

Rethinking Failure as a Site for Epistemic Empathy for Educators

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Abstract: While failure is often framed as a learner-centered experience, less is known about how educators emotionally and cognitively experience failure in the context of teaching—particularly in non-formal environments like museums. In this study, we examine how museum educators make sense of failure during STEM-focused activities and how these reflections contribute to the development of *epistemic empathy*, the capacity to understand and value others' intellectual and emotional experiences in knowledge construction. Drawing on video-based recordings of reflective professional development sessions across 13 U.S. museums, we employed a naturalistic inquiry approach to analyze how 76 educators discussed moments of failure involving both themselves and learners. Findings highlight how educators engaged in perspective-taking, surfaced shared vulnerabilities, and reframed failure through emotional and relational lenses. We suggest that moments of failure provide fertile ground for epistemic empathy, creating conditions for reflection and perspective-taking. In doing so, we reconceptualize epistemic empathy as a professional disposition that encompasses not only learners but also peers, caregivers, and oneself.

Keywords: emotions, epistemic empathy, failure, museum educators, professional development, video-based reflection

1. Introduction

Teaching is inherently emotional work. It involves sustained social interaction, complex decision-making, and engagement with learners—factors that make teachers' emotions deeply intertwined with their cognition, motivation, and pedagogical choices (Antilla et al., 2016). Emotions are not just individual reactions, but socially constructed and personally enacted responses to goals, standards, and social exchanges (Fu & Clarke, 2023; Schutz et al., 2006).

These emotional experiences—whether in moments of perceived success or failure—can shape how teachers approach their practice, interact with students, and navigate challenges. Moreover, research has shown that students are often attuned to and affected by teachers’ emotional states (Keller & Becker, 2021), further underscoring the need to understand educators’ emotional experiences.

Empathy, in particular, has often been identified as central to this emotional dimension of teaching, especially in efforts to humanize educational spaces and foster inclusive, caring relationships (e.g., McGowen et al., 2021; Warren, 2018). Traditionally, this work has focused on understanding and responding to students’ emotions and social identities. Yet recent work points to the importance of a more specific form: epistemic empathy, or the capacity to identify with and value others’ intellectual *and* emotional experiences in the process of constructing and critiquing knowledge (Jaber et al., 2018). In this study, we expand upon this by situating epistemic empathy within moments of failure, an emotional and cognitive experience through which educators may take on the perspective of a learner through attending, interpreting, and responding to learners within such moments (Babij et al., 2020; Nelson et al., 2018; Simpson et al., 2024). More specifically, we ask: How do non-formal educators reflect upon and make sense of failure in STEM-focused activities in ways that illuminate the role of epistemic empathy in professional reflection?

Non-formal learning environments, such as museums, provide unique conditions for examining these dynamics, as failure is often described for learners as “part of the process,” a step toward meeting some goal or expectation within a low-stakes environment (Simpson et al., 2025a). However, this scholarship further highlighted how the historical, cultural, and societal narratives around success and failure can lead museum educators to conceal their own

professional failures and avoid using the word *failure* during STEM-related activities. This tension between valuing failure for learners and avoiding it professionally underscores the need for spaces in which educators can safely examine and reframe their own experiences of failure.

Reflective, video-based professional development offers one such space (Hollingsworth & Clarke, 2017). By revisiting moments of practice collectively, educators can share perspectives, attune to the emotional and cognitive dimensions of their work, and explore how failure is experienced and interpreted (Amador et al., 2023). Through our study, we argue that reflective, video-based professional development offers a powerful context for surfacing and examining epistemic empathy, particularly in relation to moments of failure. Our analysis demonstrates that epistemic empathy also involves peer-to-peer perspective-taking and self-empathy, not just understanding learners' intellectual and emotional experiences. This extends Jaber's (2018) conception of epistemic empathy by showing that epistemic empathy in non-formal settings is not limited to teacher–student interactions, but can also involve peers, caregivers, and even oneself. Moreover, we suggest that moments of failure provide especially fertile ground for epistemic empathy, as they surface emotions and vulnerabilities that require reflection and perspective-taking. In this way, epistemic empathy may be understood not only as a stance toward learners, but as a broader professional disposition that can be cultivated through reflective practices around failure moments.

2. Theoretical Grounding

Epistemic empathy is an emerging construct that describes the ability of educators to “step into someone else's sense-making experience and see the merits in their reasoning and emotions” (Jaber et al., 2018, p. 14). The idea of epistemic empathy is a fairly recent addition to discourses within social and moral epistemology (Horsthemke, 2015; Oxley, 2011). Unlike affective empathy (feeling what another feels) or cognitive empathy (understanding another's

perspective), epistemic empathy bridges both domains in the context of learning, including the potential to learn from failure experiences (DeLiema et al., 2024; Laksov & McGrath, 2020). It requires decentering from one's own ways of knowing to better understand how a learner's ideas and reasoning make sense from their perspective (Jaber, 2021).

As Horsthemke (2015) argued, empathic understanding in educational contexts is distinct from empathy across other social differences: our attempts to understand children, for instance, differ from attempts to understand other groups, as we were all once children. Within teacher education, Jaber et al. (2018) identified several ways pre-service teachers exhibit epistemic empathy in moments of instructional analysis or reflection. Examples included: (a) Noticing epistemic affect, such as a student's frustration or excitement during sensemaking; (b) Expressing curiosity about and interest in how students are reasoning; and (c) Understanding the teacher's perspective by interpreting their instructional moves rather than judging them. While Horsthemke (2015) cautions that empathy is not a prerequisite for competent teaching, its absence raises important questions about educators' professional and moral obligations. In contexts that center human meaning-making, epistemic empathy may serve as a vital ethical orientation that guides how educators respond to others' intellectual and emotional struggles.

Relatedly, social perspective-taking can be understood as a precursor to or component of epistemic empathy. When educators engage in reflective dialogue, they must grapple with both emic (insider) and etic (outsider) perspectives—understanding the experiences of young learners and colleagues while also situating those experiences within broader sociocultural contexts (Kahn & Zeidler, 2019; Pike, 1954). Such dialogic encounters demand more than empathy—they require educators to suspend certainty, embrace ambiguity, and revise assumptions through discourse (Cohen et al., 2023; Gehlbach, 2011). Epistemic empathy thus entails both the act of

taking another's perspective and the disposition to value that perspective as epistemically meaningful (Jaber et al., 2018).

Although empathy is often framed as a moral and professional virtue, scholars have raised concerns about its limitations and potential costs. Critics argue that empathy is neither necessary nor sufficient for moral or epistemic understanding and can at times distort judgment (Spencer & Broome, 2023), lead to biased and harmful decisions (Prinz, 2011), as well as burnout and exhaustion (Bloom, 2017). Within educational contexts, Horsthemke (2015) cautions educators that neither too little nor too much empathy is desirable, as both extremes can compromise professional judgment. Other scholars have noted that empathy can be cognitively taxing and often avoided due to perceived inefficacy or emotional effort (Cameron et al., 2019), and may even contribute to compassion fatigue (Figley, 2002), which may pose a quandary for fields in which empathy is perceived as a necessary part of their job.

In epistemic terms, Jäger and Malfatti (2021) argue that efforts to inhabit another's epistemic position are inherently constrained by cognitive distance and lived experience; reminding us that some perspectives may remain partially or even fundamentally inaccessible. Extending this critique, D'Souza (2024) challenges empathy's centrality altogether, suggesting that empathy, and love, can distract from the structural work of justice. Instead, D'Souza calls for forms of solidarity grounded not in the ability to understand or translate others' experiences, but in the ethical commitment to care for others simply as fellow beings. Together, these perspectives complicate idealized notions of empathy, thus positioning epistemic empathy as an imperfect and contextually bounded stance, one that should be situated within broader commitments to justice, care, and professional responsibility.

3. Relevant literature

We situate this study along two distinct lines of research – epistemic empathy and failure as an epistemic emotion - in both formal (e.g., school) and non-formal (e.g., museums) STEM learning contexts. Research on epistemic empathy examines how individuals recognize and value others' intellectual and emotional sense-making (Jaber et al., 2018), while scholarship on failure explores how cognitive and affective responses to failure shape knowledge-building processes (e.g., DeLiema et al., 2024). Together, these two literature bases illuminate the dynamic interplay between emotion and cognition may intertwine, providing a foundation for examining how epistemic empathy emerges through educators' professional reflections within STEM-focused failure moments.

3.1 Epistemic empathy

Jaber (2021) underscores that teachers' affective development is integral to learning to teach in epistemically empathic ways. In one case study, a preservice teacher's growing awareness of his own emotional relationship with science enabled him to recognize and affirm similar experiences in his students. This alignment between the teacher's and students' epistemic affect helped shift his instructional stance toward one that valued students' sensemaking—even when it was tentative or incomplete. When teachers attend to both the reasoning and emotional dimensions of students' engagement, they are better positioned to notice the generative potential in students' ideas (Jaber et al., 2018). Such responsiveness resists deficit interpretations and instead treats students' diverse experiences and ways of reasoning as intellectual resources (Rosebery et al., 2016; Jaber et al., 2024). In this way, epistemic empathy becomes a stance through which teachers can reinterpret failure moments.

While some teachers may bring a natural sensitivity to students' thinking, epistemic empathy is not innate. Whether in science (Jaber et al., 2022), engineering (Portsmore et al.,

2020), or mathematics (Ebby et al., 2022), research suggests it can be developed through structured experiences that position teachers as learners. For example, when teachers engage in scientific or engineering inquiry themselves, they experience confusion, struggle, recognition, and insight—providing an embodied understanding of what it feels like to be a learner (Jaber et al., 2022; Portsmouth et al., 2020). Ebby et al. (2022), for example, found that engaging teacher leaders as learners in problem-solving communities helped teachers develop epistemic empathy for learners, which in turn shaped how they envisioned equitable math instruction. Participatory activities like the “student hat” (Lowell, 2024) further promote this capacity as teachers engage in learning activities while role-playing as students. Through the student hat approach, Mr. Emerson, for instance, deepened his empathy by recognizing his own anxiety about content uncertainty—mirroring the very struggles he anticipated his students would face in navigating scientific sensemaking (Lowell, 2024). In general, these experiences give rise to empathetic insight: teachers report better understanding the affective challenges their students face and how their reasoning may emerge from different ways of knowing.

Participatory practices such as engaging in pedagogical reflection (Jaber, 2021) or participating in video-based reflections (Jaber et al., 2018) have also been shown to foster epistemic empathy (Jaber et al., 2024). These settings support teachers in reconsidering assumptions, grappling with their own affective responses, and cultivating interpretive stances toward student reasoning. For example, as described by Jaber et al. (2018), preservice teachers became more willing to step outside of their own thinking and try to understand how students were making sense of things over the course of a semester. As the semester went on, the teachers became more attuned to small details in students’ thinking and emotions, and learned how to

utilize pre-existing resources for epistemic empathy more purposefully—especially when analyzing how students were exploring ideas.

3.2. Failure as an emotional and epistemic experience

Failure is a complex emotional experience that evokes a range of responses, from inadequacies and disappointment to excitement and growth (Lutovac & Kaasila, 2020; Pan et al., 2020; Phoenix & Haddad, 2025; Tulis & Ainley, 2011). Research highlights that individuals' reactions to failure, including learners and educators, are shaped by their prior experiences, personal beliefs, cultural factors, and the social context in which failure occurs (e.g., Peterson et al., 2025; Simpson et al., 2018; Zhang & Cross, 2011). For example, museum educators acknowledge failure as an invisible hand of historical, cultural, and societal structures that quietly shape how failure is understood and enacted in their professional practice (Simpson et al., 2025b). These same forces inform the implicit biases educators bring to their work—the unspoken expectations and scaffolds shaped by first impressions, often drawn from visual cues, that influence how they engage with students.

Studies also suggest that failure can be a fundamental epistemic experience for learning; shifting the narrative around failure—from a source of emotional distress to a developmental experience—which can have profound implications for motivation, resiliency, self-efficacy, and long-term success (Babij et al., 2020; Johnson et al., 2017; Nelson et al., 2018; Tulis & Ainley, 2011). More specifically, with opportunities for guided reflection, individuals may extract meaningful lessons from failure, transforming challenges into valuable learning experiences that promote growth and resilience (DeLiema, 2017; Laksov & McGrath, 2020; Simpson et al., 2025a). For example, when educators provide structured opportunities for reflection—such as prompting students to analyze what went wrong, encouraging collaborative problem-solving, engaging in argumentation, or offering targeted feedback—failure becomes an essential part of

the learning process (DeLiema et al., 2024). In addition, epistemic opportunities may be facilitated by observing others' solutions when experiencing failure, particularly when all components of the correct solution are demonstrated (Braas et al., 2025). In such instances, individuals activate their prior knowledge, consider how they might solve the problem, and/or recognize gaps in their own understanding.

Such epistemic experiences may also extend to educators' encounters with failure. Research on pre-service teachers suggests that experiences of failure play a defining role in shaping educators' professional identities and their implicit theories of teaching and learning (Lutovac & Flores, 2022). While some educators may describe failure as unsettling or self-defining (Phoenix & Haddad, 2022), others may frame it as a necessary signal for growth and self-improvement (Lutovac & Kaasila, 2022). These experiences carry relational weight: through their own encounters with failure, educators cultivate empathy for students' struggles, and in recognizing the dissonance between their values and enacted practices, they engage in epistemic and pedagogical growth (Lutovac, 2020; Simpson et al., 2025a). As Lutovac (2020) noted, teachers who have grappled with failure often envision themselves as more attuned to students' learning challenges. Taken together, these studies suggest that educators' experiences with failure are not merely individual or emotional episodes but epistemic encounters that shape how they come to know, teach, and relate to others within their professional contexts.

While failure can serve as an epistemic experience, it does not inherently do so. Research across psychology and education demonstrates that failure is often experienced as an emotionally charged and ego-threatening event that inhibits, rather than promotes, learning (Carlson & Fishbach, 2024; Eskreis-Winkler & Fishbach, 2019, 2022). Carlson and Fishbach (2024) found that the sting of shame and humiliation accompanying failure can lead individuals to lower their

aspirations or disengage entirely from valued pursuits. Similarly, Eskreis-Winkler and Fishbach (2019) observed that participants learned less from failure feedback than from success feedback, even when both contained equivalent information, because failure provoked self-protective withdrawal. Emotional barriers such as shame and ego threat also make the cognitive work of learning from failure—reasoning through what went wrong—more difficult, leading people to disengage rather than reflect (Eskreis-Winkler & Fishbach, 2022). These findings suggest that epistemic engagement with failure depends not simply on experience itself but on the conditions that make it safe to attend to and learn from failure. For educators, these same emotional and cognitive barriers may surface when confronting their own instructional failures, particularly within professional cultures that may value competence and control. When failure threatens self-concept or public perception, opportunities for reflection and learning may be eclipsed by avoidance or self-protection, limiting the potential for epistemic growth.

3.3 Summary

The literature on epistemic empathy and failure highlights the productive entanglement of emotion and cognition in learning and teaching. Yet, despite growing attention to the affective dimensions of teachers' epistemic practices, several conceptual and empirical gaps remain. Theoretically, epistemic empathy is still an emerging construct, and broadly speaking, scholars debate its moral necessity and epistemic limits (Jäger & Malfatti, 2021; D'Souza, 2024). Empirically, most studies of epistemic empathy focus on classroom-based responsiveness to students (e.g., Jaber, 2021), with less attention on how educators reflect on their own epistemic and affective experiences—particularly experiences of failure—as a site of professional reflection. Similarly, while research on failure underscores its potential as a catalyst for growth (e.g., Laksov & McGrath, 2020), it also reveals the fragile conditions under which such growth occurs (e.g., Eskreis-Winkler & Fishbach, 2022). Finally, research has yet to fully integrate these

two strands to consider how educators' reflections on failure might activate epistemic empathy as a professional stance. By investigating how non-formal museum educators make sense of failure in STEM-focused contexts, this study extends prior work by situating epistemic empathy within the emotional and institutional complexities of professional reflection.

4. Methods

This research employed a naturalistic inquiry approach, which emphasizes studying phenomena in their natural settings rather than through controlled experiments (Lincoln & Guba, 1985). It prioritizes understanding participants' perspectives, interactions, and lived experiences without researcher-imposed constraints. In this study, the natural setting included video-recorded interactions among museum educators reflecting upon their interactions with visitors when experiencing failure within a STEM-focused activity. These reflections occurred within workshops designed and facilitated by the museum organizations themselves, without researcher intervention or standardization, thereby preserving the local authenticity of educators' perspectives and decision making process (Laurier & Philo, 2006). Guba and Lincoln (1982) presented five axioms that distinguishes naturalistic inquiry from other paradigms, and guided our approach to this study.

1. Reality is multiple and subjective, requiring a holistic approach to study. Rather than seeking prediction and control, it prioritizes deep, contextual understanding (*verstehen*).
2. The researcher and the subject influence each other through their interactions, a dynamic that is particularly evident when studying human participants.
3. Phenomena are bounded by time not context. The goal is not generalizability.
4. An action results from a network of interacting factors, events, and processes, making it difficult to pinpoint a single explanation. Researchers can only infer plausible connections and underlying patterns that shape it within a specific context.

5. Inquiry is value bound.

4.1. Professional development context

This study is situated within a reflective video-based professional development (PD) cycle to support museums educators to productively attend, interpret, and respond to visitors' experiences with failure while engaged in STEM focused activities. More specifically, in collaboration with our partnering museums, we co-designed a professional development cycle that adapted elements of established mathematics-focused models (the Mathematics Leadership Preparation model and the Problem-Solving Cycle; Borko et al., 2015) for non-formal STEM learning environments (Simpson et al., 2025c). Museum organizations had agency in how to structure the workshop; consistent with a naturalistic inquiry approach that emphasizes context-dependent meaning-making. A few museums, for example, focused on an effective and an ineffective failure clip as defined and selected by each educator. As another example, some museums directed their educators to focus on educator, visitor, and/or environmental failures. One last example, educators focused on evidence around a failure moment, as well as how the evidence made them feel, react, think, and/or wonder. The STEM-focused activity also differed across museums from designing and prototyping their own roller coasters to building something that hovers in a wind column to designing a habit for astronauts to live on Mars. These variations across sites were not researcher-driven but emerged from local organizational priorities, underscoring the situated and contextually bounded nature of the professional development.

More broadly, the professional development cycle consisted of four interconnected workshops designed to support educators' pedagogical practice around youths' experiences of failure (see Figure 1), while also framed within a sociocultural view of learning as inherently social, mediated, and activity-based (Johnson & Golombek, 2011; Vygotsky, 1978). In Workshop 1 (Engage), educators first took part in the STEM activity as learners, both to

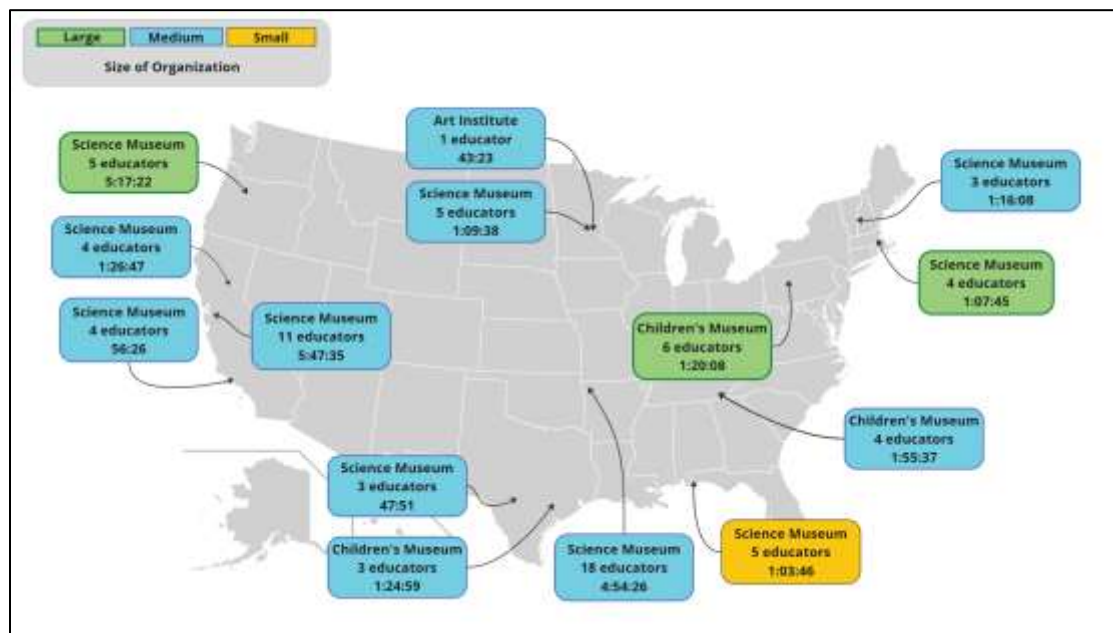
anticipate likely points of failure and to develop empathy for youth participants. In Workshop 2 (Plan), they identified pedagogical strategies for productively engaging with those failure moments in practice. For Workshops 3 and 4 (Analyze and Reflect & Improve), educators shared 1-2 short videos, approximately 3-5 minutes in length, with their colleagues with the goal of analyzing, reflecting, and improving upon their pedagogical approaches to visitors' failure.

Professional Development Cycle

4.2. Participating museums and informal educators

Figure 2

Map of Museum Organizations



Note. Size was self-reported or matched based on income reported through annual reports or IMLS data (Frehill & Pelczar, 2018), where annual income was <\$2.5 million for small, \$2.5MM-\$5MM for medium, >\$5 million for large.

As noted in Figure 2, 76 museum educators engaged in the reflective video-based workshop. Of the participants that self-reported ($n = 60$, 80%), the majority of the educators identified as White ($n = 39$, 65%), eight (13%) as Asian/Pacific Islander, six (10%) as more than one Race, five (8%) as Hispanic/LatinX, one (2%) as African American, and one (2%) as American Indian. Additionally, seventy-six percent ($n = 58$) of educators that reported their gender identity identified as female ($n = 36$, 62%), 12 (21%) as male, and 10 (17%) as non-binary. The educators had a range of experience as a museum educator with the majority having four or less years of experience ($n = 40$, 67%), 13 (22%) having between 5-8 years of experience, and seven (11%) having eight or more years of experience.

4.3. Data source

The data source for this study was video-recordings of the reflective video-based workshops by a member of the PD team at each organization and shared through the Sibme app (2023). Video as a medium uniquely captured both the emotive and cognitive in a distinct temporal space that made naturalistic observations of relational events possible. The workshops were either conducted virtually or in-person, in which a recording device was set up to capture the room. The time of the video recordings ranged from 9 minutes, 18 seconds to approximately 2 hours, 3 minutes, with the total amount of time equaling about 27 hours, 12 minutes. Figure 1 includes the total amount of time in hours:minutes:seconds per organization. Variation in time is due to a couple of factors – number of educators, number of PD cycles, and the inclusion of one-on-one reflections.

4.4. Data analysis

Guided by the principles of naturalistic inquiry, our analytical process was designed to capture the complex, subjective, and context-bound nature of participants' interactions within the reflective video-based workshops. While our approach was inductive and grounded in naturalistic inquiry, we were sensitized by the construct of epistemic empathy (Jaber et al., 2018), which directed our attention to how educators engaged with both the cognitive and emotional dimensions of sensemaking during moments of failure. First, two members of the research team – Author A and Author J – analyzed the videos by noting and transcribing moments in which educators discussed emotional experiences and perspective-taking within the reflective video-based professional development, as well as analytical memos that documented our individual emergent insights, questions, and meanings while closely engaging with the data (Birks et al., 2008; Saldaña, 2016). This memoing process was not only a tool for analysis but also a practice of *verstehen*—seeking a deep, contextual understanding of participants'

perspectives (Axiom 1). In doing so, we remained attuned to both cognitive and emotional dimensions of participants' reflections, in line with our interest in epistemic empathy as a way of understanding others' perspective-taking and sensemaking experiences.

Throughout this process, two researchers met once a week to discuss our ongoing memoing process collaboratively, using these conversations to surface areas of convergence and divergence in our interpretations. The goal was not to reach a consensus, nor develop and assign a code, but rather to examine the same data set through the lens of our diverse cultural backgrounds, educational experiences, and individual research perspectives (i.e., investigator triangulation; Denzin, 1978). This dialogic process allowed us to explore alternative explanations, interrogate our assumptions, and remain open to the continuous development of meaning from the data itself (Axiom 2). As an example, the following transcribed statement led to a decision to include moments in which participants provided self-compassion to one another or themselves, moments of forgiveness during instances of identified failure moments: "... I cannot blame anybody who's in my shoes. Because I know... we [educators and caregivers] mess up regularly." Such instances resonated with our sensitizing interest in epistemic empathy, as they reflected educators' efforts to understand and value both their own and others' cognitive and emotional experiences in moments of failure.

Next, one member of the team, Author A, undertook the task of identifying patterns, recurring ideas, and conceptual groupings across the data, using the memo content and raw data as a foundation. This initial thematic structuring was developed inductively, with close attention to context and participants perspectives (Axiom 3). For instance, transcripts and memos in which participant's identified the emotion of a child were grouped together (e.g., "Also, at every moment she expressed frustration, you had a response that was supportive."). The patterns were

considered as plausible interpretations—not singular truths, but patterns shaped by a collection of interacting conditions, influences, and ideas (Axiom 4).

The preliminary themes were then shared with a third researcher, Author L, who engaged in a process of review and refinement. This step involved revisiting the data with the preliminary patterns in mind, questioning interpretations, offering alternative framings, and ensuring the patterns remained grounded in the participants' perspectives and settings. For example, in considering the pattern regarding the acknowledgement and identification of children, Author L noted how participants went beyond simply naming the emotion to discussing how they managed or dealt with emotions during failure moments. Author L further probed into the importance of how they noticed, whether through learners' verbal and/or non-verbal actions and behaviors. This expanded the pattern beyond noticings of learners' positive and negative feelings and emotional responses within failure moments to how these verbal and non-verbal forms of emotional cues were also tied to how educators responded. This peer debriefing served to enhance the credibility and confirmability of our findings, in line with criteria for trustworthiness in naturalistic research (Lincoln & Guba, 1985). The inductively developed patterns also provided the basis for how educators' reflections align with and extend the construct of epistemic empathy (see Discussion).

4.5. Positionality statement

The positionality statement reflects the perspectives of the first three authors who were directly involved in the design of the study, the analysis of the data, and/or interpretation of the findings. Similar to Johnson and Fonbuena (2023), we considered our positionalities in terms of various identities – formal and/or non-formal educators and STEM learners – particularly in regards to our perspective of failure within each identity. In addition, we acknowledge how our

racial and gendered identities informed how we interpreted our participants' experiences with failure. We include these through a first-person perspective.

Author A: As a White, cisgender woman, my understanding and of failure is shaped by the cultural narratives and educational norms that have framed success and struggle in my own schooling and professional life, as well as by the privilege of not having to navigate failure through the lenses of systemic bias or marginalization. As a teacher educator, I experience failure through my instructional practices. There are times I leave the classroom thinking, "That didn't go well. They missed my point." These moments often stem from my struggle to shift students' perspectives on the teaching and learning of mathematics. In non-formal STEM learning environments, although I deeply value failure as a productive part of the learning process, I often find myself stepping in rather than stepping back—intervening rather than allowing space for learners to wrestle with uncertainty. As a STEM learner, my experiences with failure were more personal and internalized, framed by a familial context in which only A's were considered an acceptable form of "learning." I often saw failure as a reflection of my self-worth, which eroded my sense of belonging and confidence.

Author J: In my Asian immigrant household, emotional wellness is valued over traditional measures of success due to our history with genocide and mass atrocities. Happiness and play indicated freedom from scarcity, not high scores. Hence, failure largely involved personal perfectionism instead of social expectation. When I served as a former foreign language teacher, I experienced failure when students would avoid playful experimentation and disengage from the group. While assisting classrooms as an undergraduate researcher, I found this pattern in STEM learners who lost confidence in the presence of peers with higher scores. Unraveling negative self-beliefs required an empathetic understanding of each learner's unique perspective.

Likewise, my current role in innovation development involves extensive perspective-taking as I progress ideas outside my expertise. My purpose is to help learners embrace failure moments to lead more fulfilling lives.

Author L: I am a White female who grew up in a family of engineers whose work centered on designing tools to make life better for people and the environment. As a maker, I see failure in making as a process of iterative refinement. As an informal educator, I ask questions and engage in joint problem solving as I attempt to support learners in achieving their goals. As a researcher, I seek to understand what drives people so I can design better tools and spaces for learning.

These layered experiences informed the lens through which we individually interpreted the data, namely the reflective nature of the teaching and learning process within failure moments. Our personal histories shaped what we noticed, how we made sense of the data (e.g., analytical memos), and took on the perspective of the museum educators. Yet, analyzing the data through the lens of multiple researchers—particularly those whose experiences and perspectives that differ from one another (i.e., investigator triangulation; Denzin, 1978)—was an essential component in recognizing and interrogating our assumptions.

5. Findings

In what follows, we present four ways in which museum educators reflect on failure with epistemic empathy toward learners, peers, caregivers, and themselves as part of their professional reflection. Evidence is provided through exemplary quotes. Pseudonyms are used for both participants and museums to maintain confidentiality.

5.1. From repairing to validating

Educators frequently mentioned both positive and negative emotional responses from learners during moments of failure, with emotions such as frustration, sadness, excitement, and

pride being especially common. This recognition and interpretation of these learners' emotions also revealed an important nuance in educators' perspective-taking: the recognition that what adults might label as a "failure" may not align with how children themselves experienced the moment. For instance, one educator stated, "I was trying to identify what was the failure moment. And if I was in Sky's [learner] shoes, I don't know that I would have thought that I failed" (Jasmine, Museum of Exploration). Similarly, Alexander (Innovator) stated, "I even still have some trepidation around using the word failure because what that looks like for [the learner] and how he processed it [changes to his design]." By imagining the event from the learner's point of view, educators questioned whether the child would even interpret the experience as a failure at all. This shift moves beyond merely empathizing with a child's experience to interrogating the very framing of failure itself—highlighting that failure is not an objective event, but a socially constructed and context-dependent experience. The educator in the second quote even expressed trepidation in labeling the moment as "failure," recognizing that for the child, the experience may not have been interpreted and felt as a failure, but about iterative sensemaking and design revision.

Furthermore, educators' responses to learners' emotional cues—particularly in how they sought to understand and reshape learners' interpretations of failure—reflected moments of epistemic empathy in the context of failure-based learning. For instance, Ava (Museum of Engaging Science) stated the following:

My goal was to reframe guests' negative attitudes and focus more on supporting the emotional side of failure or perceived failure [referring to video clip moment]. She was struggling to cut it out. Several times, she was just like "I can't do this. I can't cut it. I

can't do this.” But I showed her some tips on that we did together first, and by the end, she was like, she wanted to draw the lines herself. She was like “I can do that.”

In this example, the educator prioritized reframing the learner’s negative self-assessment (“I can't do this”). By acknowledging the learner’s frustration by providing manageable tips through collaborative action (“we did together first”), the educator shifted the emotional trajectory of the experience from discouragement to confidence. As such, the educator’s goal was not to erase the struggle, but to help the learner reframe their relationship to failure—positioning it as a space for growth rather than a signal of inability. Through this process, Ava demonstrates epistemic empathy as an integrative stance: she attends to how the learner feels and how the learner understands her own knowledge and ability.

Yet, for some participants, engaging in video-based reflection and mutual dialogue led to questions regarding their roles and/or instructional moves as educators. When do we intervene? How do you respond? If we are always turning failure moments into a “okay moment,” what message are we sending? This is captured well in the following quote from Jacob (Museum of Science and Wonder):

On a slightly different note, where is the balance with validating the negative emotions? Yeah, because it is not so black and white, where if you fail, you are bad, right? But there's also like, oh man, I feel so disappointed or I feel frustrated because I spent all this time, I was gonna make something to give to someone and now I have nothing to give to them. And where's the empathizing with that and being like, yeah, that totally is frustrating. Or I watched you build that tower for 10 minutes and now it's crumbled. Like I know you were working hard like that. Is that when that happens? Because we have the knee jerk reaction to be like, no, no, it's okay. Don't cry. Hold your tears. But doing that,

what does that say about failure? Like does us trying to fix it mean that failure is so shameful that we should just get rid of it and fix it and make it better...?

This reflection highlights a critical tension surfaced through the process of epistemic empathy: the recognition that emotional responses to failure are valid and should not be immediately minimized. Rather than instinctively fixing or soothing the moment, the educator questioned how to acknowledge children's authentic feelings of frustration and disappointment. In doing so, they surface a broader cultural challenge—moving beyond framing failure as something to "fix," toward valuing it as an essential epistemic experience. This grappling reflected a shift toward affirming emotional vulnerability as part of the learning process.

5.2. Seeing through the learner's eyes

Participants frequently engaged in perspective-taking by imagining the experience of the child during moments of struggle or failure. This process involved drawing on their own learning tendencies, recalling personal experiences with failure as young learners, and projecting their possible thoughts, emotions, and sensemaking processes of the children in the moment. First, educators in this study engaged in perspective-taking by reflecting on their own learning tendencies to better understand the experiences of the children they observed. This is highlighted through the following example from Nadia (Museum of Engaging Science):

I think it made me wonder, based on my own learning style, but when I used to do a lot of complex physics, and you don't get it right away, and you have someone watching you not...and I think it can really be an overwhelming thing.

Similarly, Joe (STEM Collaborative) stated:

Trying to get the kids to visualize their own success. I learn very visually. You just tell me something and it may go in one ear and out the other, but when I see it, like a visual,

that would have helped me feel easier that I could do it. So that would've help me if I was the guest.

Together, these reflections show how personal learning histories served as an important mediating tool for perspective-taking. In the first example, the Museum of Engaging Science educator relates their memory of grappling with complex physics concepts, highlighting how the presence of an observer can intensify feelings when understanding does not come immediately. By reflecting on their own emotional and cognitive experiences as a learner, the educator deepened their sensitivity to how public struggles might feel for children in similar moments of uncertainty. Moreover, the STEM Collaborative educator reflected on their preference for visual learning and projected how providing visual supports might ease children's anxiety and build confidence. By considering what would have helped them as learners, they engaged in a form of empathetic projection, imagining how different scaffolds could support children's success.

Second, educators engaged in perspective-taking by drawing on their own early experiences with failure to better understand the emotions children might experience during challenging moments. In recalling feelings of sadness, fear, and certainty of failure from their own childhood, educators not only positioned themselves alongside the children they observed, but how this was associated with their response to learners. Consider the following reflection from Sabrina, an educator from STEM Learning Museum:

So I think I need to learn how much do I engage and how much input to put into helping them, like gauging that because obviously each child's going to be different in what they can do. And sometimes kids will snap. I would have been that kid where I'm like, I just don't get it. I need lots of help. So, I think I have a lot of experience in failure. Like when I think back as a child, I was that kid, the one that looked sad, and like I'm afraid to try

because it's not going to work. I'm certain this isn't going to work. So, I can kind of relate to those kids.

This personal memory of vulnerability allowed the educator to anticipate the emotional needs of learners who might similarly hesitate or shut down in the face of failure. Such perspective-taking reflects the development of epistemic empathy, as the educator recognized both the cognitive struggle and the emotional stakes inherent in children's attempts to engage. By seeing their own younger self in the children, the educator moved beyond generalized assumptions and toward a more nuanced, compassionate understanding of failure as an integral and emotionally-charged part of learning.

Third, educators engaged in perspective-taking through projecting the cognitive emotional experiences of the children they observed. The following is an example from Kiara (City Science Museum):

And something else that I really liked that you did, because it made me feel comfortable even just watching it, is you have very comfortable body language. Even just like you lean in and kind of make yourself a little bit more like at the visitor's eye level. I can imagine if I was a visitor how that would make me feel more comfortable, because even just watching it I'm like, okay, I feel like you're right there with them on their side. Like let's figure it out together instead of just like, "you did this wrong."

By imagining how the facilitator's body language (e.g., leaning in at eye level) might make a visitor feel more supported, the educator recognized the importance of relational positioning in shaping students' sense of comfort and partnership. Rather than interpreting facilitation moves from an outsider's perspective, the educator stepped into the learner's view and underscored how subtle embodied actions can sustain emotional safety during moments of failure. We further

observed this outsider perspective of a failure moment through the following reflective quote from Myra (Museum of Awe):

My initial gut reaction was he saying that doesn't mean "I don't understand"? What is he trying to communicate in that moment? Is it this is chaotic and I feel overwhelmed? Is it I don't understand a word? Is it I don't understand a concept? Is it I just don't know where to start? We can't interpret everything a child says. But immediately, my thought was, okay, what is he actually saying? I think it sounded like he really needed your attention in that moment. He needed you specifically to talk to him. And that was, like you did a good job of spending that time with him specifically. It was enough for him to feel secure, confident, and ready to move forward.

This reflection shows the educator engaging in perspective-taking by actively imagining multiple possible meanings behind a child's expression of confusion. Rather than accepting the child's words at face value, the educator considered a range of potential emotional and cognitive states—feeling overwhelmed, struggling with language, grappling with concepts, or not knowing where to start. This kind of interpretive projection demonstrates epistemic empathy, as the educator suspends quick judgment and instead explores how the learner might be experiencing the situation internally.

5.3. Surfacing shared vulnerabilities through empathetic reflection

Participants also demonstrated empathy by understanding and resonating with one another's experiences and emotions by seeking to make sense of their instructional choices and responses to moments of failure, rather than judging them. As stated by a Naomi, an educator from the Museum of Awe, "I could definitely feel that," implying a shared feeling in watching the video of a peer. As another example, "There wasn't a moment of distinct "I can't do this", but there were many moments of like struggle. Like (*shook head and laughed*) I don't know. I can

see your pain. I can see your pain for sure. I would have been having pain too" (Sam, Museum of Engaging Science). These examples highlight an expression of emotional resonance—the educator is feeling what their peer felt, emotionally identifying with their experience while watching the video.

This process further fostered empathy grounded in shared experiences and mutual reflection, as seen when Tommy, an educator from Museum of Exploration, recognized their own fear of silence mirrored in a peer's teaching:

I saw a lot of things that, kind of, trends that I also did I think when I was, when I was doing this. . . . And I think there were some moments where there was like, a little bit of a fear of silence, kind of what Mia said, originally said. And I have that as well, I think I had a similar issue with mine, where I like, felt like if there's any silence, it's like, 'what are we thinking,?' you know.

By identifying trends in both their own and a peer's facilitation of a STEM-activity, and by building on Mia's earlier observation, Tommy illustrates how reflection became a collective process. Their acknowledgment of a common "fear of silence" points to how emotional vulnerabilities were surfaced, normalized, and understood as part of a shared professional experience.

5.4. Reliving vulnerability and expanding relational understanding

Through the utilization of video-based reflections, educators re-lived and re-experienced their own failures and emotions with visitors both in the moment and as experienced in re-watching their video clip with their peers. In the following example, Amy (Art & Culture Institute) framed the failure moments as not knowing how to respond to a child's comment.

[L]ike, all of a sudden, this moment came in suddenly one of the kids, he said...out of the blue, he said, my mom always say I move around, and I can't sit still. And I just, I just

like talked and talked and talked and talked because of discomfort. And I was saying, you know, like how everybody's different. (Laughter) Totally frazzled. (Laughter) I just could not stop and I was like, okay, you know, that's yeah, I'm just overdoing it.

Amy's reflection highlights the dual nature of epistemic and emotional vulnerability. In the moment, she experienced discomfort and a sense of being "frazzled," which she later re-lived with laughter. This laughter, layered over her recounting, may signal a coping mechanism for discomfort or embarrassment.

As Amy continued, she provided an analogy for her emotional state when re-watching the video: "It just came out of the blue. I don't even remember, like, I got shot sideways. That's what I felt like, you know, I was ready to catch the ball. But then the ball just came from the sideways." This analogy—"I got shot sideways... the ball just came from the sideways"—captures the emotional and pedagogical disorientation she experienced in the moment. It reflects a tension between preparedness and unpredictability, revealing how unexpected student input can disrupt a teacher's sense of control (i.e., failure moment).

But as the reflection continued, Amy's noted taking on the perspective of an individual that was not even present in the STEM activity, but someone with a shared role – a parent. She shifted her role and relational understanding from that of an educator to that of a parent, a powerful act of social perspective-taking that blurred professional and personal identities:

I [was] just really frazzled because I lost myself as a teacher, but like, I became a mother. I started looking back over the moment, as a parent. I'm sorry. (Crying) That I might have said something awful. I just don't know. . . . I think that was, it that was a moment that I wasn't a teacher but I became a mother, a parent.

This moment illustrates a key dimension of epistemic empathy: the decentering of oneself to understand others' ways of knowing and feeling. Amy's emotional vulnerability and role-shifting reflect a process of internal transformation.

6. Discussion

This study contributes to a growing body of research on epistemic emotions by attending to a significant gap: how epistemic empathy and failure unfold in non-formal educational settings such as museums. While prior work has explored epistemic empathy primarily in relation to understanding learners' ideas and reasoning in classroom contexts (e.g., Jaber, 2021), this study extends that conceptualization to a professional disposition that includes peers, caregivers, and oneself. Moreover, we propose that moments of failure offer particularly rich terrain for cultivating epistemic empathy, as they expose the emotions and vulnerabilities that invite reflection and perspective-taking. Educators recognized failure as a relational and interpretive experience. In particular, reflective video-based professional development afforded educators a space to collectively revisit classroom moments, exchange interpretations, and make visible the cognitive and emotional contours of their teaching. Through this shared inquiry, they engaged in social perspective-taking, grappled with the uncertainty and ambiguity of in-the-moment failure moments, and reframed failure as an epistemic and relational moment (Cohen et al., 2023; Gehlbach, 2011). Educators in this study were able to reconsider how experiences of failure were felt, understood, and reimagined (Amador et al., 2023). The results from this study bring the literatures on epistemic empathy and failure into conversation, revealing how moments of failure can serve as critical sites where epistemic empathy is enacted and developed. In what follows we share four insights that emerged through this work.

First, educators' reflections revealed a shift from emotional recognition to interpretive understanding of others' struggles. Rather than simply acknowledging moments of frustration or

excitement, participants began to consider what those emotional expressions signaled about the learner's or peer's underlying sensemaking process, at times, through their own experiences with failure as a child. For example, in reflecting on a child's verbalized confusion, an educator questioned whether the statement reflected cognitive misunderstanding, emotional overwhelm, or a need for relational reassurance. These shifts reflect Jaber's (2021) concept of epistemic empathy, in which attending to both reasoning and affect enables deeper understanding of how others make sense of challenging situations. They also echo Cohen et al.'s (2023) framing of social perspective-taking as a dialogic and metareflective practice—requiring individuals to move beyond surface impressions and revise assumptions about others' thinking and emotions. By engaging in this interpretive work, educators enacted a more responsive stance, using emotional cues as intellectual resources to revisit their own and others' pedagogical decisions (Jaber et al., 2024; Laksov & McGrath, 2020).

Second, empathy emerged through shared vulnerability, as educators recognized aspects of their own emotional and instructional struggles reflected in the experiences of others (e.g., Peterson et al., 2025). This recognition often took the form of identifying “trends” in a peer's facilitation that mirrored their own discomforts or uncertainties, such as the tension surrounding silence during failure moments. In these moments, empathy was not constructed through distance or observation (Jäger & Malfatti, 2021), but through a sense of emotional proximity—of *being in it together*. One educator even reflected on a moment of discomfort by shifting her perspective from that of a teacher to a parent, revealing how emotional vulnerability can catalyze socially meaningful perspective-taking. This aligns with Jaber's (2021) emphasis on affective self-awareness as central to epistemic empathy, wherein educators' ability to recognize their own learning and teaching vulnerabilities creates space for more compassionate interpretations of

others. Through dialogic reflection, educators in this study used their own emotional histories as tools for connecting with peers (e.g., Simpson et al., 2018; Zhang & Cross, 2011)—transforming what may have previously felt like private struggles into shared, generative insights about teaching and learning within moments of failure. Such moments of emotional mirroring suggest that epistemic empathy is not solely a cognitive projection, but an embodied and historically situated response—a recognition of “I’ve been there too” that bridges peer-to-peer or educator-to-educator experiences.

This was further echoed in educators’ imaginative projection into children’s minds and emotions in the moment of failure, oftentimes informed by their own remembered experiences of failure as a young child, as well as their own personal learning tendencies (e.g., visual learner); highlighting Horsthemke’s (2015) notion that empathic understanding in educational contexts is distinctive precisely because teachers can draw upon their own remembered experiences of being a child—allowing them to relate to young learners not as distant others. This extends upon prior scholarship that points to the development of epistemic empathy by immersing educators in youth-focused learning experiences (Ebby et al., 2022; Lowell, 2024). Our research shows how reflective, video-based professional development can elicit comparable insight through revisiting authentic moments of practice.

Third, as educators revisited and relived their own facilitation through video, moments of perceived failure became catalysts for questioning established norms and expectations around how failure “should” be managed. This reflection often led to discomfort—but also to reimagined instructional stances. Rather than defaulting to quick reassurance or control, or even disengaging or withdrawing as a protective measure (Winkler & Fishbach, 2019), educators began asking how to validate learners’ emotional experiences while still supporting perseverance

and agency. This shift signals the emergence of transformative agency (Lantz-Andersson et al., 2022), as educators not only examined their own assumptions but considered how their responses shaped broader cultural messages about failure, which begins to push beyond individual reflection toward a more critical awareness of the institutional and cultural structures that shape how failure is valued and sanctioned within educational practice (Simpson et al., 2025a).

Fourth, educators in this study came to view failure not as a disruption to learning, but as a productive and necessary part of learners' epistemic activity. Through video-based reflection, they began to recognize that learners' emotional responses to failure—frustration, confusion, disappointment—were not signals of disengagement, but signs of active sensemaking and investment. This reframing reflects a shift from managing failure to interpreting it, aligning with research that conceptualizes failure as a situated, meaning-making process (Hilppö & Stevens, 2020) and epistemic emotions as integral to disciplinary engagement (Jaber, 2021; DeLiema, 2017). Rather than smoothing over struggle or minimizing discomfort, educators began to see these emotional moments as invitations to better understand how learners were navigating content, tools, and social dynamics. In some cases, this interpretive stance took on a deeply humanizing quality, as educators explicitly projected themselves into the learner's experience—asking what emotions, thoughts, and strategies a child might be drawing upon in the moment of difficulty, and how those might echo their own histories of “getting stuck.” In embracing the emotional dimensions of failure, educators broadened their definitions of what meaningful learning looks and feels like.

6.1. Implications for practice

These findings from this study align with prior research demonstrating that epistemic empathy can be developed through participatory experiences (Jaber et al., 2024). Epistemic empathy is bounded and sometimes costly: it can strain emotional resources (Bloom, 2017; Jäger

& Malfatti, 2021) and bias judgment if unreflective (Prinz, 2011). Empathic responses while essential to humanizing pedagogy, achieves its full potential only when embedded within institutional cultures that also value equity, collaboration, and systemic change (D'Souza, 2024). Thus, cultivating epistemic empathy should be paired with professional development designs that scaffold reflection, protect educators' emotional labor, and align with broader organizational supports and equity-oriented reforms (Jaber et al., 2018). Our findings point to several important implications, particularly within the context of professional development for educators in non-formal, STEM-focused learning contexts beyond museum settings such as makerspaces, libraries, and summer camps.

First, PD should leverage tools such as video-based reflection and pedagogical reasoning discussions to deepen educators' interpretive practices and develop their epistemic empathy around moments of failure. Reviewing video clips of educator-learner interactions allowed educators in this study to slow down and notice the subtle emotional and cognitive shifts experienced during failures with STEM-focused activities. Videos served as a powerful mediating tool. By revisiting their own actions on video, as well as their peers, educators were able to "re-see" themselves—not only as educators, but through the lived experience and perspective of learners, parents, and peers. In this way, video made vulnerability visible and shareable, turning individual emotional experiences into opportunities for collective reflection and growth.

Second, PD should include opportunities for museum educators to experience failure as an epistemic emotion from a learner perspective (i.e., seeing through the learner's eyes). Based on prior research, this may include experiences through inquiry, design challenges, or role-play (Ebby et al., 2022; Lowell, 2023). These embodied experiences can cultivate empathy by helping

educators experience and understand the intersection of affective and cognitive dimensions of learner thinking prior to STEM-focused activities, which may also extend to conversations regarding their own early experiences with failures. Such firsthand encounters may help educators shift away from negative interpretations of failures and instead view them as meaningful openings for sense-making and relationship-building.

Third, PD should cultivate reflective questioning practices to help educators attune to learners' emotional and epistemic experiences. Questions like "What might this feel like for them?" or "How might I have responded as a young learner?" can prompt educators to consider the emotional and lived experience of learning—especially moments of uncertainty, struggle, or failure. Within PD and collaborative contexts, such questions can also deepen empathy among peers, inviting perspective-taking of others' actions. Additional prompts such as "What sense are they trying to make?", "How might I have responded in that moment?", or "What resources are they drawing on that I might not immediately see?" can further support teachers in shifting from evaluative to interpretive stances. Embedding these reflective questions into PD structures may help normalize emotional responsiveness as a professional practice, a practice that may extend outside the PD to their interactions with learners.

6.2. Limitations and future research

While this study offered important insights into museums educator development of epistemic empathy through reflecting on moments of failure, the findings may not easily transfer to other learning environments that involve STEM-focused activities as museum educators may work with different instructional constraints and learner population, as well as view failure moments differently. Future research might explore how similar reflective processes unfold in other contexts such as formal classroom settings, where time constraints, curricular demands, and accountability pressures may shape how failure is experienced and responded to, or summer

campus, where educators interact with the same learner population for an extended amount of time.

In addition, the study involved a relatively small group of museum educators who self-selected into the reflective video-based PD experience, likely those already open to critical reflection and dialogue. Future work could expand upon this study by examining how educators with different levels of experience, varying perspectives of failure, openness to vulnerability, or disciplinary backgrounds develop epistemic empathy around failure moments. For instance, how might varying perspectives of failure and openness to vulnerability inform how museum educators engage in the perspective-taking process? How may it impact their instructional practices around learners' failure moments or how they empathize with their peers?

Further, this study did not examine changes in teacher learning (e.g., instructional approaches) following the professional development experience. As a result, it remains unclear how the development of epistemic empathy observed during PD translated into actual practice—particularly in how educators responded to student emotions during failure moments or how they may empathize with a peer in working together in an exhibit or workshop. Based on prior research, at this point, we can only speculate that engaging in epistemic empathy through reflective video-based professional development as educators is one aspect of teacher learning (Jaber, 2021; Jaber et al., 2022; Lowell, 2023) and not an experience that inhibits or disengages individuals from learning (Carlson & Fishbach, 2024). Future research should follow educators' post-PD to investigate whether and how their approaches to failure, uncertainty, and emotions evolve in instructional contexts. This research would also benefit from the inclusion of additional data sources such as follow-up interviews, in-the-moment field observations, and student or learner perspectives. This would offer valuable triangulation and insight into how educators'

evolving views on epistemic emotions and empathy are reflected in their day-to-day interactions with learners, peers, and caregivers.

7. Conclusion

This study contributes to a growing understanding of how educators experience and reflect upon failure not only as a pedagogical challenge but also as a site for emotional and professional insights. While existing literature on empathy in teaching often centers on interpersonal relationships and student well-being, this work foregrounds epistemic empathy—the ability to attend to others’ thinking and feeling during knowledge construction—as a powerful lens for understanding educator development. In the unique context of museums, video-based reflection offered a meaningful opportunity for museum educators to revisit their own and others’ failures, surface emotions, and engage in deep perspective-taking. By returning to moments that might otherwise be dismissed as mistakes or evidence of inadequacy, educators were able to discuss failure as a productive site for inquiry and relational understanding. Through this process, educators engaged in practices of epistemic empathy by reinterpreting learner emotions, grappling with their own vulnerabilities, and reconceptualizing failure as a productive part of STEM learning. Importantly, this study suggests that non-formal learning environments, with their flexibility and emphasis on inquiry, offer fertile ground for developing emotional and interpretive understanding of others’ sensemaking. Taken together, these findings challenge dominant narratives that equate failure with lack of competence, instead framing it as a possibility for empathic and epistemic professional dispositions.

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