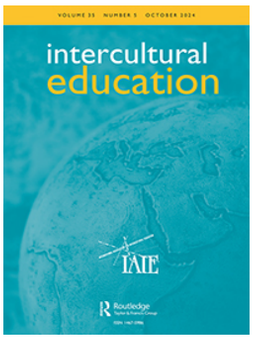

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Inclusive classrooms and assigning competence special issue on Complex Instruction

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Inclusive classrooms and assigning competence special issue on Complex Instruction

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ABSTRACT

This article captures a convergence of its authors' life experiences and existent data, made possible by Complex Instruction (CI). There is a pressing need to study and support the foundational practice of *assigning competence*, which requires that a teacher first recognise students' strengths and publicly name their academic contributions. However, a teacher cannot name what they have not noticed. Collectively, we wondered what we could learn from one teacher's fluid ability to effectively assign competence. We embraced CI principles to co-author our article.

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At its heart, this is a love story about mathematics, collegiality, and Complex Instruction (CI) (Cohen and Lotan 2014). The 2023 Hamburg CI Conference, attended by authors of this issue, revealed a pressing need to study and support the practice of assigning competence, a critical feature of both CI and equitable mathematics classrooms. When a teacher *assigns competence*, they publicly name students' intellectual strengths and how they support the group's learning in the moment. But assigning competence is limited by what passes through the filters of personal experiences and professional beliefs: teachers assign competence to what they notice and value. Even well-intentioned teachers who care about equitable education are challenged to enact these beliefs in their day-to-day teaching practices (Jilk 2016; Louie 2017).

Lisa and Jenny were both Ana's instructors, though they worked with her at different times and in different ways: Lisa was Ana's high school mathematics teacher, and Jenny taught the mathematics methods course for her CI-centred teacher preparation program. Accordingly, Lisa studied Ana's experiences as an immigrant and mathematics student at Railside[1] high school in Northern California (Jilk 2012; Jilk and Connell 2014; Nasir et al. 2014) and Jenny studied Ana's experiences as a new mathematics educator to sixth-grade students at City School in Northern California (Lo and Ruef

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2020; Ruef 2020, 2021; Ruef and Torres 2020). Noting that Ana excels in assigning competence, we all wondered how better understanding her expertise might support other teachers' practices. We re-examined data from Lisa's interviews with Ana and her parents about immigration, identity, and experiences at Railside and Jenny's observations of her 2015–16 sixth-grade classes at City School. To connect extant data with her practice as of Spring, 2024, Ana wrote reflections on her vision for teaching and the three of us interviewed each other about Ana's teaching practices. This paper provides unique opportunities to triangulate data sources and ongoing conversations to answer that question.

Ana's vision

We begin with Ana's vision of an equitable mathematics classroom because it provides a glimpse into her practice and features *key CI concepts for math education* that support assigning competence: (1) multidimensionality, (2) agency and authority, and (3) interdependence. Ana believes that:

> All students need someone who listens, cares, learns their story, recognizes their strengths, and has empathy instead of pity for them. Students need someone who teaches them how to collaborate with different people and perspectives, someone who believes in their capacity to do challenging work, problem solve and think critically. Students need someone who acknowledges their fears and anxieties around math and creates a safe space for them to make mistakes and be confused. Students need someone who believes in their intelligence and the power of their voice. Perhaps they need someone who creates an interdependent, collaborative and collectivist culture within the classroom. (Reflection, April 6, 2024)

Multidimensionality

Ana's vision embodies inclusive equitable mathematics classrooms (Louie 2017; Nasir et al. 2014; Ruef 2021). In Ana's *multidimensional* classes, many aspects of mathematical work are valued and learning is dynamic and interpersonal. There are many ways to be 'smart'. This contrasts with the limited ways a person is perceived as 'smart' in classes where teachers provide rote instruction provided to students who replicate preselected procedures: getting correct answers quickly and independently with few mistakes (Louie 2017; Ruef 2021).

Ana's vision of student engagement had its foundations in her student experiences at Railside, where 'the tasks themselves allow[ed] for interdependence because they were too much for one person to do alone'. Here, Ana references the *multiple dimensions* of mathematical activity necessary for sensemaking. Students are not expected to simply practice procedures and get correct answers. Instead, they argue, compare, justify and re-phrase, a few examples from an expansive set of practices for 'doing math'.

When mathematics is framed as multidimensional, students can leverage more resources to be successful. In fact, in multidimensional classrooms, students *must* access multiple abilities to support the group's work. When there are more ways to participate, more people can engage mathematically, and teachers have more opportunities to assign competence. Ana explained this concept brilliantly to her students:

> You see the same problem, but the way that we think about it is very different. Look at all those strategies! This is why it's important to listen to each other. To learn from each other. Just because someone understands it differently doesn't mean they're wrong. We learn from listening to how others understand things. (Interview, May 7, 2024)

In addition to connecting multiple strategies for solving problems, students also learn to make time for their colleagues' thoughts to develop, to listen, share, and debate ideas (Ruef 2020). When teachers assign competence to these learning practices, students may even adopt them and even learn to assign competence to their colleagues (Lo and Ruef 2020; Nasir et al. 2014). What researchers call *agency* and *authority* Ana renamed as *freedom* and *power*.

Agency and authority

To enact multidimensional mathematics, students must share agency and authority in sensemaking. We define *agency* as the sanction to act and *authority* as the ability to sanction an argument. In humanising and equitable mathematics classes, *actions* include publicly proposing, debating, and refining mathematical arguments; choosing and organising intellectual and physical tools; and freedom to care for one's body (Ruef 2021). Authority determines who (or what) decides what counts as a correct answer or coherent mathematical argument. This contrasts with the restrictions of the all-to-familiar, and problematic, teacher-centric modelling of procedures.

Ana's classes achieve equitable distributions of agency and authority because she believes that students are 'capable problem solvers' who need to see each other as 'resources', a reflection of how she was positioned in her birth family:

> Being the oldest of five and an immigrant to the US, a lot was expected of me. For example, I had to take care of my siblings by cooking for them and babysitting while my parents worked. I was expected to be an exemplary student and role model to my younger siblings, and I was expected to follow all rules at home and at school. (Reflection, April 6, 2024)

Ana experienced both agency and restriction as a child. Her parents relied on Ana to help manage the household and expected her to be a 'model immigrant' in school. Ana shared that 'It's so easy for students to hide, especially in mathematics. I know because I was a hider. A lot of times it's the girls of color, Black and Brown girls, who don't want to be seen'. Like many students, Ana feared being publicly wrong. This changed for Ana when she studied

mathematics at Railside. Ana's mathematics teachers assigned competence with high expectations for engagement. Students were expected to share their thinking and were provided support to do so:

> I had the experience of someone shining a spotlight on me. That's what I want to do for my students because somebody did that for me. I got out of my shell, at least in math class. I took that with me to college. I hung onto it tightly, I asked questions and participated. Because that's what I learned to do in math class. (Interview, May 7, 2024)

'Shining a spotlight' on someone's intellectual contributions is assigning competence. In the following example,[2] Adam has just explained how he found the area of an irregular shape by 'cutting' it into polygons. His classmates are asking questions to better understand his method:

Monserrat: 'Why did you cut it like that?'

Alexandra: 'Why did you change it from 44 to 48?'

Ana: 'Thanks for asking those questions so [Adam] can better explain and you can better understand his thinking'.

This example of assigning competence makes it clear that the questions positively affected everyone's learning by prompting further explanation from Adam. This positively impacted students' beliefs about Adam's mathematical competence and highlighted that everyone has important ideas, explanations can be strengthened, and we learn by making connections.

Ana consistently reminds her students: 'What you say is important. Can you share that with the class?' To support her students, Ana scaffolds risk-taking by providing students space to share initial ideas, polish those ideas with partners, and publicly present them to the class (Ruef 2020).

> I try to create opportunities where students feel powerful, recognize the power in their ideas and each other's ideas. *So I name it*. If someone participates, but I don't name the importance of their strategy, the students will see it as just another strategy. But if I name it, specifically why it matters, it has power. . . . I'm in a position of power. If I believe in the power of their ideas, other students will see the power and value in those ideas. (emphasis added, Interview, May 7, 2024)

'Naming it' is AC. In another class, Ana mitigated potential status differences when she valued Lauren's use of *Spanglish*, a mixture of Spanish and English, in explaining a solution. Ana translated the Spanish parts of Lauren's presentation to English to underscore their importance to the class discussion. When a unilingual student complained, she gently reminded them that using both languages was helpful, and sometimes necessary, because then everyone can share ideas fluidly, and we need everyone's ideas (Ruef 2020). Ana assigned competence to Lauren, in that moment, because her use of Spanglish contributed to an inclusive learning culture for the whole class. Lauren's participation

was legitimated by Ana's move, which potentially shifted how Lauren thought about herself and how others positioned her as a smart and capable mathematics person. It also broadened how other students might participate: endorsing Spanglish, with translations to English (the understood common language of instruction), meant more students could share their ideas with ease and confidence.

Reciprocal interdependence

Mathematics classrooms that use a CI framework are characterised by *reciprocal interdependence* (Cohen and Lotan 2014). There are more opportunities for teachers to assign competence when the work requires students to rely on each other, leveraging their diverse strengths while learning mathematics. Ana's vision for equitable classrooms includes teaching students to be responsible for one another's learning.

> It's that trusting interdependence: I'll take care of you, and I know you'll take care of me. That's the kind of culture I want to develop in the classroom. I want students to care for each other as humans, not just as mathematicians. I want them to trust each other because of our humanity. I want them to treat each other as siblings. (Interview, May 7, 2024)

At Railside, Ana participated in mathematics classrooms that featured reciprocal interdependence. She explained that 'being a student at Railside made a big difference' in her need for and passion to develop similar classroom cultures.

> The math classes at Railside provided a safe space and a community of learners where nobody was above each other. I remember having different roles. We needed each other in the group. I started to slowly see that my contributions to the group, what I had to say, were important. [My teammates] valued my input. (Interview, May 7, 2024)

Teachers must deliberately foster students' abilities and need to connect and build on each other's ideas. This is in contrast to underdeveloped group work in which a few students do the work and then 'help' their teammates. Reciprocal interdependence is supported by teachers AC, linking the multitude of competencies students demonstrate to learning opportunities.

A powerful example of this emerged from the teamwork of Flor, Brooklyn, Elena and Kazaly as they were presenting two methods for finding the area of an irregular trapezoid to the class. While the team was sharing their strategies, Ana noticed that Flor's diagram represented how her team found the area of the shape whereas Brooklyn offered a verbal description of their calculations. Ana asked Flor to label her diagram with Brooklyn's words so they could connect their ideas and strengthen their presentation. This co-constructed strategy communicated more about their team's thinking than either students could alone and improved learning opportunities for the whole class.

In this example, no one was positioned as wrong or knowing less than the others. No one corrected or fixed their mistakes. Ana leveraged this moment to show her students how to connect their different strengths and communicate their ideas in a way that was more mathematically rich and meaningful for everyone. While Ana leveraged the agency she had delegated to her students for making sense of this problem to show how Flor and Brooklyn could rely on each other's strengths, this move also provided Ana with an opportunity to assign competence to both Flor for accurately diagraming the problem in a way that communicated the team's strategy and to Brooklyn for her verbal representation of their strategy.

Conclusion

It can be difficult to create the kind of learning spaces Ana described for many reasons. Even when teachers position students with agency and authority, many young people choose not to act. *Hierarchies of competence*, which position some people as brighter and more capable than others on the basis of race, gender, and class, support inequitable participation (Cohen and Lotan 2014). Equitable classroom cultures must explicitly disrupt, rather than reproduce, harmful hierarchies. Doing things differently requires concerted and continuous effort.

Assigning competence can dismantle hierarchies of competence by reframing students' perceptions of themselves and their peers as mathematics learners. It does so by expanding students' understanding of what counts as important knowledge and practices, what it means to be 'smart' or 'good' at mathematics, thereby providing more opportunities for more students to see themselves as competent learners and participate reciprocally. After delegating agency and authority to students, teachers' work shifts to managing the status differences that naturally arise between students. Assigning competence can promote equitable participation by reframing what counts as academic competence (Reinholz et al. 2024).

As we work to empower more teachers to enact CI, opportunities for students and future teachers will grow. We honour Ana's work with continued hope and effort towards co-constructing more equitable and democratic classrooms for all preservice teachers and their students. As teacher educators, all three authors support preservice and inservice teachers in this ongoing work. This transformational work includes self-examining their identities as students and teachers, beliefs about mathematical competence, and developing the ability to notice and name multiple mathematical competencies (Jilk and Connell 2014; Ruef 2020). In this way, we enact core CI principles in our own practices and relationships.

Notes

1. All school names are pseudonyms used in related publications.
2. All student names are pseudonyms chosen by participant. All participants were sixth-grade students in Ana's 2015–16 mathematics classes.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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Lisa Jilk identifies as a White, middle-class, English-speaking, cis woman who grew up in a small town in the Midwest of the United States. She was a high school mathematics teacher and now works with mathematics teachers to create humane learning spaces in which everyone is valued. Dr. Jilk is also a Research Associate for Complex Instruction in Mathematics.

Jenny Ruef identifies as a cis-gendered, white, English-speaking, North American, and middle-class woman. She taught secondary mathematics for 20 years before completing her doctorate and transitioning to humanising teacher education. Dr. Ruef is an Associate Professor of Mathematics Education.

Ana Torres identifies as a Mexican, cis-gendered, middle-class woman who learned English as a second language in the United States. Her experience as a first-generation immigrant allows her to empathise with different student stories and help students find the power in their voice and ideas. Ms. Torres is a secondary-level mathematics teacher and instructional leader with twelve years of experience with Complex Instruction.

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