



The emergence of a communitarian ethics in initial mathematics teacher education contexts

La emergencia de una ética comunitaria en contextos de formación inicial de profesores de matemáticas

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Abstract

Initial teacher education in Western societies is shaped by a market-oriented view of education that fosters relationships based on convenience and self-interest. As teacher educators, we seek to promote a communitarian ethics grounded in responsibility, commitment, and care for others. In this context, this article examines how such ethics emerge in an activity that encourages forms of relating different from market logic. Based on a dialectical-materialist analysis of an episode involving four pre-service teachers and a teacher educator solving a task on equivalence and fraction ordering, we identified dialectical opposites that express the unity of contradictory features of communitarian ethics. The results show that this ethics emerged from the way participants dealt with features such as relinquishment of voice, exclusion, and lack of empathy.

Keywords:

- Mathematics teacher learning
- Communitarian ethics
- Contradictions
- Fractions

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Resumen	Palabras clave
La formación inicial de profesores en las sociedades occidentales está moldeada por una visión mercantil de la educación, que fomenta relaciones basadas en la conveniencia y el interés propio. Como formadores, buscamos promover una ética comunitaria sustentada en la responsabilidad, el compromiso y el cuidado del otro. En este contexto, este artículo analiza cómo dicha ética emerge en una actividad que promueve formas de relación distintas a la lógica del mercado. A partir del análisis dialéctico-materialista de un episodio que involucra a cuatro futuros profesores y un formador resolviendo una tarea sobre equivalencia y orden de fracciones, identificamos opuestos dialécticos que expresan la unidad de rasgos contradictorios de la ética comunitaria. Los resultados muestran que esta ética emergió del modo en que los participantes lidiaron con rasgos como la renuncia de la voz, la exclusión y la falta de empatía.	– <i>Aprendizaje del profesor de matemáticas</i> – <i>Ética comunitaria</i> – <i>Contradicciones</i> – <i>Fracciones</i>

Resumo	Palavras-chave
A formação inicial de professores nas sociedades ocidentais é moldada por uma visão mercantil da educação, que fomenta relações baseadas na conveniência e no interesse próprio. Como formadores, buscamos promover uma ética comunitária sustentada na responsabilidade, no compromisso e no cuidado com o outro. Nesse contexto, este artigo analisa como essa ética emerge em uma atividade que promove formas de relação diferentes da lógica de mercado. A partir da análise dialético-materialista de um episódio que envolve quatro futuros professores e um formador resolvendo uma tarefa sobre equivalência e ordenação de frações, identificamos opostos dialéticos que expressam a unidade de traços contraditórios da ética comunitária. Os resultados mostram que essa ética emergiu da maneira como os participantes lidaram com traços como a renúncia da voz, a exclusão e a falta de empatia.	– <i>Aprendizagem do professor de matemática</i> – <i>Ética comunitária</i> – <i>Contradições</i> – <i>Frações</i>

Résumé	Most Clés
La formation initiale des enseignants les sociétés occidentales est façonnée par une vision marchande de l'éducation, qui favorise des relations fondées sur la commodité et l'intérêt personnel. En tant que formateurs, nous cherchons à promouvoir une éthique communautaire fondée sur la responsabilité, l'engagement et le soin de l'autre. Cet article analyse comment une éthique émerge dans une activité qui encourage formes de relation différentes de la logique du marché. À partir de l'analyse dialectico-matérialiste d'un épisode impliquant quatre futurs enseignants et un formateur résolvant une tâche sur l'équivalence et l'ordre des fractions, nous avons identifié opposés dialectiques exprimant l'unité de traits contradictoires l'éthique communautaire. Les résultats montrent que cette éthique a émergé de la manière dont les participants ont fait face à des traits tels que le renoncement à la voix, l'exclusion et le manque d'empathie.	– <i>Apprentissage de l'enseignant de mathématiques</i> – <i>Éthique Communautaire</i> – <i>Contradictions</i> – <i>Fractions</i>



1. Introduction

In recent years, ethics in education, and particularly in mathematics education, has become a recurrent research topic in these scientific fields (Boylan, 2016; Dubbs, 2020; Ergas, 2017; Kerna, 2019; Radford, 2023b; Roth, 2013; Stetsenko, 2020). According to Ernest (2024), the shift towards the ethical “[...] is only just now reaching mathematics and mathematics education. So, [ethics constitutes] a wide-open and burgeoning field” (p. 4). This ethical turn has already been advanced in fields such as philosophy, humanities, and social sciences (e.g., Davis & Womack, 2001; Goodman & Severson, 2016; Voloshin, 1998). We agree with Boylan (2016) and Ernest (2024) on the importance of this for mathematics education given that teaching-learning activities are deeply intertwined with issues of ethical concern. In fact, when considering ethics from a relational dimension¹, it can be stated that:

[...] every act of learning is based on and mobilizes an ethic. [...] in every pedagogical model [...], there is a teacher and at least one student. And one will have to *address* the other. And that addressing the other already includes a *form of relation* (for example, a relation of power, a relation of obedience, a relation of solidarity). This addressing already includes an ethical component. (Radford, 2020, pp. 32-33)

Given that educational institutions, especially universities, are fundamental in the production and legitimization of knowledge considered as essential for social reproduction (Bourdieu & Passeron, 1996), ethical forms of relating to others, in these spaces, are strongly intertwined with social practices in the classroom that, at the same time, produce specific subjectivities (Boylan, 2016). In other words, depending on these practices, teachers and students interact ethically in specific ways which constitute them as unique, dynamic and changing subjectivities within the limits and possibilities of their culture (Radford, 2021). As consequence, social practices in the classroom, which respond to a conception of education as a market (Fraser, 2019), produce and also reproduce ethical forms of relating between teachers and students that shape them as private owners — that is, as subjects dedicated to accumulating wealth (knowledge), exchanging ideas, negotiating meanings, etc. (Ball, 2017; Giroux, 2014; Radford, 2014b).

The understanding of education as a market, which prevails in Western universities (Connell, 2022), is a response to today's world globalization that affects different aspects of contemporary life. For developing countries — as is the case of Chile — this globalization has caused a growing economic interdependence with other *influential* nations and regions of the world, mediated by mechanisms of economic, political and cultural regulation (D'Ambrosio, 2018). As a result, Chilean universities have undergone a



gradual transformation in recent years, turning into organizations characterized by “academic productivism, bureaucratization and an incessant assessment of individual and collective performance that the academic profession perceives as a source of alienation” (Brunner et al., 2019, p. 129). Within the faculties and schools of education, this transformation is nourished, especially by the obligation of accrediting initial teacher education programs with a focus on the development of high demand competences and abilities for the labor market, as stipulated by the *Framework for Good Teaching* (MINEDUC, 2021) of the national teacher policy.

In this context, the current dynamics in initial teacher education in Chile are shaping both pre-service mathematics teachers (PMTs) and teacher educators (TEs) into subjects *manufactured* by activities that are regulated by productivity and adaptation to the demands of the educational market (Montecino, 2019; Montecino & Valero, 2017). Under these circumstances, the ethical forms of relating to others are affected by performance and efficiency objectives, which irremediably leads to the loss of contact between the PMTs, the TEs, and the culture that surrounds them. This *loss of contact* makes these subjects behave, in their activity as “an ensemble of monads loosely related to each other through simple convenience. [...] I need you because you can do something I cannot: you can corroborate for me the viability of *my* knowledge” (Radford, 2024, p. 37).

The daily confrontation with this reality invites us to critically consider our role as TEs and researchers in Chilean university contexts where a conception of education as a market prevails. Recognizing that education is never neutral (Hooks, 1994; Freire, 1970), we have adopted a perspective of education in general, and mathematics education in particular, as a social, political, historical, and cultural project of co-production of ethical and reflective individuals who critically take a stance in inclusive and supportive social practices (Radford, 2023c). In opting for this perspective, it becomes crucial to promote ethical forms of relating between PMTs and TEs based on context-sensitive responsibility, on the encounter with other voices and consciences, and on a pluralistic sense of collectivity and the common good. We refer here to forms of relating to others to what Radford (2021) calls a *communitarian ethics*.

In this article, we start from the assumption that the emergence of communitarian ethics in initial mathematics teacher training activities is not a trivial matter. In fact, the forms of relating to others, which are characteristic of this ethic, may appear in these activities in a significant way, but without being exempt from tensions, conflicts, and contradictions. Based on the above, we ask: how does communitarian ethics emerge in an initial training



activity that seeks to promote forms of relating to others different from those predominant in university contexts influenced by a market-oriented education?

2. Theoretical framework

In order to answer the research question, we rely on the communitarian ethics concept of the Theory of Objectification (TO), which offers us “reference points towards the renewal and imagination of new forms of relating to others and working with others” (Radford, 2021, p. 206). In this section, we explore some notions that allow us to take a stance theoretically speaking before the emergence of communitarian ethics, in an initial mathematics teacher training activity — in what follows, activity — as a study phenomenon. This positioning will let us move forward in the research from the methodological point of view.

2.1. Beyond the reproduction of knowledge

TO is a teaching-learning theory inspired by the dialectical materialist philosophy — a philosophy rooted in Hegel’s dialectics, which Marx and Engels transformed by removing its idealist stance and grounding it in materialism (Radford, 2021). From this philosophical current, TO highlights two fundamental ideas. On the one hand, being and culture are mutually constituted, i.e., “individuals create culture and culture creates its individuals” (Radford, 2014a, p. 137). On the other hand, this mutual constitution between being and culture occurs only through human activity. Based on these ideas, TO postulates that it is through the practical activity in the classroom that students and teachers *encounter* and, in doing so, they co-produce against the backdrop of their culture (Radford, 2021).

On the basis of the above mentioned, the interpretation of activity we make in this article — as teaching activity— goes beyond the mere reproduction of knowledge, considered essential for the labor market. In concrete practice, the activity involving PMTs and TEs produces subjectivities in the very heart of university contexts, where these subjects live their existence both concretely and materially. This production of subjectivities foregrounds our interactions with others, where conflicting points of view emerge, which inevitably lead to tensions and contradictions in the forms of relating to others. Therefore, in the perspective of TO, it makes sense to assume the activity as an ethical event.

2.2. Communitarian ethics

From TO, ethics is not conceived as “a theory based on moral rules and principles that have to be followed [but as] a fluid, personal and cultural relation between the one and the other, or at a more general level, as the *form of alterity*” (Radford, 2020, p. 33). Therefore,



we acknowledge that ethics comprises the way in which PMTs and TEs commit and assume — or not — certain responsibilities in the activities where they participate, thus configuring the relations that these subjects establish among themselves. Ultimately, ethics affects how PMTs and TEs affirm their subjectivities in concrete practice (Gutiérrez et al., 2022).

As it has been mentioned, the ethics that interests us in this article is communitarian ethics. According to Radford (2021), this ethics is turned towards:

the reflexive and critical constitution of what Marx (1988, p. 108) called “human powers”, such as will, love, cooperation, and solidarity—i.e., capacities that affirm the social, cultural, and historical nature of individuals and where our relations to others as sentient beings become the ontological condition of our existence (p. 222).

In the concrete practice, communitarian ethics emerges materially in the classroom in the form of three elements that shape the essential structure of subjectivity: responsibility, commitment and the care for others. In Radford’s words (2023b, p. 69): (i) *responsibility* “means living and acting with and for others; it means to respond to the call of others as they are on their own terms: in their “existence [...]””; (ii) *commitment* is the “resolution to engage in joint labour, to participate in the creation of the classroom common work”; and (iii) *the care for others*, “far from being an act of condescending or simply caring for someone, is a relational involvement entailing the attention to, and recognition of, others and their material and spiritual needs”.

2.3. The emergence of communitarian ethics

We agree with Radford (2021) on that the three elements that shape communitarian ethics are not natural virtues of human beings, but virtues of forms of alterity historically and culturally articulated around a vision of ethics as emancipation (D’Ambrosio, 2006). Given that the forms of relating to others are closely linked to social practices in the classroom — as we have previously pointed out—, the activities, committed to performance objectives and the achievement of effectiveness, are a hold of forms of alterity between PMTs and TEs based on oppression, exclusion and control of the other.

The emergence of communitarian ethics, in a context such as the above, strengthens our belief that its elements —responsibility, commitment and the care for others— appear in activities in *dialectical relation* with other ethical forms that, being embodied by PMTs and TEs, offer resistance. In this article, we assume that these subjects embody an ethics when their actions, reflections and emotions —expressed not only through linguistic formulations but also through gestures and facial expressions— reveal some characteristic features of the forms of relating to others that shape such ethics.



Regarding communitarian ethics, some features of the forms of relating to others, that belong to it, have been described by Lasprilla Herrera (2021). For instance, the term *welcoming* is used by this author to refer to a feature of responsibility, which is linked to taking charge of the other. By assuming a dialectical approach to the elements of this ethic, we broaden the author's view to consider that welcoming appears in the activity in *opposition* to its contrary, i.e., *indifference*. For us, indifference constitutes a feature of responsibility as opposed to welcoming, which expresses the lack of interest or affection of PMTs and TEs for the other. Considering that everything is composed of two opposing poles necessary assembled with each other—as postulated by the first law of dialectical materialism, called the *law of unity and struggle of opposites* (Yajot, 1978)—, we maintain that welcoming and indifference are interconnected opposing poles of responsibility as a communitarian ethics element.

With the intention of providing empirical evidence that allows us to answer the research question, we set the following objectives:

- To describe forms of relating to others manifested in an activity that reveal characteristic features of responsibility, commitment and the care for others between the pre-service mathematics teachers and the teacher educator.
- To explain the way in which communitarian ethics emerges in the activity from the dialectic appearance of its constitutive elements such as responsibility, commitment and the care for others, in the forms of relating to others between the pre-service mathematics teachers and the teacher educator.

3. Methodology

3.1. Context and participants

Research took place during a mathematics teaching method course, corresponding to the fourth year of study in a degree in mathematics teaching at a state university in Chile. At the time of this study, the curriculum of this degree had undergone an evaluation of the quality of its processes, based on the fulfillment of pedagogical and disciplinary standards for the pedagogy programs that derived from the Framework for Good Teaching (MINEDUC, 2021). As a result, the program obtained accreditation to operate for five years, with the obligation to submit its curriculum to a new evaluation at the end of this period. In the Chilean university context, what underlies this accreditation process is the adoption of an education approach of PMTs based on professional performance standards, aligned with the needs of the educational system and the demands of the labor market.



Recognizing that this teacher education is a source of reproduction of alienating forms of relating to others, we decided to take part in the configuration of a formative process oriented towards the emergence of communitarian ethics in the mathematics teaching methods course. According to the course syllabus, we linked this formative process to the study of learning the equivalence and fractions ordering. The formative process design included a series of tasks for the PMTs, implemented by the first author over six sessions of 120 minutes each.

In this article, we analyze the activity carried out by the PMTs and the TE during session four in which we find indices of the emergence of communitarian ethics in the actions, reflections and emotions of the participants. Specifically, we analyzed what happened upon inviting the PMTs to solve task T_0 , which consisted of matching a fractions problem (Figure 1a), —extracted from a mathematics textbook for third grade (8-9 years old), edited by the Ministry of Education in Chile (MINEDUC, 2022)— with one of the situations S_1 , S_2 or S_3 , characteristic of the ordering of fractions with common denominators (stage 1, see Figure 1b), according to Maza-Gómez² (2010). To do this, the PMTs had to suggest changes to the statement of the problem to transform it into one of comparison of fractions associated with S_1 , S_2 or S_3 . Since the original problem asks for the successive calculation of the fractions of milk received by 1, 2 and 3 children, one possible response consisted of reformulating the statement as a comparative question between two of these quantities — for example, between $2/4$ and $3/4$ —, which would correspond to S_2 .

Figure 1

Task T_0 and didactic proposal by Maza-Gómez (2010)

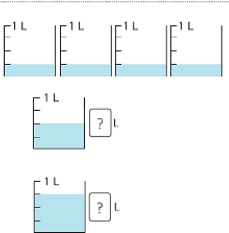
Based on the following problem (MINEDUC, 2022, p. 56):

4 1 L of milk is divided equally between 4 children.

a) What part of the L of milk does each child receive?

b) What part of the L of milk do 2 children receive?

c) What part of the L of milk do 3 children receive?



Respond to the following:

Do you consider that this problem corresponds with one of the situations (S_1, S_2, S_3) associated with stage 1 of the didactic proposal of Maza-Gómez (2010)? If so, which situation does it correspond to and why? If not, why doesn't it correspond to any of the situations and how could you change the problem to make it correspond to one of these situations?

(a)

The didactic proposal (Maza-Gómez, 2010)

Sequence of fractions comparison tasks:

1. Ordering fractions with a common denominator.
 - S_1 . Compare fractions obtained by iteration of a unit fraction.
 - S_2 . Compare fractions with a common denominator and any numerator.
 - S_3 . Compare the size of two mixed numbers whose fraction part has a common denominator.
2. Ordering fractions with the same numerator.
3. Considering different fractions as an expression of the same state or action.
4. Constructing of equivalent fractions.
5. Ordering fractions with multiple denominators.
6. Ordering by way of simplifying fractions.
7. Ordering fractions with prime denominators.
8. Calculating intermediate fractions between two other fractions.

(b)



Eight PMTs —to whom we refer by pseudonyms— were registered in the mathematics teaching methods course, of which five started the program in 2020 —2020 cohort— and the remaining started in years prior. It appeared that the students from the 2020 cohort were tight-knit and strongly united throughout the course, providing examples of a tight camaraderie, mutual support, and identification as a group. Of these PMTs, Albert stood out for his special affinity for more abstract mathematics and the tensions he experienced when he had to position himself as a teacher. For his part, Kenneth was recognized by his peers as the leader of the group, while Jane was seen as calm and obedient. Of those PMTs that were not part of this cohort, Michael stood out because of his positive attitude towards group work, despite staying somewhat nervous and cautious throughout the course. These four PMTs participated from start to finish in the resolution of task T_0 .

Regarding the TE, we highlight that his participation in the activity was not limited to facilitating or observing the work of the PMTs. On the contrary, this individual played an important role in the activity by assuming himself as part of a collective consciousness in the search for shared responses, creating conditions for the emergence of forms of relating to others characteristic of communitarian ethics.

3.2. Data collection

To gather data, we used audio and video recordings which allowed us to capture the complexity of the social interactions produced during the resolution of task T_0 . Before collecting the data, we provided PMTs with clear and detailed information on the objectives, procedures, risks, and benefits of this study, in order to obtain their consent to consciously and voluntarily participate in the formative process. That is how PMTs accepted the recordings would be used for research purposes, ensuring the confidentiality of data collected.

With this information, we collected the research data in three moments: (i) *we observed the audio and video recordings* to identify fragments of the activity of the PMTs and TE that showed indications of forms of relating to others between these subjects —we called the set of identified fragments, which we organized spatio-temporally, an *episode*—; (ii) *we transcribed the episode* based on the participants' spoken statements; and (iii) *we enriched the transcription* with images extracted from the video recording, which complemented the statements, highlighting elements of interpersonal interaction and non-verbal communication that are impossible to translate into words (Powell & Silva, 2015). To safeguard the identity of the PMTs, we opted to treat images with the intention of turning them into comic-style illustrations, making sure not to lose those elements of



nonverbal communication that were important for the study — for example, gestures, postures, and facial expressions.

3.3. Data analysis

In accordance with the theoretical principles that guide us, we assume the historical-dialectical materialist method of understanding concrete reality (Moretti et al., 2016) as a reference for data analysis. This method consists of systematically analyzing the contradictory aspects of a phenomenon —in our case, the activity of the PMTs and the TE when solving task T_0 — to understand it in the totality of its movement. Based on this method, we analyzed the data in two stages.

In the first stage, we undertook successive readings of the transcription to familiarize ourselves with the dynamic and structure of the episode (Moura, 2004). With attention to the nature of the interactions produced in the activity, we tracked evidence of the *forms of relating to others* between the PMTs and the TE that showed features of responsibility, commitment and care for others while they were solving task T_0 . To identify these features, we leverage the components and indicators of communitarian ethics elements, suggested by Lasprilla Herrera (2021). This stage resulted in a description of three *dialectical opposites* (Stouraitis et al., 2017) that express the unity of contradictory features of each of the communitarian ethics elements that were revealed in the episode, namely, proximity-distancing, sensibility-condescendence, and welcoming-indifference.

In the second stage, we analyzed the forms of relating to others in each dialectical opposite to offer an explanation of how communitarian ethics emerged in the activity, from the opposition of the characteristic features of its constituent elements. In other words, based on the first law of dialectical materialism (Yajot, 1978), we assume that the opposing features of the same element of communitarian ethics coexist dialectically in the actions, reflections and emotions of the PMTs and the TE, keeping a constant struggle with each other that gives both movement and direction to the emergence of this ethics in the activity.

In this way, we produced narratives for each dialectical opposite where we explained how an opposite feature —distancing, condescendence, and indifference— was present in the data and in what way the PMTs and the TE dealt with this feature, making communitarian ethics appear from its constitutive elements. For example, to explain how distancing was present in the data, we identified evidence of relinquishment of voice and exclusion among the participants that we assume as defining aspects of such opposite feature. In the same way, to account for the way in which participants dealt with distancing, we identified evidence of how certain defining aspects of the proximity feature appear in the activity to



offer resistance to these expressions of voice-relinquishment and exclusion among participants. We interpreted this resistance as the manifestation of a communitarian ethics in emergence, linked to the commitment element.

4. Results

The first three parts of our results present the dialectical opposites — the first stage of our analysis —, while the final part presents the narratives from the second stage, showing how communitarian ethics emerged in the activity through the elements of *commitment, care for others and responsibility*.

4.1. Proximity-distancing

At the beginning of the session, the way in which PMTs distributed themselves spatially in the classroom is called to attention: Albert, Kenneth, and Jane —2020 cohort— sat together to the left of the TE; alone, Michael occupied a space to the right of the TE (Image 1).



Image 1

When the moment came, the TE invited the PMTs to solve task T_0 in pairs, so that Albert and Michael would work together while Kenneth and Jane would work together. This intervention of the TE is considered coherent with the purposes of the formative process carried out in this research in terms of promoting forms of relating between the PMTs that could show the emergence of communitarian ethics, regardless of the closeness between these subjects. After being told to work with Michael, Albert was disconcerted by the fact that he had to separate himself from his “close” peers — Kenneth and Jane —, and work with someone who resulted in being a “stranger” to him — Michael. The looks that Albert repeatedly directed at Kenneth and Jane (Image 2) while he sat next to Michael, are an example of the PMT's disconcerted state at that moment.



Image 2

When paired together to solve the problem, Albert and Michael began to experience tension regarding working together. This was evident in Albert when he put his hands on his head (Image 3), held his hair (Images 4 and 5), and leaned back with his arms crossed while avoiding eye contact with his partner (Image 6). On his part, Michael looked tense by hugging his backpack (Image 5), swinging his legs, and clasping his hands. The tension between Albert and Michael kept these PMTs *distanced*, preventing them from undertaking a collective effort to solve the task. In fact, while Michael was referring to the need to modify the problem in task T_0 (lines 6 and 8), Albert “thought out loud” about some possible modifications that could be made to the problem statement, unrelated to his partner's suggested intervention and assumed a body posture that seemed to indicate his lack of commitment to the discussion (line 7). Realizing this, the TE sought to break the distance between the PMTs by inviting them to write their response to the task, an invitation that Michael accepted (line 11).

[6] Michael: We have to take the problem that is presented to us [meanwhile, Albert places his hands behind his head (Image 3)] and make it correspond with one [situation] of these over here [S_1 , S_2 and S_3]. Since it says “all [the situations] are [ones of] comparison” and there [in the problem], there’s no comparison, just operation. Therefore, we have to change it, so that the comparison appears. It could be...

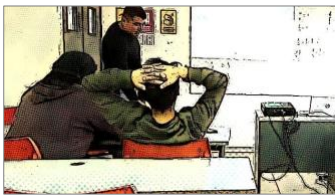


Image 3

[7] Albert: Let’s suppose that, I don’t know, Juanito, Pedrito have the liters of milk and... Pedro, Juan, Martín and Lucia have both in a container of... I don’t know, a bowl of... I don’t know... [takes his hair in his hands (Image 4)].



Image 4

[8] Michael: What confuses me is that it [the problem] tells us that a liter of milk is divided equally between four children. It’s assumed that there are four children. So, maybe [it makes sense] to say that a liter of milk is divided in equal parts and not by children in an equal manner [he hugs his backpack, puts his hands together and looks fixedly at the board (Image 5)].

**Image 5**

[11] TE: I would like you to write your answer to share it later on [Michael looks for a notebook in his backpack to take notes while Albert leans back with arms crossed (Image 6)].

**Image 6**

The intervention of the TE achieved a certain *proximity* between Albert and Michael that begins to be noticed in the new physical positioning of these PMTs in the activity, creating conditions for collective work around task T_0 . In fact, after following the TE's call, Michael prepared to make entries in his notebook, which he immediately used to question the usefulness of the graphic representations of the fractions of the problem if it were framed in situation S_1 (line 14), while Albert abandoned his reclining position and suggested situation S_2 as a solution to the task (line 15). In this way, Albert became involved in the discussion for the first time, establishing a position regarding Michael's contributions (line 16), taking the pencil from his partner's hand, and proposing a different context for the problem — which involved the use of two containers — that he quickly ended up abandoning (line 17). Seeking to rescue this proposal, Michael established eye contact with Albert for the first time in the activity, appearing close to him (line 18), while this PMT let go of his pencil, thus relinquishing participation in the discussion (line 19) and distancing himself again from Michael.

[14] Michael: [Drawing four rectangles representing containers (Image 7)]. So... um... If it's going to be the first [situation], this [the rectangles] wouldn't help much because they are all the same. There's only a comparison, so I would have to transform one of these into something else...

**Image 7**

[15] Albert: So, it would have to be the second [situation] [pointing to the board (Image 8)].



Image 8

[16] Michael: In this case, for the second [situation] it would be necessary that these four liters [pointing to the rectangles on the page (Image 9)] have this iteration of $1/4$ and then see the filling, how it would be filled; and which has more, and which has less.



Image 9

[17] Albert: We could give the instruction that... [taking the pencil from Michael (Image 10a) and making some drawings on the paper (Image 10b)]. For example, we could give two containers and the instruction: “Well, you know...”. Ah... Though we are going to end up short with [the] water, looking at it this way... [looking thoughtful (Image 10c)].



Image 10

[18] Michael: But it's that each [of these] is an iteration to see which are the comparisons. Because when doing this type of problem [pointing to Albert's drawing], you can say “pour this out any way you want” [looking at Albert (Image 11)] and you would have to compare with the fractions that come up.



Image 11

[19] Albert: Umm [letting go of the pencil and putting his hand on the back of his neck (Image 12)].

**Image 12**

While line 19 shows Albert distancing himself from Michael, line 20 suggests that the latter provided assistance to his partner, which materialized in a problem proposal that demanded the comparison of two fractions arising from the iteration of $1/4$, when pouring a liter of milk into the two containers that Albert suggested. This proposal was shared by Michael through linguistic and body signs that included eye contact (Image 13a) and annotations on paper (Image 13b and 13c). However, Albert showed disinterest in this proposal (line 21) by leaning back with his arms crossed (Image 14). Simultaneously, Michael lost eye contact with his partner and began grabbing his hair, trying to release tension.

[20] Michael: So, we will have the comparison of these fractions [looking at Albert (Image 13a)]. If we pour one out here [taking the pencil and pointing to something on the page (Images 13b and 13c)] and these three here, it would be $1/4$ and $3/4$. Which is greater? Which is less? If you pour out these two here, it would be $2/4$ and $2/4$, so you would have to see which one is greater. There appears the equivalence. If I pour out three here and one here, it would be $3/4$ here and $1/4$ here, so there is that type of comparison and you would be using the materials that are already set up.

**Image 13**

[21] Albert: Yes, it could be [leaning back with his arms crossed (Image 14a), while Michael lets go of the pencil (Image 14b) and holds his hair (Image 15c)].

**Image 14**

The activity moved after to a general discussion that will be mentioned in the following section.



4.2. Sensibility-condescendence

At the beginning of the general discussion of the responses to task T_0 , what is striking is both the way in which Albert handed over to Michael the responsibility of sharing the response to task T_0 (Image 15a) and the way in which Michael accepted this responsibility without resisting. At that moment, the distance between the two PMTs became more evident when Albert linguistically and physically disengaged from the general discussion, choosing not to participate, keeping his hands inside his pockets most of the time and directing his gaze outside of the classroom on certain occasions (Image 15b). With these actions, Albert made known his state of tension in the activity.

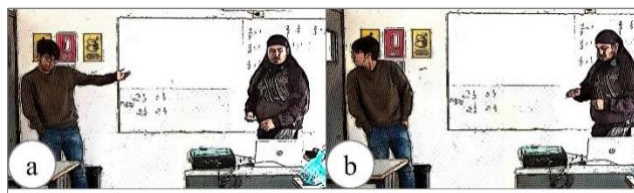


Image 15

In this context, Michael shared a response to task T_0 that was related to the modified problem in situations S_1 and S_2 of Maza-Gómez (2010) and that included two questions (line 70). Nevertheless, the tension in Albert was so evident that, for a moment, this became the focus of a conversation that came up when this PMT refused (lines 72 and 74) to accept Michael and the TE's invitation to join in the activity (lines 70, 71 and 73), giving rise to an emergence of different *forms of care* towards Albert. In the middle of this conversation, Kenneth responded to his peer's call, saying "*you are very shy, my friend*" (line 75), while the TE sought to raise awareness among the rest of the PMTs about Albert's state of vulnerability. The latter was evident in the way in which the TE, surprised by the situation, asked about the cause of Albert's state of tension (line 76).

[70] Michael: ... so, there would be two questions. First, the action that is "pour out the four glasses of milk in the jugs as you want and compare the jugs." Um, "which is greater and why? [...]" And the other question is "When do the jars have the same amount of milk?" [...] These are the questions. I don't know if you want to say anything else [looking at Albert (Image 16)].

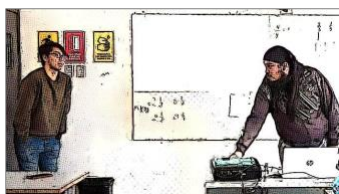


Image 16

[71] TE: Albert, what do you want to add?

[72] Albert: Nothing, professor. Haha [smiling while rocking side to side (Image 17)].



Image 17

[73] TE: Nothing? Are you sure?

[74] Albert: Yes. I'm sure.

[75] Kenneth: You are very shy, my friend.

[76] TE: What's up with Albert? He's strange today.

In response to the TE, Kenneth and Jane offered explanations for Albert's state of tension. On the one hand, Jane humorously claimed that her partner was nervous, trying to make him feel more relaxed. On the other hand, Kenneth offered Albert his opinion of the conflict that his classmate had with positioning himself as a teacher in the face of the demands in task T_0 (line 83). In particular, we observe that the phrase "*that creates a lot of conflict for you, friend*" (line 85) is an indication of Kenneth's condescendence towards Albert, which was supported by Jane (lines 84 and 86).

[79] Jane: He's nervous. He must need a little bit of water. Hahaha.

[83] Kenneth: I feel like you have something with basic math [directing his comment at Albert while he adopts a rigid body posture (Image 18)]. Not in the sense of what you understand, but rather...



Image 18

[84] Jane: [In] how you express it.

[85] Kenneth: Right, [in] how you teach a child, putting yourself in the place of the children and how to help them understand, in a simpler way, something you have firmly mastered. I feel like that creates a lot of conflict for you, friend.

[86] Jane: Yes! Definitely.



Albert reaffirmed what Kenneth said about his problems with elementary mathematical content during his university education (line 87). However, unlike Kenneth and Jane, the TE seemed to understand Albert's situation as a call to jointly overcome the conflict that this PMT had with these contents (line 88). In fact, we observe that the phrase “[that] *doesn't mean that is inaccessible to you*” is an indication of how the TE recognizes a *need* in Albert to establish a non-alienating relation with school mathematics, which favors his co-production with others as a teacher.

[87] Albert: From the first year of university and on, I handle everything [the mathematics content of the degree]. Everything below that is harder for me.

[88] TE: It's hard for you, sure. But the fact that [this content] is hard for you doesn't mean that is inaccessible to you [...]. The important thing is that we can understand the differences between us in terms of facing a specific challenge [task T_0] such as this one.

In an act of recognition of the TE's intervention in line 88, Kenneth assessed the need for Albert to overcome his conflict. However, he positioned himself from an apparent position of authority when evaluating his peer's situation (lines 83 and 85), adopting a sententious tone that reflected an attitude of superiority. In particular, by connecting the management of mathematics teaching with the mastery — or lack thereof — of the content, Kenneth reduced the conflict to a mere lack of knowledge, without considering the relation Albert had established with school mathematics. Furthermore, by suggesting that “*if you work harder on this*”, he not only individualized the conflict but also closed off the possibility of engaging in dialogue with Albert about his experience. In response to this, and concerned about the potential impact of Kenneth's intervention on Albert, the TE demonstrated empathy toward this PMT, understanding and making him see that his relation with elementary mathematics was causing him tension (line 92).

[91] Kenneth: I think that each person has their own specialty, a greater tendency towards a certain kind of managing mathematics teaching. Now, that you have a tendency towards one kind doesn't mean you can't improve in another. [...]. I think that if you work harder on this, eventually you will have a better understanding.

[92] TE: Sometimes not knowing is a good thing. And I know that not knowing creates tension for us.

4.3. Welcoming-indifference

As we showed above, the conversation surrounding Albert's state of tension in the activity left out the response to task T_0 that Michael shared. In fact, line 94 reflects the TE's intention to end the general discussion. However, Kenneth reacted to this attempt at closure (line 96), calling attention to Michael's response. This call from Kenneth —



answered by the TE on line 97— is an example of a responsible and committed action by the PMT towards his peers and the activity itself.

[94] TE: These are situations that are always going to come up. So don't worry, Albert. We wanted to talk about the task, and we ended up talking about Albert [addressing everyone].

[96] Kenneth: Can I make a quick comment about the task? [referring to Michael's solution].

[97] TE: What do you think about it?

The conversation regarding the response shared by Michael revolved around the relevance of the question “*which is greater and why?*” in the problem statement (see line 70), in relation to the purposes of the task T_0 —the establishing comparisons between fractions. In this conversation, Kenneth and the TE revealed different *forms of responsible relating* to Michael, characterized by the *welcoming* they had towards the proposal. On the one hand, Kenneth's questioning was accompanied by a superficial assessment of the problem's question, evidenced in the phrases “*I like the idea*” and “*it's nice*”, which he expressed without further depth (lines 98 and 102). On the other hand, lines 101 and 103 show the TE taking charge of managing the opinions of the PMTs (lines 99 and 100), not only sharing with Kenneth his questioning regarding the question, but also highlighting the strengths of the proposal shared by Michael.

[98] Kenneth: I like the idea, but I would be careful with the question, when it talks about “which is greater” in the part about the glasses. Instead of being greater, I would ask in which situation will the glass have more milk.

[99] TE: Do you have the questions written in your notebook? [Addressing Michael].

[100] Michael: Yes [handing the notebook to the TE].

[101] TE: I like that... Kenneth, I think that your peers want to highlight the idea that “you can pour it out any way you want” [meanwhile, Albert grabs his hair (Image 19)].



Image 19

[102] Kenneth: Right. It's nice.

[103] TE: There are the four glasses, each glass has $\frac{1}{4}$ of the liter of milk, you pour it out how you want. I like the decision that each group can do it any way they want. Now, “which is the



greatest and why?”, this is what Kenneth is critiquing, because this isn’t a question... [finishing his thought with a gesture of his right hand as if holding something superficial (Image 20)].



Image 20

Despite the differences in the forms of welcoming discussed, we observed that Kenneth and the TE worked in harmony to persuade Michael to reformulate the problem’s question with the intention of guaranteeing the establishment of the desired comparisons (lines 103, 104 and 105). After this joint effort, Michael responded responsibly by assuming the need to reformulate the question and propose an alternative question (line 106), which was well received by both subjects (lines 107 and 108). However, Albert's absence during this conversation can be interpreted as a form of relating to others, characterized by the evident *indifference* towards the shared response for which Michael took responsibility in the face of the others’ opinions. In fact, Image 19 not only shows Albert silent in the conversation, but also reveals through his gestures of grabbing and pulling his hair how the tension he was experiencing prevented him from being a conscious part of the activity at that moment.

[103] TE: ... and be careful because, as you are using glasses, [the students] can end up studying natural numbers. Then, they don’t use fractions.

[104] Michael: It’s just that there, though they use glasses, what they are really comparing are the jars. They only use the glasses to fill the jars.

[105] Kenneth: For that very reason. They aren’t necessarily going to associate the word “greater” with the quantity of milk. They could, but saying “which is greater?” is not the same as “which glass contains more milk or a greater part of the milk?”.

[106] Michael: In the context, it would be “Which jar contains more milk?”.

[107] Kenneth: Exactly.

[108] TE: Which jar contains the greatest part of a liter of milk.

4.4. How communitarian ethics emerged in the episode

In the previous sections, we described some features — expressed as dialectical opposites — which we relate to the elements of *commitment*, *care for others* and *responsibility* among the PMTs and the TE, that were revealed in our data. From these features, in the following subsections, we become aware of how communitarian ethics was emerging in

the episode from the dialectical appearance of each of its constituent elements in the forms of relating to others between these subjects.

4.4.1. Communitarian ethics from commitment

Regarding the relations that Albert *established* with the others, we highlight what happened with the TE and Michael in the search for answers to task T_0 . On the one hand, the data shows a particular form of relating that Albert establishes with the TE, which appears founded on a *relinquishing of his own voice* in the face of the teacher figure. We observe this, for example, when, having been invited by the TE to add his perspective to the group discussion, Albert declined to elaborate and closed the exchange with a minimal, evasive response (lines 71-74). Similarly, when Kenneth characterized Albert's relation to elementary mathematics as conflictive, Albert confirmed this characterization without contesting it or offering his own account of his existence (line 87). In both instances, rather than resisting or reframing the position assigned to him, Albert accepted it, suggesting a relation to the TE's — and, by extension, the group's — authority marked by non-contestation.

On the other hand, while Albert interacted with the TE, he also interacted with Michael, but in a different way. In this case, we observe an Albert who, being obedient to the TE regarding pairing up with a stranger, erected a protective barrier that kept him distanced from Michael and that determined a form of relating from *exclusion* with this PMT. This barrier is reflected in Albert's disinterest to working collectively with Michael, repeatedly ignoring his partner's attempts to bring him into the activity. From this narrative, relinquishment of voice and exclusion of the other are aspects that define the distancing that Albert kept with the others in the episode.

Regarding the relations that others *established* with Albert, we highlight the way in which the TE and Michael dealt with the distancing that Albert maintained from them in the episode. On the one hand, we notice in the data that the TE was *determined* to break the distance between Albert and Michael with the intention to materialize the collective work that he hoped to see in both (line 11). On the other hand, and in tune with the actions of the TE, Michael related to Albert in such a way that he was *interested* in his partner's possible contribution to solving task T_0 and *attentive* to providing help in the midst of the tense situation that both had been experiencing. Similarly, this narrative suggests that being determined, interested and attentive to others are aspects that define proximity as a feature of commitment of communitarian ethics, as seen in our data.



4.4.2. Communitarian ethics from the care for others

As we described in section 4.2., the tense situation that Albert experienced in the activity became the focus of the participants' attention during the general discussion, giving room to specific forms of relating from Kenneth, Jane and the TE towards Albert. These forms of relating emerged in response to Albert's refusal to contribute to Michael's explanation to the others. Albert's attitude in the activity made him vulnerable in the presence of the others, to the point of making his own presence influenced them in such a way that it became the center of the conversation.

Regarding the relations that Kenneth and Jane *established* with Albert, the data reveal acts of condescendence in which Kenneth positioned himself as entitled to diagnose Albert's difficulty, without engaging him as a subject with his own account of his existence. This condescending stance is particularly evident when Kenneth, rather than showing interest in listening to Albert's perspective —especially after the TE invited him to speak (line 76)—, intervened to assert that Albert's conflict stemmed from a lack of knowledge (lines 83 and 85). Jane, in turn, emphatically reinforced Kenneth's view with a “Yes! *Definitely*” (line 86). Kenneth's form of care thus stood out for its *lack of empathy* and recognition of Albert as a subject capable of engaging with the pedagogical demands of task T_0 . In fact, by stating that each one has “*their own specialty*” and recommending that Albert work more on his conflict to achieve “*better understanding*” (line 91), Kenneth revealed an understanding of the learning subject as a given entity, that is, that subject who “is considered to be the source of thought, knowledge, and meaning” (Radford, 2021, p. 71). Ultimately, this narrative reveals how treating Albert's difficulty as an inherent, fixed trait —rather than as an existence to be understood together— was a defining aspect of the condescending way in which Kenneth and Jane cared for Albert.

In opposition to the above, we highlight the way in which the TE dealt with Kenneth and Jane's condescendence way of acting to relate in a different way to Albert. In this regard, we observed in the data that the TE was willing *to listen* to Albert to understand not only his contribution to Michael's explanation, but also the origin of his state of tension in the activity with the intent of providing help (lines 71 and 76). Later, after Albert agreed that his conflict with task T_0 was due to a lack of knowledge (line 87) as Kenneth suggested, the TE intervened to try to break the condescendence relation between the PMTs at that moment. Specifically, we observed how the TE, propelled by a vision of the teacher as a being in perpetual transformation, *recognized* not only Albert's agentic capacities to interrupt the course of his becoming as a mathematics teacher, but also that this interruption was a matter that concerns everyone in terms of responsibility (line 88). From



our analysis, we found that listening and recognizing the other as a subject with the capacity to intervene in his reality and transform it are aspects that define the sensibility with which the TE related to Albert in the episode.

4.4.3. Communitarian ethics from responsibility

By sharing the response to task T_0 , Michael exposed himself to others with his body and his actions, becoming a presence that invited others to get involved in the general discussion of a response that he had taken charge of, in the face of Albert's *indifference*. The data show that this relation of indifference towards Michael was expressed through a *lack of interest* on the part of Albert in getting involved in the general discussion with his partner, revealing a certain *lack of consideration* towards Michael that forced the latter to face Kenneth and the TE's opinions on the shared response alone. According to our analysis, the lack of interest and lack of consideration expressed by Albert are aspects that define the indifference that led to this PMT to “abandon Michael — the stranger to him — to his fate” during the explanation of the response, revealing the lack of commitment that he had with his partner and with the activity in which both were participants.

As a way of coping with Albert's indifference, Kenneth and the TE worked in harmony to express their *welcoming* to the response shared by Michael. In principle, Kenneth set out to *appreciate* Michael's effort by asking the TE for the opportunity to position himself regarding the response in question (line 96). In his intervention, this PMT noted the need to achieve greater precision in the question of the problem. The TE took advantage of Kenneth's positioning to *highlight the strengths* of the PMTs' proposal, creating favorable conditions for a responsible relation between Kenneth and Michael that became closer as the conversation progressed. Michael accepted the welcoming that Kenneth and the TE expressed to him very well, to the point of agreeing with them on their opinions and being able to make the suggested adjustments to the problem's question. In this way, we find that appreciating effort and highlighting the strengths of the other's work are aspects that define Kenneth and the TE's ways of welcoming Michael; ways welcoming that although different at the time of expression, shared the same purpose.

5. Discussion and conclusions

In this article, we analyzed forms of relating to others between PMTs and the TE to explain how communitarian ethics emerged in an activity around the solution of task T_0 , which required students to take a stance on various situations characteristic of ordering fractions with a common denominator. Founded in the historical-dialectical materialist method, we



identified three dialectical opposites that describe some characteristic features of the constituent elements of communitarian ethics in the activity. Subsequently, we elaborated narratives in which we explained how communitarian ethics emerged from the dialectic appearance of its constituent elements. Although our interpretations do not necessarily apply to other contexts, the topics we discuss next could be of interest to other studies.

First, we highlight the vital role of the TE in the emergence of communitarian ethics. Aware that task T_0 demanded a non-trivial conceptual re-elaboration — transforming an equal-sharing problem into a fraction comparison problem — and of the elements that constitute this ethic, the TE intervened at key moments in the episode to suggest new forms of relating to others, *interrupting* those that offered opposition to his didactic project. For example, recognizing the distancing that Albert and Michael maintained was key when trying to encourage these PMTs to engage in the search for a shared response to task T_0 . Apparently, Albert and Michael came closer as a result of the TE's intervention. However, being obedient to the TE's request to work together with Michael and, at the same time, show indifference towards the collective work, makes us think that Albert's approach to his partner at that moment was not genuine. That is to say, the apparent change in the way Albert related to Michael after the TE's intervention could have been due to the links of subordination to the teacher's authority and not an expression of commitment to joint work. Results like this were reported by Radford (2023b) with Canadian primary school students who, embodying what the author calls an *ethics of exclusion*, did not listen to the classmates' voices during small-group resolution of a geometry problem, which, according to this author, creates an invisible yet significant “wall between *us* and *them*” (p. 59).

Second, we show that communitarian ethics emergence in the activity does not necessarily imply the harmonious coexistence of individuals tolerant of the diversity of social relations that can arise in the same activity. On the contrary, in our research, opposite features of responsibility, commitment and the care for others coexisted dialectically in the solution of task T_0 in ways that made possible the acknowledgement of the complex and changing nature of the ethics embodied by PMTs and the TE. In this regard, Radford and Lasprilla Herrera (2020) reported a pattern generalization activity in which Colombian primary school students embodied what the authors call a *closed ethic*, through which they offered resistance to the forms of collaboration that the teacher sought to promote. For these authors, this ethics limits the quality of interactions within the classroom. However, in light of our results, we can conclude that opposite features such as distancing, condescendence and indifference can be assumed as opportunities to promote and strengthen relations with others based on commitment, care for others, and responsibility.



Third, we emphasize that opposite features were brought to the activity by Albert, Kenneth, and Jane, without it necessarily being a decision of their own. In fact, conceiving these PMTs as subjectivities in perpetual becoming means assuming them as individuals who are deeply intertwined with their social, historical, and cultural contexts. This means that the dynamics within universities provide them with the raw material of what they are as potential mathematics teachers (Connell, 2022). Based on Bourdieu and Passeron's (1996) ideas, we argue that ethics other than the communitarian ethic foster particular forms of relating to others. Albert, Kenneth, and Jane appear to have found and practiced throughout their initial education course in a degree in mathematics teaching that continues to reproduce a society "in the benefit of some groups or classes and the reproduction of inequality" (Radford, 2021, p. 218). This is not about labeling the three PMTs as "bad peers" to Michael or among themselves, but about recognizing that their *agentic space* and sense of self are shaped by historical, political, and economic networks beyond them. This recognition resonates with the analysis of Montecino and Valero (2017), who argue that the mathematics teacher is caught in a "double bind": simultaneously a product of educational policies and an agent of the curriculum. The way in which Kenneth related to Albert — diagnosing his conflict as a "lack of knowledge" (lines 83-85) — can be interpreted as a manifestation, at the level of peer interaction, of this double bind operating at a formative level. Similarly, Montecino (2019) has shown how, in the Chilean context, the mathematics teacher is fabricated within a narrative that both exalts and degrades his or her professional competence, a tension that also seems to permeate the interactions observed in our episode.

Fourth, this intertwining of PMTs with their historical and cultural realities does not free them from experiencing certain states of *alienation* (Gutiérrez et al., 2022; Prieto-González et al., 2025), which we understand here as objective social relations that constrain PMTs' possibilities for engaging with others in the activity as an ethical event. In fact, in our data, the most representative case of the states of alienation that PMTs can experience in activities is found in Albert. His withdrawal from Michael, from the collective work on task T_0 , from the general discussion with the rest of the class, and ultimately from himself as a subject capable of facing the pedagogical demands of the task constituted an empirical manifestation of alienation. Although we agree with the fact that alienation is like "an endemic disease of the contemporary school" (Radford, 2017, p. 142) and that we must "progressively abandon those pedagogical models in which individuality and alienation prevail" (García-Ubaque & Vergel, 2022, p. 8), we see it as inconvenient to ignore this reality in the context of initial mathematics teacher education. On the contrary, we consider that



the states of alienation experienced by PMTs during activities can be consciously leveraged by the TE to promote communitarian ethics in these spaces.

To conclude, we consider that this research constitutes a contribution to studies that focus on the forms of human collaboration produced in contexts of initial mathematics teacher education. Focusing on communitarian ethics emergence, our findings invite us to conduct further research that explores the tensions that arise in the forms of relating between PMTs and TEs in these education contexts; contexts that, while are tied to a conception of market education, their actors seek new conditions for thinking and acting “on what they are doing and to embark in a critical appraisal of the relations between self and others that we find in society and that we enact willingly or unwillingly” (Radford, 2023a, p. 123).

Authorship contribution statement

Juan Luis Prieto-González: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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Adriana Lasprilla-Herrera: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization.

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Notes

1. Boylan (2016) identifies four dimensions of ethics in mathematics education: relational, societal/cultural, ecological and self. In this article, we focus on the relational dimension.
2. This author's didactic proposal has eight stages for elementary students to encounter fraction comparison, linking teaching equivalence with number ordering (Figure 1b).

