

## Examining the Role of Epistemic Empathy in Responsive Teaching

### Abstract

Studies have shown that teachers' responsiveness to students' epistemic work and experiences in the classroom is critical for promoting student agency, disciplinary engagement, and equitable participation. Yet what allows teachers to enact responsive teaching is less clear. We argue that "epistemic empathy"—the capacity for tuning into and appreciating students' cognitive and emotional experience in constructing, communicating, and critiquing knowledge—is a key driver for responsive teaching. Here, we take a first step to empirically examine whether and how preservice teachers' stances of epistemic empathy align with their enactment of responsive teaching practices. We end with implications for teacher education to cultivate epistemic empathy as a target for teacher learning.

### Proposal (Total words: 1990)

#### Objective

Reform visions in education call for engaging students in science and mathematics in ways that resonate with the disciplines' respective practices and discourses (Council of Chief State School Officers, 2010; National Research Council, 2012). Such visions entail that students not simply learn the canon but rather take active roles in sense-making about phenomena and contributing towards the construction and critique of knowledge (Engle & Conant, 2002; Ford, 2008). Accordingly, classrooms should be spaces where students draw on their varied meaning-making repertoires and everyday experiences as resources for exploring phenomena and solving problems. In such classrooms, teachers would then pay close attention to students' contributions, identify the productive beginnings in their reasoning (Hammer & van Zee, 2006), and responsively build on those beginnings to adapt instructional activities (Ball, 1993), what some scholars have referred to as *responsive teaching* (RT) (e.g., Hammer, Goldberg, Fargason; 2012; Robertson, Scherr, & Hammer, 2016).

Studies have shown that RT promotes students' intellectual agency, disciplinary engagement, and equitable participation in science and mathematics classrooms (e.g., Atkins & Frank, 2016; Ball & Bass, 2009; Colley & Windschitl, 2016; Radoff, Robertson, Fargason, & Goldberg, 2018). However, there is much to be learned about the dynamics underlying teachers' responsiveness and what facilitates their uptake of students' contributions in the classroom (Kang & Anderson, 2015). We argue that "epistemic empathy" is key for responding to and pursuing students' contributions during instruction. We define epistemic empathy as the capacity for tuning into and appreciating someone's cognitive and emotional experience within an epistemic activity—i.e., an activity aimed at the construction, communication, and critique of knowledge. In this study, we empirically examine whether and how preservice teachers' (PTs) stances of epistemic empathy relate to their enactment of responsive teaching in the classroom.

#### Perspective: Epistemic Empathy

While there is no clear consensus on the nature of empathy, most accounts describe it as about "tuning-into" someone's experience (Oxley, 2011) by decentering from one's ways of understanding (Donaldson, 1979) to project into another's situation and make sense of their thoughts, feelings, and actions. In education, empathy has been examined as part of teachers' views of their roles, especially in terms of cultivating caring relationships and fostering socio-

emotional learning in the classroom (Arghode, Yalvac, & Liew, 2013; Cassidy & Bates, 2005; McAllister & Irvine, 2002). Teachers note for example the importance of empathizing with their students' cultural experiences and connecting with students' communities (Dolby, 2012; Tettegah & Anderson, 2007; Warren, 2018). While these general portrayals of empathy are important for teaching, we argue that they may not account for how teachers come to empathize with learners' *epistemic* experiences (Authors, 2018) in ways that allow them to be responsive to students' epistemic work.

To be responsive to students' sense-making efforts in the classroom, teachers need to move beyond their familiar and comfortable ways of reasoning to take on the learners' perspectives and see how, *to the learners*, their ideas and questions make sense (Sikorski, 2016). Epistemic empathy, we propose, allows teachers to identify with and value learners' cognitive and emotional work of constructing, communicating, and critiquing knowledge, and as such is critical for supporting students' sense-making. It allows teachers to delve into the logic of their students' reasoning and emoting within science and math explorations, to understand the roots of their thinking, and to find ways to build on student contributions. Epistemic empathy, for instance, might compel teachers to pause and reason through, rather than immediately judge or dismiss, a student's seemingly convoluted idea or argument. While studies of responsive teaching hint at the value of epistemic empathy, researchers have not empirically examined how teachers' empathy may shape their responsiveness in the classroom. Here, we take a first step to address this gap by examining the potential association between preservice teachers (PTs)' epistemic empathy and their enactment of responsive instruction in a science and mathematics teacher preparation program.

## Methods

The qualitative exploratory study is part of a larger project aimed at cultivating PTs' epistemic empathy and their recognition and appreciation of students' diverse ways of thinking and feeling in science and mathematics. We draw on data from an early teacher education course where eleven PTs participated in a number of activities as part of their "Learning to Listen" (LtL) project. PTs read articles on student thinking, analyzed K–12 student work in videos and transcripts, engaged in science and mathematics activities as learners, interviewed others to elicit their thinking around science and mathematics questions, and participated in a field-placement in upper elementary and middle school science and mathematics classrooms.

For their LtL capstone activity, the main data source for this study, PTs enacted a "Learning to Listen" teach event where they engaged students in their field site in a mathematics or science launch question (Table 1). The events ranged from 26 minutes to 57 minutes, and averaged 37 minutes. These events were video-recorded and transcribed and PTs were provided access to their own videos for analysis. PTs also submitted a reflection on their enactment where they addressed specific prompts about their experiences (Table 1). Additionally, PTs submitted a final paper reflecting on their experiences throughout the course.

To analyze the videos for PTs' responsiveness to student work, we first created detailed analytical notes for each PT, describing the PT's elicitation, uptake, and engagement with students' contributions, and how they made space for student sense-making (Lau, 2010; Levin & Richards, 2011; Lineback, 2016). From these overviews, we conducted a thematic analysis (Braun & Clarke, 2006) of responsive teaching (RT) moves and identified eight moves (Table 2) that we then applied to the whole dataset with frequency counts (Table 3). From these counts, we identified five "profiles of responsiveness" (Table 4) that we discuss in the findings section.

To analyze teachers' stances of epistemic empathy (EE), we coded their written reflections on their LfL teach event as well as their final reflection papers drawing on a coding scheme that we adapted from prior work (Authors, 2018). The scheme comprised seven codes (Table 5) that depicted different ways in which teachers displayed a stance of epistemic empathy, in particular in terms of teachers' efforts to take the learners' perspective, delve into their reasoning, and appreciate their sense-making efforts. After coding the data, we created frequency counts for each PT (Table 6) from which we identified five "profiles of epistemic empathy" (Table 7).

Lastly we compared the profiles of responsiveness and profiles of epistemic empathy for each PT to examine whether any association might exist between PTs' responsive moves and empathic stances.

## **Findings**

### **Responsive Teaching**

The analysis of PTs' videos highlights distinct ways in which PTs' engaged in practices of responsive teaching. From the coded instances across all eight RT moves for each participant (Table 3), we identified a wide spectrum of RT enactment from which we parsed PTs' responsiveness along five profiles to depict a holistic sense of their enactment: High, Upper Mid, Mid, Lower Mid, Low (Table 4). We realize that such wholesale characterization does not capture the nuances and variabilities we see within each of the teaches, but it nonetheless serves our purposes in this particular study. A closer look at the profiles reveals that on the high end of the RT spectrum, participants not only had more instances of responsiveness but they also engaged in a wider range of RT practices as compared to the lowest end of the RT spectrum where participants' moves primarily clustered around one or two of the RT codes (see Table 3). For example, Javier's and Cesar's responsive moves were mostly centered around asking clarifying questions (Code 2) as compared to the higher end where Melissa, Amy, and Jamie engaged in all eight RT moves. Additionally, toward the lowest end of the spectrum, PTs tended to do little in terms of extending student ideas (Code 3), responding to students' affect and epistemological framing (Code 5), and synthesizing, tracking, and juxtaposing ideas (Code 7), suggesting that perhaps they were less closely attending to the substance of the discussion and to how students were experiencing and framing the activity.

### **Epistemic Empathy**

Our analysis of PT's epistemic empathy similarly shows that there was a wide spread in terms of the number of epistemic empathy instances along the seven EE codes across participants (Table 6). Based on our analysis and the total number of coded EE instances for each PT, we again identified a spectrum of five epistemic empathy profiles: High, Upper Mid, Mid, Lower Mid, Low (Table 7). In their written reflections, nearly all PTs noticed and appreciated students' epistemic affect (Code 1), identified merits in student ideas (Code 3), and expressed curiosity and interest in students' reasoning (Code 5) around the math and science launch questions. However, when comparing the lower end of the EE spectrum to its higher end, we once again noticed a much narrower range of EE moves at the lower end where most instances clustered around one or two codes, such as in the cases of Javier and Jett. There were also fewer instances of explaining and justifying the reasoning or actions of another (Code 2), anticipating ideas, feelings, and epistemic experiences (Code 6), and recognizing the importance of listening to and understanding students (Code 7), as compared to the higher end of the spectrum.

### **Examining Potential Association between RT and EE**

As illustrated in Table 7, in juxtaposing RT profiles and EE profiles, we found that there was a clear association between them. In other words, the different bands of the RT spectrum (high to low) corresponded with the different bands of the EE spectrum (high to low), at the exception of one PT, Jett. For Jett, while his profiles did not exactly match up, they were still close (Low RT and Low Mid EE). Figure 1 further illustrates the relationship between responsiveness and epistemic empathy by representing the RT and EE percentages for each participant in terms of the total number of coded instances for each construct. This finding suggests that participants' facility with enacting responsive teaching practices may be related to the ways in which they tune into and appreciate learners' emotional and cognitive experiences in an epistemic activity—i.e., to their epistemic empathy. While preliminary, we argue that this finding sheds light at an important yet overlooked aspect of responsiveness by suggesting empathy as a key factor in responsive teaching.

### **Significance**

This study is a preliminary attempt to explore how PTs' epistemic empathy may be associated with their enactment of responsive teaching in science and math classrooms. The findings serve as a proof of concept regarding this association: Indeed, we found that those PTs who displayed epistemic empathy more consistently were more adept at taking up and pursuing student contributions in their teaching. The results then suggest that supporting PTs to orient to students' ideas and feelings in an epistemic activity with care, investment, and curiosity could foster responsiveness in the classroom. These findings warrant further attention to the role of epistemic empathy as part of teachers' learning to become responsive practitioners.

In sum, this research contributes to teacher education in at least three ways: theoretically, by nominating “epistemic empathy” as part of the process of responsiveness; empirically, by providing empirical insights into the nature of the association between epistemic empathy and teachers' responsiveness; and pedagogically, by suggesting the need for learning experiences that cultivate epistemic empathy as a learning target for teachers in support of their enactment of responsive teaching. While the findings show a link between teachers' epistemic empathy and their responsiveness, it is important to acknowledge that this study was limited to one specific teach activity. Therefore, future studies should examine whether and how PTs' stances of epistemic empathy within their teacher education program may more broadly influence their future teaching in their own classrooms. In future work, we also aim to examine how epistemic empathy may be cultivated over time in light of educative experiences designed to promote PTs' learning to listen to students and to identify disciplinary roots in their work.

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*Table 1. Learning-to-Listen (LtL) Capstone math and science launch questions and reflection prompts*

LtL Launch Questions	Math-related Questions	When using a balance scale with equally spaced ‘pegs’ on each side, if there are 20 grams on peg number six on one side, how can we use only 10 grams to balance the other side of the scale?
		If we have a 10x10 square grid and all of the squares along the outside border are shaded, how can we determine the number of shaded squares along the border without counting one-by-one?
	Science-related Questions	If there is a string-and-washer pendulum swinging back-and-forth and we cut the string when the washer reaches its highest point, what path will the washer take when it is cut?
		If there is an object on a ramp, will it always move down the ramp? What causes an object to move on a ramp?
LtL Video Analysis and Reflection Prompts	Before you answer the questions, please watch the video from your Learning to Listen project closely. In your reflection paper, please address the following:	
	General questions about the experience:	
	<ol style="list-style-type: none"> <li>1. What was your Learning to Listen (LtL) question and what grade level were your students?</li> <li>2. Briefly describe any feelings or expectations you had about the LtL before teaching.</li> <li>3. What was rewarding about this LtL experience?</li> <li>4. What was challenging about the experience?</li> </ol>	
	Questions about student thinking:	
	<ol style="list-style-type: none"> <li>1. What are some interesting student ideas and student questions that came up?</li> <li>2. What were some ideas or questions that you wished you followed up on? And how might you have followed up on them if you had the chance?</li> <li>3. What did you learn about students? Please include in your response what you learned about the resources that they bring, the ways they can engage in science and math, and what they may need support with.</li> </ol>	
	Questions about yourself as a listener:	
	<ol style="list-style-type: none"> <li>1. What did you learn about yourself as a listener and facilitator and what aspects of your practice you hope to refine?</li> <li>2. What were some of the emotions you experienced in this process?</li> <li>3. If you were to do this again, what would you do differently?</li> </ol>	

Table 2. Descriptions of responsive teaching move codes with examples

Code Number	Code Description	Example(s) from PT LtL video data
1	Re-voicing student thinking	PT Caddie: So, what is friction? Student: Rubbing two things together. PT Caddie: You're saying how <b>two things rub together</b> , that would be friction?
2	Re-voicing with interpretation	Student: I [wrote] 'the ball will or won't go down because first it needs a force of motion' PT Amy: <b>It needs something to like push or pull it.</b> Student: Yeah
3	Seeking to clarify student thinking and eliciting ideas	Student: The washer goes like this <moves arm in a swinging motion> then you get some scissors, snip, and then <moves arm straight down> PT Lizbeth: <b>So you don't think that it could keep going up?</b> PT Cesar: Alright, did you figure out the answer? Student: 40 PT Cesar: <b>How'd you get 40?</b>
4	Pressing for explanation	Student: I did ten times four because there's four sides and then I did minus four because there's still corners. PT Melissa: <b>So why did you take out the corners?</b>
5	Extending and expanding the substance of student ideas	PT Edrina: So, now that [Student A] said the number 14, that's kind of interesting because <b>even though it's not on the scale, it can still be a possible answer.</b>
6	Responding to student affect and/or epistemological framing of the activity	PT Amy: [Student J], I saw you kind of raising your hand, did you have a different idea? Student J: <6 seconds elapse> ummm... crap. I forgot. PT Amy: <b>That's okay. We'll come back to you.</b> We'll come back to you.
7	Synthesizing, tracking, and juxtaposing (comparing and contrasting) ideas	PT Hadley: <b>So we think that when something's heavier, um, there's more force—the force could act more on it. Okay—well—that was <i>this</i> side of the room. [Student D] said that lighter would move faster.</b>



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8

Attending to the collective by asking students to respond to each other's ideas

Student: Can I say why it's not forty?

PT Melissa: Well, we'll get to that in just a second. **Does anyone have a different strategy for how they got to forty?** So, we're gonna look at forty. So, **we said four by ten. Is there any different strategy that anyone had?**

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Table 3. Number of coded instances of responsive teaching (RT) moves for each PT\*

PT	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Total Coded Instances
Melissa	3	1	7	6	1	6	4	15	43
Amy	2	4	15	1	6	4	4	6	42
Jamie	4	2	7	10	5	2	3	4	37
Lizbeth		3	16	1	2		7	8	37
Marisol	2		8		1	3	5	14	33
Hadley	2	3	11	1		1	5	10	33
Caddie	3		8	3	2	1	1	7	25
Edrina	1	2	5	3	3	1	1	7	23
Cesar	2		14	1				5	22
Jett	1	2	6	6			1	1	17
Javier	1		10			1		3	15

\*(Shaded boxes represent 0 instances)

*Table 4.* Profiles of PTs' responsiveness based on number of coded RT instances

<b>Profiles of Responsive Teaching</b>	<b>Preservice Teachers</b>	<b>Total Coded Instances of RT</b>
<b>High</b>	Melissa	<b>43</b>
	Amy	<b>42</b>
<b>Upper Mid</b>	Jamie	<b>37</b>
	Lizabeth	<b>37</b>
<b>Mid</b>	Marisol	<b>33</b>
	Hadley	<b>33</b>
<b>Low Mid</b>	Caddie	<b>25</b>
	Edrina	<b>23</b>
	Cesar	<b>22</b>
<b>Low</b>	Jett	<b>17</b>
	Javier	<b>15</b>

Table 5. Descriptions of epistemic empathy codes with examples (Author et al., 2018)

Code Number	Code Description	Example(s) from PT reflective data
1	<b>Noticing and appreciating learners' epistemic affect</b> by attending to the emotional and cognitive work that another is doing as a sense-maker	<p>They seemed happy to be able to share their ideas, and kids who normally put their heads down for the whole class were participating. – PT Amy</p> <p>I was worried that a student's idea wasn't being heard and that it would discourage them [from discussing] it more. – PT Cesar</p>
2	<b>Explaining and justifying the reasoning or actions of another</b> by noticing the substance of their ideas or the dynamics and patterns in their sensemaking	<p>Connecting real-world examples that the students have witnessed, or previously learned schemas, is a key part of a student's understanding of a lesson. This was clear in my "Learning to Listen project" when the students tied in the idea of friction to the ramp, and how the addition of butter would affect the object rolling down. – PT Caddie</p>
3	<b>Identifying merits in ideas</b> by attending to the productive potential of their sensemaking and reasoning rather than critiquing ideas for correctness or a lack of canonical alignment	<p>I think the most powerful thing that I learned about was how every idea is important and should be investigated for the full picture behind it, because what the student says may only be a tiny portion of the full idea they are trying to convey. I think it has been important to learn about how each idea can be delved into and productive beginnings can be found and built upon in every idea. – PT Melissa</p>
4	<b>Anticipating ideas, feelings, and epistemic experiences of others</b> by projecting into someone else's mind or ways of thinking	<p>I could ask them what it means to have two different answers. This could have brought a different discussion about how there might be some places where you could have different right answers. – PT Cesar</p>
5	<b>Expressing curiosity and interest in another's reasoning</b> by displaying an inquisitive stance toward their ideas, expressing interest in hearing and eliciting their reasoning, and demonstrating a willingness and desire	<p>I wished I could have followed up, without making [the student] feel like she was put on the spot. [I wonder] why she thought that friction would make it go faster. She said one time she thought that if the object and the ramp were smooth it would be easier to go</p>

	to pursue and co-construct lines of reasoning with others	down. So, I would have liked to follow up with how she got from there to friction [causing objects to] speed up. – PT Hadley
6	<b>Tapping into and channeling one's own personal experiences as a learner</b> in order to connect to someone else's intellectual and emotional experiences	I want to challenge the students and encourage them to continue being curious. In my experience in school, I would always want to question everything and my teachers would limit me and told me that whatever I was learning was all that I needed to know. I want to encourage the students for being so engaged and wanting to learn more about the topic. – PT Marisol
7	<b>Recognizing the importance of listening to, understanding, and taking seriously learners as capable sense-makers</b> by reflecting on learners' potential to engage in learning through responsive teaching	You can try to anticipate how students will think and how you'll respond, but ultimately you need to be responsive in the moment to student thinking. Meeting students where they are in terms of their understanding, and truly listening and being responsive to their reasoning and emotions is important. – PT Amy

Table 6. Number of coded instances of EE from PTs' written reflections\*

	<b>Code 1</b>	<b>Code 2</b>	<b>Code 3</b>	<b>Code 4</b>	<b>Code 5</b>	<b>Code 6</b>	<b>Code 7</b>	<b>Total Coded Instances of EE</b>
Melissa	1	2	7	2	6	2		<b>20</b>
Amy	5	2		3	5		2	<b>17</b>
Lizabeth	5	3	3		2		2	<b>15</b>
Jamie	4	1	2	1	4		2	<b>14</b>
Marisol	1	1	3	1	2	3		<b>11</b>
Hadley	1		3	1	4	1		<b>10</b>
Caddie	1	3	1		2			<b>7</b>
Edrina		1	1	4	1			<b>7</b>
Cesar	2		1	1	3	1		<b>8</b>
Jett	4		1			2		<b>7</b>
Javier	3							<b>3</b>

\*(Shaded boxes represent 0 instances)

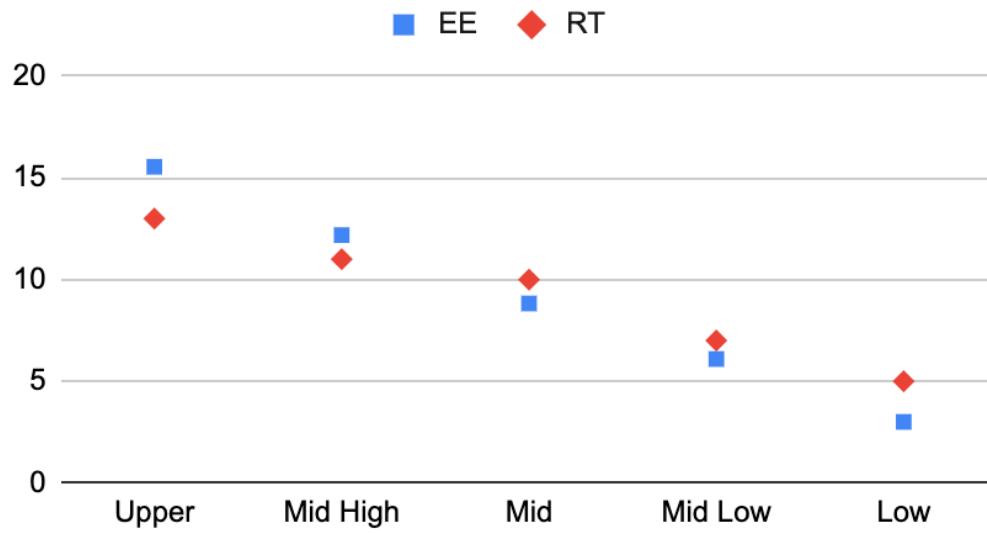
*Table 7.* Profiles of PTs' epistemic empathy based on number of coded EE instances

<b>Profiles of Epistemic Empathy</b>	<b>Preservice Teachers</b>	<b>Total Coded Instances of EE</b>
<b>High</b>	Melissa	<b>20</b>
	Amy	<b>17</b>
<b>Upper Mid</b>	Lizbeth	<b>15</b>
	Jamie	<b>14</b>
<b>Mid</b>	Marisol	<b>11</b>
	Hadley	<b>10</b>
<b>Low Mid</b>	Caddie	<b>7</b>
	Edrina	<b>7</b>
	Cesar	<b>8</b>
	Jett	<b>7</b>
<b>Low</b>	Javier	<b>3</b>

*Table 8.* Association between EE and RT profiles for each PT

Profiles of Association between EE and RT	Preservice Teacher	<b>Total Coded Instances of EE</b>	<b>Total Coded Instances of RT</b>
<b>High</b>	Melissa	20	43
	Amy	17	42
<b>Upper Mid</b>	Lizbeth	15	37
	Jamie	14	37
<b>Mid</b>	Marisol	11	33
	Hadley	10	33
<b>Low Mid</b>	Caddie	7	25
	Edrina	7	23
	Cesar	8	22
<b>Low Mid // Low (Boundary case)</b>	Jett	7	17
<b>Low</b>	Javier	3	15





*Figure 1.* Visualization of the association between epistemic empathy (EE) and responsive teaching (RT). The y-axis represents the overall percentage of the average EE and RT instances for each profile with respect to the total number of coded instances across all the data for EE and RT respectively.