subjects of the reflective process, recognizing their capacity to improve.	Student-centered approach
Learned	"Formative feedback is to evaluate the child to know what they learned." (Female teacher, 58 years old, 19 years of experience)	Feedback becomes a direct way to confirm whether meaningful learning has been achieved.	Verification of acquired learning
Objectives	"It is a series that is generated from the children's performance, in order to achieve the learning objectives." (Female teacher, 52 years old, 13 years of experience)	The purpose of feedback is linked to the progressive fulfillment of pedagogical objectives.	Monitoring the achievement of objectives
Improvement	"Feedback, well, is a process through which students' learning is improved." (Female teacher, 45 years old, 12 years of experience)	Feedback is valued as a tool for continuous improvement, focused on learning progress.	Progressive improvement of learning

Table 2.

Axial coding: emerging categories around formative feedback

Emerging category	Grouped open codes	Representative excerpt
Purpose of feedback	Comprehensive evaluation of learning, Verification of acquired learning, Monitoring the achievement of objectives	"Formative feedback is to evaluate the child to know what they learned." (Female teacher, 58 years old, 19 years of experience)
Pedagogical process	Feedback as a formative process, Progressive improvement of learning, Performance-based feedback	"Feedback, well, is a process through which students' learning is improved." (Female teacher, 45 years old, 12 years of experience)
Student-centered	Student-centered approach, Pedagogical accompaniment in feedback	"It is a process of reflection that motivates children to create new productions and to identify their achievements." (Female teacher, 27 years old, 3 years of experience)
Development of competencies	Reinforcement of competencies, Valuation of achievements and progress	"Well, I would say that formative feedback is to reinforce based on the competencies worked through open questions." (Female teacher, 26 years old, 5 years of experience)

From the grouping of open codes that resulted from the interviews, four emerging categories were extracted that synthesize teachers' perceptions of formative feedback in the context of virtual teaching in primary education. These categories reflect how meanings are constructed around this pedagogical practice in non-presential settings, marked by the use of technologies, family mediation, and the particularities of child development.

1. Purpose of feedback: This integrated category consists of expressions that refer to feedback, linking it with learning assessment in the formative sense and with the objective of achieving educational goals. For the primary teacher, providing feedback in a non-presential modality means verifying whether children have understood and achieved the expected learning outcomes in virtual communication. As one teacher (58 years old with 19 years of experience) argues: "Formative feedback is to evaluate the child to know what they learned." In this sense, formative feedback is a function of pedagogical adjustment, since it makes it possible to identify progress and needs individually for each student.

2. The pedagogical process: Feedback is conceived as a cyclical process that supports the development of learning during sessions in virtual classrooms. The category emphasizes the sequential, orderly, and progressive nature of the didactic action, rather than a simple punctual correction. As expressed by one teacher (45 years old with 12 years of experience): "Feedback, well, is a process through which students' learning is improved." This conception reinforces the idea of the need to provide feedback in a continuous and planned manner, shaping the particularity of a class without the young student being physically present in the classroom.

3. Student-centered: In primary education, where learning is accompanied with kindness and motivation, feedback is seen as a mechanism that enables active participation, the children's effort, and their achievements. The category integrates the emotional, expressive, and reflective dimensions that teachers bring through questions, positive contributions, and spaces opened for self-assessment. One teacher (27 years old with 3 years of experience) states: "It is a reflective process that makes children create new productions and be able to see what they have done." Consequently, feedback is therefore considered a personalized experience to reinforce self-confidence and commitment to learning.

4. Development of competencies: Finally, this category includes those perceptions that associate feedback with a way to reinforce specific skills, address difficulties, and consolidate learning in accordance with the competencies included in the curriculum. In the virtual context, teachers adapt their strategies to continue strengthening these capacities, often with the support of digital materials and family mediation. One teacher (26 years old with 5 years of experience) notes: "Well, I would say that formative feedback is to reinforce based on the competencies worked through open questions." This view responds to a logic of progression and differentiated attention, centered on the progress of each student.

Results of selective coding and emerging central category

In this stage of the analysis, the categories built in axial coding were integrated through selective coding, which made it possible to identify a central category that articulates the phenomenon of study as a whole (Table 3). This category emerged by identifying the concept that offered the greatest explanatory capacity and cohesion among the dimensions developed in the axial analysis.

Table 3

Transition from axial coding to selective coding and central category

Axial categories	Selective coding result	Emerging central category
Purpose of feedback	Feedback is conceived as a pedagogical adjustment function that verifies, monitors, and guides learning achievement in virtual contexts.	Formative feedback as a comprehensive pedagogical process centered on the student
The pedagogical process	Feedback is understood as a cyclical, sequential, and continuous process that supports and improves student learning in virtual classrooms.	Formative feedback as a comprehensive pedagogical process centered on the student
Student-centered	Feedback emphasizes active participation, reflection, motivation, and recognition of children's achievements as protagonists of their own learning.	Formative feedback as a comprehensive pedagogical process centered on the student
Development of competencies	Feedback is associated with the reinforcement of skills, overcoming difficulties, and strengthening curricular competencies through adapted strategies.	Formative feedback as a comprehensive pedagogical process centered on the student

The emerging central category was: "Formative feedback as a comprehensive pedagogical process centered on the student." This category synthesizes teachers' conceptions of feedback in virtual teaching contexts in primary education, highlighting its continuous, formative, and goal-oriented nature.

According to the teachers, its purpose is to evaluate, verify achievements, and readjust the process; its dynamic relies on planning that is continuous and adapted to the needs and performance of each child. Its impact on the development of competencies and on meaningful learning is recognized, even in situations of low connectivity.

Also, based on the integration of the evidence, it is proposed to consider virtual formative feedback as a complete, continuous, and planned pedagogical process of assessment aimed at verifying the achievement of learning, readjusting teaching processes, achieving and strengthening competencies, within a student-centered approach. In non-presential primary education, this process articulates accompanying, motivating, and recognizing the student's progress, adjusting strategies according to performance, and creating favorable conditions for the construction of meaningful learning through technological mediation and, in many cases, family support.

Teaching practices and critical conditions for feedback in virtual settings: contributions to the construction of the model

In addition to inquiring about the general meaning of formative feedback, additional questions were asked to teachers in order to access their practical experiences in virtual teaching. These questions made it possible to identify strategies, difficulties, and critical conditions for providing feedback in primary education. Table 4 summarizes the significant thematic issues that emerged: effective strategies, ineffective strategies, difficulties, suggestions for improvement, types of feedback, and determining factors for the choice of strategies.

The complementary results allow for a deeper understanding of how teachers develop feedback in virtual contexts; the most effective practices can be observed in relation to personal interaction and the variety of resources, while the less effective practices are associated with a one-dimensional, grade-centered approach. Structural difficulties conditioned the development of the types of strategies used (connectivity, resources, and participation). In parallel, teachers suggest planning feedback with greater timeliness, clarity, and a diversity of formats, highlighting the role that families played as support in the feedback processes. In addition, there is a flexible use of synchronous and asynchronous modalities, depending not only on the teacher's technological skills but also on the students' family and social context. These findings show how pedagogical, technological, and family dimensions intertwine in the practice of virtual feedback. Taken together, these complementary results deepen the understanding of how teachers conceive and implement formative feedback in virtual settings, providing insights for building the study's emerging conceptual structure.

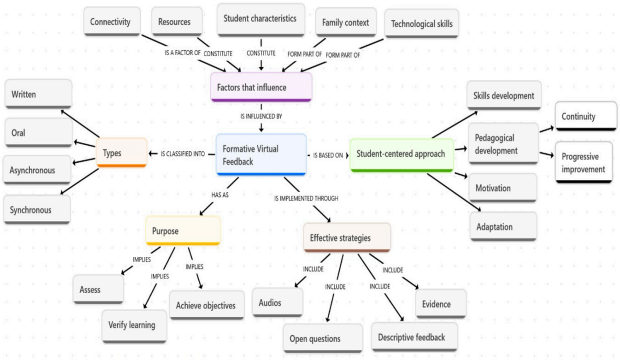
Table 4

Complementary results: teaching practices and critical conditions for formative feedback in virtual teaching

Explored dimension	Synthesis of findings	Representative example (teacher quote)
Effective strategies	Use of open-ended questions, personalized audios, descriptive feedback, work with evidence, and family involvement.	"It was through open-ended questions on the Meet platform and also based on their worksheets, which were their evidence." (Female teacher, 26 years old, 5 years of experience)
Ineffective strategies	Generalized feedback, exclusive use of grades or marks, closed questions, and sessions with many students without individual follow-up.	"It didn't work for me to give feedback only through final grades... students didn't know what they were doing wrong." (Female teacher, 45 years old, 12 years of experience)
Difficulties in providing feedback	Lack of connectivity, low participation, parental intervention, limited attention of children, lack of resources, and limited technological skills.	"Constant intervention of parents when their children wanted to answer the questions." (Female teacher, 27 years old, 3 years of experience)
Suggestions to improve feedback	Provide timely feedback, maintain direct contact with students, use varied media (videos, questions, drawings), promote reflection, and family support.	"Ask, ask questions about what we worked on throughout the class and finish in a general way... I usually talk with the parents on Fridays so that they talk with their children about what they did." (Female teacher, 55 years old, 22 years of experience)
Most frequently used types of feedback	Synchronous, asynchronous, oral, and written modalities predominate, depending on the teacher's technological and communicational context.	"I frequently use synchronous feedback for my virtual classes." (Female teacher, 12 years of experience, I.E. El Faro)
Factors influencing the choice of strategies	Connectivity, student characteristics, family context, resource accessibility, teacher's technological skills.	"My students' connectivity was a great challenge, so I chose to send activities through WhatsApp and use them as feedback in class." (Female teacher, 12 years of experience, I.E. República Argentina)

Figure 2

Conceptual structure of virtual formative feedback from the teachers' perspective



The conceptual model presented in the figure organizes in an integrated manner the categories that emerged from the analysis and allows for visualizing how teachers structure formative feedback in virtual environments. The representation shows that this practice is composed of different elements that relate to one another: the influencing factors, such as connectivity, available resources, student characteristics, and the family context; the types of feedback used; the purposes that guide its application; and the concrete strategies employed by teachers. Likewise, the model demonstrates that these dimensions are articulated around a student-centered approach, which operates as the organizing axis of the practices described. Taken together, the figure graphically synthesizes the conceptual structure derived from the study and allows for understanding how teachers combine contextual conditions, pedagogical decisions, and forms of interaction to carry out feedback in virtual primary education.

Discussion

The study was based on the analysis of interviews with primary education teachers in virtual environments, which made it possible to identify common patterns summarized in a conceptual map. The interpretation process revealed three central dimensions of formative feedback for education: cognitive, focused on guiding understanding and self-regulation; socio-emotional, linked to motivational support and recognition of effort; and techno-pedagogical, related to the use of digital resources to streamline and personalize feedback. In this way, the data analysis revealed that, in their daily practice, teachers think of and perform feedback as a process that intertwines the academic, the emotional, and the technological.

Unlike previous studies focusing mainly on secondary or university levels, the present work provides a situated understanding of formative feedback in virtual primary education, a context scarcely explored in the international literature. The specificity of the primary level, marked by technological dependence, family mediation and the cognitive and socioemotional characteristics of children, generates a particular way of providing feedback that is not observed in other educational levels. This uniqueness justifies the need for a conceptual model specific to this segment, which was not systematized previously. The three dimensions identified in the conceptual model derive directly from the coding process. The cognitive dimension emerges from categories associated with understanding, objectives and performance; the socioemotional dimension arises from codes related to support, motivation and recognition of effort; while the technopedagogical dimension is grounded in the accounts referring to the use of digital tools and the management of online interaction. This direct link between the data and the model strengthens the interpretive coherence of the study.

The emerging conceptual model differs from approaches described in the international literature because it integrates within a single framework pedagogical, socioemotional and technopedagogical elements that in other studies are often addressed separately. In secondary and higher education contexts the emphasis tends to be on learner autonomy or technological efficiency, whereas in our study the teachers' practices reveal an interdependence between family mediation, technological availability and the need for continuous support characteristic of virtual primary education. This integrated approach constitutes a distinctive and necessary contribution to understanding feedback at this educational level.

Regarding the cognitive dimension, as mentioned, teachers emphasize that feedback ceases to be efficient when it is limited to pointing out errors. From there, the need for explanations and possible routes for improvement that support the development of understanding and self-regulation of learning is observed. Authors of studies agree with these perceptions; for example, Van der Kleij and Lipnevich (2020) argue that feedback is more efficient when it is clear, procedural, and actionable. However, some participants admitted that, despite their intervention, the feedback they usually provide is reduced to numerical grades. This reflects a culture centered on summative evaluations practiced by teachers (Vilca et al., 2022).

The socio-emotional dimension appears with the purpose of encouraging and boosting students' confidence with messages that seek to sustain motivation in virtual contexts, recognizing students' effort. This emotional role of feedback aligns with the findings of Green (2023), who details how children particularly value comments that encourage them to persevere, so that they may invent their own solutions.

Furthermore, current research has shown that feedback could have a beneficial impact on students' motivation, along with cognitive successes (Sortwell et al., 2024).

With regard to the techno-pedagogical dimension, teachers stated that they used platforms such as Google Classroom or WhatsApp to provide quick responses, maintaining contact with their students. Although these tools streamline the process, they admitted the lack of training to take advantage of resources that allow for more systematic and personalized follow-up. These results align with experiences from other contexts where student response systems simplify reciprocal feedback cycles (Pai, 2025), and video analytics help enrich collaboration and productive classroom discourse (Tong et al., 2025). Additionally, current literature has shown that digital technologies, including artificial intelligence–based solutions, can expand the possibilities of personalization and the speed of feedback, despite the challenges associated with the digital divide and teacher training (Anastasopoulou et al., 2024; Zhang et al., 2025).

By contrasting these three dimensions with international literature, significant coincidences and nuances appear. The results are consistent with those indicated by Van der Kleij and Lipnevich (2020), who emphasize that the effectiveness of feedback depends on its timeliness, clarity, and above all, its relevance so that it can be adequately used by students. At the same time, the most recent systematic reviews show that formative assessment generates positive effects on the learning of basic education students depending on the type of strategy and the content area (Sortwell et al., 2024). This article contributes by offering a qualitative perspective, since it shows that, in online primary teaching, the value given to feedback is measured not only in cognitive achievement but also in its capacity to sustain the pedagogical bond and motivation.

In this regard, the present study expands previous findings by showing that, in virtual primary education, formative feedback takes on a more distinctly dialogic and relational character than in other educational levels. While studies in secondary and higher education emphasize learner autonomy or instructional efficiency, primary school teachers describe a process shaped by adult mediation, the need to sustain affective bonds, and the adaptation to technological limitations. This contrast shows that feedback in virtual primary education constitutes a phenomenon with its own dynamics that justify its specific study. These elements do not usually appear in studies at other educational levels, and therefore represent original contributions of the analysis conducted.

Other authors highlight the central role of teachers' conceptions. Brown et al. (2025), in their research, found that if teachers value assessment as improvement, this tends to generate more coherent feedback practices, a fact that aligns with the designed model, which supports the idea of belief in assessment as a learning mechanism, as the basis of feedback practices. In the same line, Green's (2023) study in a primary education context shows that students appreciate processual feedback that allows them to develop their own solutions, which also agrees with the perceptions that, up to that point, a similar study collected in this work generated in its participants.

The most recent literature also draws attention to the role of technologies in the framework of feedback improvement. Pai (2025) proposes a reciprocal cycle of feedback through student response systems that allow the teacher to update instruction in real time. Likewise, Tong et al. (2025) indicate that the use of video analytics improves collaborative work and productive dialogue of low-achieving students. Both contributions establish dialogue within the techno-pedagogical dimension of the model. Research carried out in Latin America, such as that of Vilca et al. (2022), also warns that the school culture based on numerical grading cancels out the potential of feedback, which contrasts with the model presented here, centered on the construction of shared meanings. Our data show that technological effectiveness is conditioned not only by the availability of tools but also by their integration into the affective and support dynamics that characterize virtual primary education.

The search for recent literature nourishes this approach. Anastasopoulou et al. (2024), for example, explain that digital technologies (AI, LMS, VR/AR) facilitate immediate and personalized feedback while warning that they may also hinder pedagogy in different languages due to the digital divide or lack of teacher preparation. Altmann and Arnold (2024) show how peer learning feedback and interaction with e-tutors in international collaborative contexts (COIL) can foster learning and lighten teacher workload, which can serve as inspiration for other practices in virtual school contexts; while McCarthy et al. (2025) insist on the conceptual clarification of feedback and formative assessment, an important aspect for the coherence of models such as the one being presented. Recent research also explores the potential of AI-based automatic feedback tools, such as RATsApp, or frameworks based on language models that provide immediate, personalized, and scalable feedback (Kuzminykh et al., 2024; Steinert et al., 2024; Zhang et al., 2025).

In this study, we found findings that dialogue both with what has already been reported in the literature and with aspects specific to the context analyzed. As noted

by Green (2023) in primary students, the participating teachers expressed that feedback is experienced as a motivating and accompanying process, rather than as a simple correction of errors. The accounts also highlighted the centrality of the student and the role of feedback in the development of competencies, in line with what was described by Moya-Muñoz et al. (2025) and Imaicela Vega et al. (2025).

However, unlike exploratory research conducted at higher educational levels, here factors that are scarcely documented emerged: the influence of family mediation, the limitations derived from connectivity, and the need to employ strategies adjusted to children's age. These elements, according to the teachers themselves, condition the way feedback can be implemented in practice.

This contrast highlights the relevance of constructing a concrete conceptual structure for virtual primary education. In our view, this is an original contribution, since most of the studies preceding this research offer general feedback frameworks (Black & Wiliam, 2018; Van der Kleij & Lipnevich, 2020), but do not specify what conceptual structures respond to the particularities of this educational level.

Regarding the limitations, the present study is based on a small sample of teachers from a specific regional context, which restricts the generalization of the results. Likewise, the students' voices were not systematically included, an essential element to know the degree of congruence between teachers' intentions and the way feedback has been received (Van der Kleij & Lipnevich, 2020). Finally, the conceptual model we have developed has not yet been validated in terms of its direct impact on academic performance, which represents an aspect to be addressed in future research.

The implications are diverse. In terms of pedagogical practice, the results point to the need to strengthen teachers' feedback literacy, understood as their ability to provide models of comments that are clear, relevant, and usable by students (Brown et al., 2025). There is also a need to establish digital tools critically and contextually, leaving aside instrumentalization and emphasizing their pedagogical value (Anastasopoulou et al., 2024). Regarding future research, it is suggested to carry out comparative studies that include both teachers' and students' voices, and to conduct interventions whose impact is related to cognitive and socio-emotional learning.

Conclusions

As for the conclusion, the study carried out provides a conceptual model of formative feedback based on virtual primary education that articulates cognitive, socio-emotional, and techno-pedagogical dimensions. Its main contribution is to show that feedback is a dialogical and motivating process, deployed through technological resources and subordinated to teachers' conceptions. Although exploratory, the model serves as a basis for advancing pedagogical practice and guiding future research in more inclusive and technology-mediated contexts. However, the study presents limitations related to the regional nature of the sample, the absence of the students' perspectives, and the lack of empirical validation of the model, aspects that should be considered and further examined in future research.

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