UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

REFRAMING ENGINEERING AS RELATIONAL PROBLEM SOLVING IN EARLY CHILDHOOD CLASSROOMS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

BY

ANNE MOFFITT
Norman, Oklahoma
2026

Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/342554

REFRAMING ENGINEERING AS RELATIONAL PROBLEM SOLVING IN EARLY CHILDHOOD CLASSROOMS

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF INSTRUCTIONAL LEADERSHIP AND ACADEMIC CURRICULUM

BY THE COMMITTEE CONSISTING OF:

Dr. Amber Beisly, Chair

Dr. Elizabeth Zumpe

Dr. Vickie Lake

Dr. Kathleen Gallagher

©Copyright by ANNE MOFFITT, 2026
All Rights Reserved.

DEDICATION

To the engineers who have shaped how I think about problem-solving, to all my STEAM students at IMS, and to Owen and Adalyn, my favorite problem solvers.

Acknowledgements

A huge thank you to my family and church family who have prayed for, encouraged, studied the Bible with me, and provided support in so many practical ways as I have completed 25 years of formal education. You know I love you.

Uncle Kurt (Dr. Cline), I wouldn't be here without your example. I didn't become a "real" doctor after all, but I think being a Doctor of Philosophy like you is even better. Thank you for always believing in me.

Thank you, Dr. Beisly, for taking me on as your first doctoral candidate. Thank you for listening, letting me teach and publish with you, and helping me realize how much I love early childhood science and engineering.

Dr. Lake, Dr. Gallagher, and Dr. Zumpe, thank you for teaching me so much about how to be a better writer and researcher and giving me detailed feedback about how to improve. I really appreciate you.

Dr. Ethridge, thank you for going above and beyond for me during my undergraduate and graduate years at OU-Tulsa. You have been so kind and thoughtful.

Thank you, Boo Young and Elnaz, for being the best office mates! Your friendship is such a blessing.

And the biggest thank you to the One who holds me up: "A woman's steps are directed by the LORD, and the LORD delights in her way. When she falls, she will not be thrown down headfirst because the LORD holds on to her hand" (Psalm 37:23-24).

Table of Contents

List of Tables xiii

List of Figures xiv

PROLOGUE xv

Dissertation Abstract xvi

MANUSCRIPT I 1

Abstract 2

Limitations of Conventional Early Engineering Education 7

Theoretical Strands of RPS 10

Sociocultural Theory: Engineering as Socially Mediated Activity 11

The Ethic of Care: Engineering as Moral and Relational Practice 12

Culturally Relevant Pedagogy: Engineering as Culturally Situated Design 13

Weaving the Strands Together 14

Reframing the Engineering Design Process as Relational and Culturally Situated 15

Define: Collectively Interpreting a Problem 18

Learn: Gathering Knowledge from Multiple Perspectives 19

Plan: Negotiating and Making Meaning Together 20

Try: Acting Collectively and Responsively 21

Test: Evaluating for Relational Impact 21

Decide: Reflecting Collectively and Sustaining Shared Responsibility 22

Implications for Curriculum Theory 23

Implications for Practice 25

Conclusion 27

References 29

MANUSCRIPT II 34

Abstract 35

The Engineering Design Process: A Shared Classroom Language 36

From Design Problems to Relationship Problems: One Process, Two Contexts 42

Define: Naming the Problem 42

Learn: Listening to Understand 43

Plan: Generating More Than One Idea 44

Try: Putting the Plan into Action 45

Test: Did It Work? 46

Decide: Reflecting and Moving Forward 46

Conclusion 50

References 52

MANUSCRIPT III 54

Abstract 55

Designing Solutions, Repairing Relationships: Relational Problem Solving through Engineering Design and Navajo Peacemaking in a K–2 Classroom 56

Literature Review 58
Engineering Education 59
Peer Conflict and Social Problem-Solving 60
Culturally Relevant Pedagogy and Navajo Peacemaking 60
Practitioner Inquiry and Action Research 61
Theoretical Framework 62
Methodology 63
Study Design, Participants, and Setting 63
Critical Reflexivity and Teacher-Researcher Positionality 65
Curriculum Description 66
Data Sources and Procedures 68
Structured Reflections 69
Analytic and Planning Memos 69
Annotated Curriculum Planning Documents 70
Informal Consultation Notes 70
Data Analysis 70
Trustworthiness and Reflexivity 72
Findings and Discussion 73
K'é: Relationship as the Foundation of Curriculum Adaptation 75
Hózhó: Harmony in Theory and in Practice 79

Implications 87

Limitations and Directions for Future Research 90

Conclusion 91

References 94

Appendix A. Structured Reflection Prompts and Sample Excerpt 99

Appendix B. Sample Annotated Lesson 102

Appendix C. Condensed Codebook with Examples from Data 106

A PROSPECTUS 109

Table of Contents 111

LIST OF TABLES 115

LIST OF FIGURES 116

Chapter 1: Introduction 118

- Educational Problem 119
- Purpose of the Study 121
- Research Questions 121
- Theoretical Framework 122
- Conceptual Framework 125
- Significance of the Study 128
- Definition of Terms 130
- Engineering Education in Early Childhood 132

The Rationale for Engineering in K–2 Classrooms 133
The Engineering Design Process (EDP) as a Developmentally Appropriate Framework 134
Engineering Design as a Social Process 135
Peer Conflict and Social Problem-Solving in Early Childhood 136
The Nature and Role of Peer Conflict 136
Social and Emotional Learning (SEL) Approaches in Early Elementary 137
Reframing Conflict as Design Work 138
Curriculum Adaptation and Culturally Sustaining Pedagogy 139
Relational Foundations of Indigenous Pedagogies 140
The Need for Culturally Responsive STEM Education 141
Examples of Adapted STEM or SEL Curricula 142
Relational Learning as a Bridge for Curriculum Adaptation 143
Navajo Peacemaking and Cultural Values 144
Overview of Navajo Peacemaking 144
Educational Applications of Peacemaking 146
Connecting Peacemaking with the EDP and Classroom Conflict 147
Table 1 147
Teacher-Researcher Role and Action Research in Early Childhood STEM/SEL 149
Synthesis and Gaps in the Literature 152

Chapter 3: Methodology 155
Researcher Role/Positionality 155
Study Design 156
Participants and Setting 160
Curriculum Description 161
Data Sources and Procedures 162
Structured Reflections 163
Analytic and Planning Memos 164
Annotated Curriculum Planning Documents 164
Informal Consultation Notes 165
Peer Observation Notes 166
Analytic Rubric for Integrated Framework 166
Data Analysis 166
Preparing for Analysis: Familiarization and Memoing 167
Level 1: Structural Coding Guided by Conceptual Framework 168
Level 2: Pattern Coding 169
Level 3: Thematic Analysis Guided by Theoretical Framework 169
Trustworthiness 170
Ethical Considerations 171
Potential Limitations 172

References 175

Appendix A: Prompts for Structured Reflections 186

Appendix B: Structured Template for Analytic and Planning Memos 188

Appendix C: Annotated Curriculum Planning Template 190

Appendix D: Informal Consultation Notes Template 192

Appendix E: Peer Observation Notes Template 194

Appendix F: Rubric for Analyzing Children's Understanding of the Integrated Framework 195

Timetable 198

Publishable Articles 200

Article 1: Theoretical 200

Article 2: Practical 201

Article 3: Empirical 202

List of Tables

MANUSCRIPT I

Table 1. Reframing the EDP through Sociocultural, Relational, and Cultural Perspectives ……..……..……..…17

MANUSCRIPT II

Table 1. Guiding Questions for Applying the EDP to Design Challenges and Peer Conflict Resolution……..…..39

MANUSCRIPT III

Table 1. Action Research Cycle, Activities, and Data Sources……...…..…64

Table 2. Alignment of EDP Steps, Conflict Resolution Strategies, and Navajo Peacemaking Values……..…..67

Table 3. Instructional Pivots Across the Action Research Cycle……..73

List of Figures

MANUSCRIPT II

Figure 1. EDP Color-Coded Chart ……37

Figure 2. Sample Problem-Solving Scenario Using the EDP for Conflict Resolution…..41

Figure 3. Define, Learn, and Plan Steps of “Spilled Paint!”……..43

MANUSCRIPT III

Figure 1. Iterative Action Research Cycle Across Implementation ……..…...64

PROLOGUE

This dissertation adheres to a journal-ready format. Three journal articles prepared for submission to refereed journals comprise the first part of the dissertation. Manuscript I, "Reimaging Early Childhood Engineering Curriculum through Relational Problem Solving" is prepared for the *Journal of Curriculum Studies*. Manuscript II, "'What's the Problem?': Helping Children Use the Engineering Design Process to Work Through Peer Conflict" is prepared for the journal *Young Children*. Manuscript III, "Designing Solutions, Repairing Relationships: Integrating Engineering Design and Navajo Peacemaking in a K-2 Classroom" is prepared for the journal *The Qualitative Report.*

Dissertation Abstract

This dissertation reframes early childhood engineering as a relational, culturally grounded form of problem solving through the development and examination of Relational Problem Solving (RPS). Across three complementary articles, the study challenges dominant views of engineering as a technical and procedural activity, arguing instead that children's engineering thinking emerges through social interaction, ethical consideration, and cultural meaning making within classroom communities. The first article introduces RPS as a theoretical framework by integrating sociocultural theory, the ethic of care, and culturally relevant pedagogy. This synthesis positions engineering as a socially mediated and ethically grounded practice and expands what counts as engineering in early childhood settings to include everyday classroom challenges, such as peer conflict. The second article translates this framework into practice, demonstrating how the engineering design process (EDP) can function as a shared language for both design challenges and peer conflict resolution. Through structured routines, visual supports, and narrative-based scenarios, kindergarten through second grade students developed strategies for communication, collaboration, and relationship repair. The third article presents a qualitative action research study examining how an engineering-integrated curriculum was adapted to align with Navajo peacemaking values in a K–2 classroom on the Navajo Nation. Over a 15-week implementation, the teacher-researcher aligned the EDP with hózhó, k'é, and na'nitin to support culturally grounded peer conflict resolution. Analysis of teacher-generated data revealed that curriculum adaptation was primarily a relational and reflective process shaped by ongoing dialogue with community members and responsiveness to students' lived experiences. Together,

these findings position engineering as a relational practice that integrates technical and interpersonal problem solving and offer a conceptual, practical, and empirical model for culturally responsive early childhood engineering education.

Keywords: early childhood engineering education, relational problem solving, culturally relevant pedagogy, Navajo peacemaking, peer conflict resolution

MANUSCRIPT I

Reimagining Early Childhood Engineering Curriculum through Relational Problem Solving

This manuscript is prepared for submission to the peer-reviewed *Journal of Curriculum Studies* and is the first of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

Engineering design, the iterative process through which children identify problems, generate solutions, and revise ideas, is increasingly included in early childhood curricula, yet it is often framed as a technical problem-solving activity disconnected from children's relational, cultural, and ethical experiences in classrooms. This theoretical article advances Relational Problem Solving (RPS), a reconceptualization of early childhood engineering as a socially mediated, ethically grounded, and culturally situated practice. Drawing on sociocultural theory (SCT), the ethic of care (EoC), and culturally relevant pedagogy (CRP), three frameworks that have typically been applied separately in divergent scholarly communities, RPS positions children's everyday classroom concerns, such as negotiating access to materials, responding to peer exclusion, and resolving conflicts, as legitimate engineering problems rather than behavioral interruptions. Through this lens, engineering design is understood as a collective process shaped by dialogue, shared interpretation, and community values, rather than as an individual or purely technical endeavor. The article demonstrates how core phases of the engineering design process can be reinterpreted to foreground participation, responsiveness, and cultural accountability, thereby expanding what counts as engineering thinking in early childhood settings. By situating engineering within curriculum theory, this work contributes a conceptual model that challenges neutral and universalist assumptions in engineering education and offers implications for curriculum theory, teacher practice, and the ethical purposes of early childhood engineering in any setting where children navigate problems collaboratively.

Keywords: curriculum theory, relational problem solving, culturally relevant pedagogy, sociocultural theory, ethic of care

Reimagining Early Childhood Engineering Curriculum through Relational Problem Solving

Engineering in early childhood education (ECE, defined here as settings serving children from birth through age eight) is increasingly included in curricula, yet it is persistently treated as a technical and procedural activity disconnected from the social relationships, moral concerns, and cultural contexts that shape children's classroom lives (Cunningham, 2018; Fleer, 2021; Pawley, 2019). This article introduces Relational Problem Solving (RPS), a reconceptualization of ECE engineering that draws on sociocultural theory (SCT), the ethic of care (EoC), and culturally relevant pedagogy (CRP) to address that gap. Engineering in ECE can be understood as purposeful problem solving in which children identify difficulties, gather information, experiment with solutions, and work collaboratively toward outcomes that address identified challenges (Tank et al., 2018). Studies of engineering in ECE classrooms show that young children engage readily in engineering problem solving, drawing on observations, conversations, and cultural knowledge to make sense of design challenges that emerge during classroom activity (Sikder, 2024; Tank et al., 2018). Research also demonstrates that ECE students engage in similar forms of reasoning during social problem solving, as they negotiate ideas, revise plans, and collaborate with peers to resolve disagreements and sustain shared activity (Lottero-Perdue & Parry, 2017; Wendell et al., 2017). These studies highlight that engineering in ECE is not simply a technical exercise but a relational and interpretive process, visible in how children use problem-solving strategies to respond to conflicts, negotiate relationships, and restore shared activity (Forman & Fyfe, 2012; Rogoff, 2003).

Curriculum studies offer a perspective that challenges how early childhood curriculum has often been understood and that has rarely been applied to engineering education specifically. Rather than treating curriculum as a set of predetermined outcomes delivered through structured activities, this perspective understands it as a socially and culturally mediated practice through which children and teachers interpret what matters, what counts as knowledge, and how they should act within the educational setting (Apple, 2004; Pinar, 2019; Urban, 2008). From this viewpoint, problem solving is always situated within cultural and relational contexts rather than unfolding as a neutral cognitive process that operates independently of the social relationships and community values surrounding it. Decisions about which problems are offered to children and how those problems are framed reflect deeper assumptions about value, identity, and educational purpose.

The curriculum studies perspective outlined above is especially relevant for early childhood classrooms, where children routinely encounter complex situations involving conflict, exclusion, resource sharing, and concerns about fairness or belonging. Studies of young children's interactions show that they draw on interpretive reasoning, collaborative negotiation, and design-oriented thinking when working through such challenges (Forman & Fyfe, 2012; Kolodner et al., 2003). Although these types of situations are rarely described as engineering (Lippard et al., 2019), they involve the same processes of defining a problem, considering multiple perspectives, imagining possibilities, and deciding how to act (Ramanathan et al., 2024; Ramani & Brownell, 2014). Conceptualizing engineering as a relational and culturally situated form of problem solving makes these everyday moments visible as meaningful contexts for design.

Understanding engineering in this wider sense requires a theoretical framing that existing ECE engineering models have not provided, one that moves beyond cognitive and procedural approaches to highlight the cultural, relational, and ethical dimensions of classroom practice (Berland & Steingut, 2016; Cunningham, 2018; Pawley, 2019). Drawing on SCT, the EoC, and CRP, the framework proposed in this article positions engineering as a form of problem solving deeply intertwined with how children make sense of their interactions with each other and engage with the values of their communities. In doing so, it contributes to broader curriculum studies conversations about how children participate in meaning making and community life through their engagements with problems that matter to them.

The article proceeds in four sections. The first examines the limitations of conventional ECE engineering models, establishing the theoretical and practical need for RPS. The second introduces the three theoretical strands and their collective contribution. The third presents the integrated RPS framework and illustrates how each phase of the engineering design process (EDP) can be reinterpreted through RPS. The fourth draws out implications for curriculum theory and practice. Although the examples and scholarship drawn on here are primarily situated in North American contexts, the conceptual argument of RPS speaks to any educational setting where engineering curricula have been shaped by assumptions of technical neutrality and cultural universality, assumptions that have been critiqued internationally across diverse schooling contexts (Leydens & Lucena, 2017; Riley, 2008).

Limitations of Conventional Early Engineering Education

Conventional frameworks for engineering in ECE share a common structure: they describe engineering design as an iterative, cyclical process in which children identify a problem, generate possible solutions, build or test a prototype, and revise their approach based on results (Crismond & Adams, 2012; Cunningham, 2018; Moore et al., 2014). Engineering is Elementary (EiE), developed by the Museum of Science in Boston, adapts a five-step process (Ask, Imagine, Plan, Create, Improve) into three phases for preschool (Explore, Create, and Improve) designed to make iterative design accessible to young learners (Cunningham, 2018). The Seeds of STEM curriculum similarly organizes engineering into six steps, moving children from identifying problems and brainstorming through creating, testing, improving, and sharing solutions (Dubosarsky et al., 2018). The Framework for Quality K-12 Engineering Education translates a broader design process into child-friendly phases (Define, Learn, Plan, Try, Test, and Decide), a structure drawn on throughout this article (Tank et al., 2018). Other approaches, such as the Fundamental Design Process, locate engineering thinking in children's naturalistic play, identifying design behaviors like goal orientation, problem-solving, and collaborative building within block construction and similar activities (Bagiati & Evangelou, 2016). Although these frameworks vary in terminology and structure, they converge on a model of engineering as a non-linear, iterative cycle of problem identification, solution generation, testing, and redesign.

ECE frameworks tend to treat engineering as a technical activity oriented toward producing efficient or correct solutions, with limited attention to the relational and cultural contexts that shape children's experiences (Fleer, 2021; Pawley, 2019). Research

shows that when applied through teacher-selected tasks that foreground procedural accuracy or specific performance outcomes, engineering becomes disconnected from the everyday concerns, cultural resources, and social relationships that shape how children interpret problems (Berland & Steingut, 2016; Cunningham, 2018; Fleer, 2021; Urban, 2008). Early childhood engineering studies illustrate that children frequently focus on situations with interpersonal or communal significance, such as how to share materials equitably, how to support a peer whose design is not working, or how to resolve disagreements about competing ideas (Tank et al., 2018; Wendell et al., 2017). These situations require forms of inquiry and design that parallel engineering but are not consistently acknowledged as such in existing curriculum materials (Cunningham, 2018; Moore et al., 2014; Ramanathan et al., 2024).

A central limitation of these approaches is the separation they create between technical and relational problem solving. Typical classroom challenges involve the design of structures or objects that meet specific performance requirements, such as supporting weight or spanning distance (Fleer, 2021; Moore et al., 2014). While these design challenges are recognized as authentic engineering tasks, interpersonal challenges that shape children's daily classroom experiences, such as being excluded from group activity or negotiating access to shared materials, are often addressed as behavioral concerns rather than as opportunities for children to use engineering problem solving (Lippard et al., 2019). This division obscures the reality that engineering in community and professional contexts is deeply intertwined with relational concerns, value judgments, and negotiations over inclusion and participation (Bucciarelli, 1996; Pawley, 2019; Riley, 2008).

Conventional approaches also emphasize individual cognitive strategies, with limited attention to the relational processes that shape children's design work (Berland & Steingut, 2016; Tank et al., 2018; Wendell et al., 2017). Young children rarely engage in engineering alone. They coordinate actions with peers, negotiate roles, and respond to one another's ideas as they work toward shared goals (Lottero-Perdue & Parry, 2017; Tank et al., 2018). When these relational dimensions are overlooked, engineering becomes framed as a solitary cognitive exercise rather than a collaborative endeavor shaped by communication, shared meaning making, and collective responsibility (Wendell et al., 2017).

Cultural context is similarly underrepresented in many engineering frameworks. Much of the literature assumes that engineering principles and practices are culturally neutral and universally applicable (Cech, 2014; Leydens & Lucena, 2017; Pawley, 2019; Riley, 2008). This assumption overlooks cultural knowledge, values, and community experiences that shape how children identify problems and imagine solutions. Children's cultural backgrounds influence what they consider important, whose perspectives they believe should be included in decision making, and how they interpret fairness and care (Bang & Medin, 2010; Lee, 2020). When engineering curricula are disconnected from cultural contexts, they miss opportunities to support children in drawing on cultural knowledge as a resource for meaningful design work (Sikder, 2024).

Taken together, these limitations indicate that conventional models privilege technical rationality while marginalizing the relational, cultural, and ethical dimensions of learning (Riley, 2008). Such framing restricts children's participation in engineering and limits its relevance to the interpersonal concerns that matter within their classroom communities

(Cunningham, 2018; Lippard et al., 2019). Addressing these limitations requires a theoretical model that understands engineering as a form of problem solving rooted in relationships, cultural meaning, and ethical responsibility (Bang et al., 2007; Biesta, 2015).

Theoretical Strands of RPS

RPS brings together sociocultural theory (SCT), the ethic of care (EoC), and culturally relevant pedagogy (CRP) to illuminate dimensions of engineering that previous models overlook. Each of these theories has been influential in education research and has shed light on a distinct dimension of learning and practice. SCT emphasizes learning as socially mediated and culturally situated, highlighting how children develop understanding through participation in shared activity and dialogue (Rogoff, 1998; Vygotsky, 1978). The EoC foregrounds relationships, moral attentiveness, and responsibility as central to learning and educational practice (Gilligan, 1982; Goldstein, 1999; Noddings, 2013). CRP centers the affirmation of students' cultural identities and community knowledge, positioning these as assets for academic learning and meaning making (Ladson-Billings, 1995). Yet despite addressing related concerns about how context, relationships, and culture shape learning, these theories have typically been developed and applied within separate scholarly communities: SCT within the learning sciences and developmental psychology, EoC within feminist philosophy and moral education, and CRP within multicultural and equity-oriented curriculum studies. Although these theories emerge from different scholarly traditions, they share commitments to participation, context, human connection, and respect for diverse ways of knowing. A central contribution of RPS is to bring these bodies of scholarship into

productive conversation, arguing that their integration offers a view of engineering's cultural, relational, and ethical dimensions that no single framework provides alone.

Sociocultural Theory: Engineering as Socially Mediated Activity

SCT was developed by Vygotsky (1978) and extended by Rogoff and others (Gutiérrez & Rogoff, 2003; Rogoff, 1998) to explain how children's cognitive development is shaped by social interaction, cultural tools, and participation in community practices. SCT positions learning as a socially and culturally mediated process (Rogoff, 1998; Vygotsky, 1978). Knowledge develops through participation in shared activity, through the use of cultural tools and symbols, and through interactions with peers and more experienced others (Gutiérrez & Rogoff, 2003). Learning is therefore not merely an internal cognitive achievement but a distributed process in which meanings are constructed collectively (Rogoff, 2003).

Applied to engineering in early childhood, this perspective foregrounds the collective nature of children's problem solving. Children define problems through dialogue, observe strategies used by others, build on one another's ideas, and revise plans in response to shared interpretations (Johri & Olds, 2011; Tank et al., 2018). Criteria for what counts as a problem, what constitutes a successful solution, and how design decisions are negotiated emerge from social interaction rather than individual cognition (Rogoff, 2003).

SCT also highlights how children come to understand peer conflicts and relational challenges as meaningful opportunities for problem solving. Through participation in classroom and community life, children observe when shared activity breaks down, collaboration becomes difficult, or disagreements emerge about ideas, roles, or

responsibilities. These observations become matters of shared concern through collective interpretation and conversation (Gutiérrez, 2008; Gutiérrez & Rogoff, 2003). In this view, engineering becomes a form of joint inquiry through which children work together to address issues that are significant within their lived experiences. Yet while SCT illuminates how children learn through shared participation and collective meaning making, it does not fully account for the moral dimensions of those interactions: the obligations children feel toward one another, the relational care embedded in collaborative work, and the ethical responsibilities that shape how problems are defined and addressed.

The Ethic of Care: Engineering as Moral and Relational Practice

The EoC emerged from feminist moral philosophy, initially developed by Gilligan (1982) as a critique of stage-based theories of moral development that centered abstract principles over relational context, and extended by Noddings (1984), Goldstein (1999), and others into a framework for educational ethics and practice. The EoC emphasizes relationships, empathy, and responsibility as central to human development and educational practice (Gilligan, 1982; Noddings, 2013). Moral reasoning arises from attentiveness to others' needs and from commitment to sustaining relationships through dialogue and responsiveness. Knowledge and action are shaped by emotional understanding and relational connection, not only by abstract principles (Sevenhuijsen, 1998).

In the context of engineering, the EoC reframes problem solving as moral work. Engaging in engineering requires children to listen to peers, respond to unmet needs, negotiate differences, and consider the relational consequences of their choices

(Goldstein, 1999). These relational processes are not tangential to the design task but central to what it means to engage in engineering within a community.

The EoC is particularly useful for conceptualizing engineering as a tool for addressing peer conflict and relational tensions that emerge during collaborative classroom activity. Children often recognize issues such as exclusion, unfair material distribution, or conflict as problems precisely because they involve breakdowns in relationships (Goldstein, 1999). When children use engineering processes to respond to peer conflict, they practice moral attentiveness, empathy, and collective responsibility. Engineering becomes a form of ethical action through which children work to support the wellbeing of others (Goldstein, 1999; Noddings, 2013). However, while the EoC foregrounds the moral and relational dimensions of children's interactions, it does not fully account for the ways in which those relationships are shaped by cultural identity, community knowledge, and the histories children bring with them into the classroom.

Culturally Relevant Pedagogy: Engineering as Culturally Situated Design

CRP was developed by Ladson-Billings (1995) in response to persistent achievement gaps and the failure of mainstream schooling to affirm the cultural identities and community knowledge of students of color-and has since been extended through culturally sustaining pedagogy (Paris, 2012; Paris & Alim, 2017) and Indigenous education scholarship (Castagno & Brayboy, 2008). CRP asserts that learning must affirm cultural identity, center community knowledge, and sustain connections to the cultural contexts that shape children’s lives (Ladson-Billings, 1995; Paris & Alim, 2017). Children bring knowledge from their families and cultural communities that influences

how they interpret problems, evaluate solutions, and approach collaborative inquiry (Bang & Medin, 2010; Lee, 2020).

Within engineering, CRP highlights that design is always culturally situated. Children's understandings of what matters, who is affected by a problem, and what kinds of solutions are desirable are shaped by cultural experiences and community values (Bang et al., 2007). When engineering curricula draw on these cultural resources, they become more meaningful and relevant to children's lives (Sikder, 2024).

CRP also expands the definition of legitimate engineering problems. Children may identify issues related to cultural representation in classroom materials and stories, communication challenges when peers use different languages, environmental conditions in their community, or family responsibilities that shape daily routines (González et al., 2005). These issues become authentic engineering challenges when children are supported in drawing on cultural knowledge to define the problem, imagine possible solutions, and decide how to act (Bang & Medin, 2010; Gutiérrez & Rogoff, 2003). Engineering is therefore not culturally neutral but an activity that is accountable to the histories, values, and lived experiences of the communities in which it takes place (Paris, 2012; Paris & Alim, 2017).

Weaving the Strands Together

Taken together, SCT, the EoC, and CRP converge on a shared understanding of children as relational, culturally grounded, and morally engaged participants in community life. Where SCT establishes that learning is always socially mediated and collectively constructed (Rogoff, 1998; Vygotsky, 1978), the EoC insists that those social processes carry moral weight, that attending to others, sustaining relationships, and

responding to need are not incidental to learning but central to it (Gilligan, 1982; Noddings, 2013). CRP extends this further, insisting that the communities and cultural histories children bring to those relationships are not background context but active resources for meaning making and problem solving (Ladson-Billings, 1995; Paris & Alim, 2017). Together, these frameworks position engineering not as an individual cognitive exercise but as a form of collective inquiry that is simultaneously social, ethical, and culturally situated. This integration represents a new contribution to engineering education, one that challenges the technical rationality of conventional models and offers a richer account of what children are doing when they solve problems together, and why it matters for their relationships, their communities, and their development as ethical agents.

Reframing the Engineering Design Process as Relational and Culturally Situated

The framework can be understood through the metaphor of basket weaving, in which the strength and meaning of a basket emerge not from any single strand but from the way multiple strands are woven together (Ingold, 2013; Medin & Bang, 2014). SCT provides the structural foundation: the shared participation, joint meaning making, and distributed problem solving that make engineering possible (Gutiérrez & Rogoff, 2003; Rogoff, 1998; Vygotsky, 1978). The EoC provides the relational integrity: the moral attentiveness, empathy, and mutual responsibility that hold children's collaborative work together (Gilligan, 1982; Goldstein, 1999; Noddings, 2013). CRP provides the cultural substance: the community knowledge, values, and identity resources that give engineering problems their meaning and purpose (Bang et al., 2007; Ladson-Billings, 1995; Paris, 2012). When these strands operate together, engineering becomes a practice

through which children address concerns that matter to their communities, promote fairness and inclusion, and sustain participation in shared classroom life.

Drawing on SCT, the EoC, and CRP, RPS conceptualizes ECE engineering as a practice that is simultaneously socially mediated, morally responsive, and culturally situated. Rather than treating these dimensions as additive, RPS understands them as inseparable: how children engage in engineering design by defining problems, collaborating toward solutions, and evaluating outcomes is always shaped at once by the social relationships surrounding them, the ethical responsibilities of those relationships, and the cultural meanings they bring to the shared inquiry. RPS positions engineering as a mutually responsive practice in which both children and teachers learn to attend to one another's concerns, values, and ways of making meaning.

This integrated framing can be seen most clearly when applied to the phases of the engineering design process (EDP), where the relational, ethical, and cultural dimensions of problem solving become visible in practice. The EDP is a widely used curricular structure in ECE that guides children through iterative phases of problem solving. This article uses the child-friendly structure outlined by Tank et al. (2018) to describe the phases of the EDP: Define, Learn, Plan, Try, Test, and Decide. While this structure offers clarity and accessibility for young learners, its use in classroom practice can reinforce a narrow conception of engineering as primarily technical and procedural (Crismond & Adams, 2012; Cunningham, 2018). The preceding section established what SCT, the EoC, and CRP each contribute to understanding engineering as a practice of collaborative inquiry, moral engagement, and cultural meaning making. This section applies that integrated RPS framework directly to each EDP phase, showing how

reinterpreting the process transforms it from a procedural sequence into a richer structure for engineering in ECE. Table 1 synthesizes these reinterpretations, and the sections that follow illustrate each phase with examples from ECE classroom life.

Table 1

Reframing the EDP Through Sociocultural, Relational, and Cultural Perspectives

Engineering Design Phase	Dominant Framing in Conventional Models	Reframed Through SCT, the EoC, and CRP	Curricular Significance
Define	Identifying a problem or need	Collective interpretation of what matters within a classroom community	Positions curriculum as responsive to lived experience and relational disruption
Learn	Gathering information to support design	Distributed sensemaking across peers, teachers, families, and cultural communities	Expands knowledge sources beyond technical information to include cultural and relational knowledge
Plan	Selecting and organizing a solution	Negotiated planning shaped by dialogue, care, and cultural expectations	Frames planning as ethical and participatory curriculum work

Try	Implementing a chosen solution	Coordinated collective action attentive to participation and responsiveness	Emphasizes enactment as socially mediated and relationally accountable
Test	Evaluating solutions against predefined criteria	Relational and culturally situated evaluation of effects on shared activity	Reorients assessment toward community impact and inclusion
Decide	Selecting a final or optimal solution	Ongoing reflection and shared responsibility over time	Treats curriculum decisions as provisional, revisable, and ethically consequential

Define: Collectively Interpreting a Problem

Defining a problem is often presented as identifying a need or challenge (Crismond & Adams, 2012; Tank et al., 2018). Within RPS, problem definition is understood as a collective, morally attentive, and culturally situated act rather than a purely technical step preceding solution development. Children define problems through conversation, shared observation, and negotiation as they participate in classroom activity (Gutiérrez & Rogoff, 2003; Rogoff, 1998), recognizing shared issues because they disrupt relationships, leave needs unmet, and challenge expectations for participation (Bang & Medin, 2010; Noddings, 2013). What counts as a problem is always culturally shaped; children from different cultural communities may recognize different forms of

relational disruption and contribute diverse perspectives on what requires attention (Bang & Medin, 2010; Gutiérrez & Rogoff, 2003). Consider a kindergarten class in which a small group disagrees about how to build a shared block structure: one child wants to make it tall, another wants to make it wide, and a third feels her idea is not being heard. In a conventional EDP framing, the teacher might redirect the group toward the structural challenge and treat the disagreement as an obstacle to the task. Within RPS, the teacher instead recognizes the breakdown in shared participation as the problem itself, one to be taken up as a shared concern and addressed through the same interpretive and design-oriented thinking children would bring to any engineering challenge.

Learn: Gathering Knowledge from Multiple Perspectives

The Learn phase is often framed as gathering information to inform design decisions (Tank et al., 2018). Within RPS, learning is distributed across peers, teachers, families, and cultural communities. Children learn by observing how others experience a situation, listening to peers' interpretations, and drawing on shared knowledge developed through interaction (Gutiérrez, 2008; Rogoff, 2003; Vygotsky, 1978), while attending carefully to how peers are affected and what forms of support or adjustment may be needed (Gilligan, 1982; Noddings, 2013). Cultural knowledge from home and community further expands what counts as relevant information, contributing diverse ways of understanding what is happening and why it matters (Ladson-Billings, 1995; Paris, 2012; Paris & Alim, 2017). Returning to the kindergarten group, the teacher might invite each child to share what they were hoping to build and why it mattered to them. One child explains that building it tall reminds her of the apartment building where her grandmother lives; another says he wants to make it wide so everyone has room to add

pieces. The third child, who speaks English as a second language, has been gesturing toward a different arrangement but has not yet found the words to explain it. The teacher notices her hesitation and creates space for her to draw her idea instead, recognizing that learning in this context means attending to how each child is able to participate and what barriers might be preventing full contribution. This exchange expands what counts as relevant knowledge, moving beyond technical criteria to include the experiences, values, and relational concerns each child brings to the shared task.

Plan: Negotiating and Making Meaning Together

Planning a solution unfolds as a collaborative process that requires communication, compromise, and foresight (Tank et al., 2018; Wendell et al., 2017). Within RPS, planning emerges through shared thinking and coordinated participation rather than individual decision making (Rogoff, 1998), and carries ethical significance because decisions about whose ideas are taken up, how responsibilities are distributed, and how disagreements are addressed all shape the relational life of the classroom (Gilligan, 1982; Noddings, 2013). Cultural values and community expectations further shape which solutions are seen as appropriate or desirable within the group (Ladson-Billings, 1995; Paris, 2012; Paris & Alim, 2017). In the kindergarten group, the children and teacher work together to revisit each child's idea, including the third child's drawing, which shows a structure with a tall tower connected to a wide base. The group recognizes her drawing as a solution that incorporates both ideas, and they agree to use it as their plan. Planning here is not simply a matter of selecting an efficient solution but of negotiating whose contributions are visible, how fairness is practiced, and what the group owes one another in the process of designing together.

Try: Acting Collectively and Responsively

When children try their planned solutions, they engage in collective action shaped by interaction, experimentation, and ongoing feedback (Tank et al., 2018). Within RPS, this phase involves coordinated participation in which children adjust strategies in response to one another's actions and ideas as the activity unfolds (Rogoff, 1998), remaining attentive to peers' uncertainty, offering encouragement, and adjusting roles or strategies to support continued participation (Goldstein, 1999; Noddings, 2013). A solution that is technically workable may still fail to sustain participation if it does not align with the cultural meanings and shared norms of the group (Paris, 2012; Paris & Alim, 2017). As the kindergarten group begins building, one child starts placing blocks quickly, and the third child, whose drawing became the plan, quietly moves to the edge of the group and watches. Rather than continuing without her, another child stops and says, “Wait, she should put the pieces in since it was her idea.” This moment of attentiveness, noticing a peer's withdrawal and responding to it, is itself part of enacting the solution, as much as any adjustment to the blocks.

Test: Evaluating for Relational Impact

When children try their planned solutions, they engage in collective action shaped by interaction, experimentation, and ongoing feedback (Tank et al., 2018). Within RPS, this phase involves coordinated participation in which children adjust strategies in response to one another's actions and ideas as the activity unfolds (Rogoff, 1998), remaining attentive to peers' uncertainty, offering encouragement, and adjusting roles or strategies to support continued participation (Goldstein, 1999; Noddings, 2013). A solution that is technically workable may still fail to sustain participation if it does not

align with the cultural meanings and shared norms of the group (Paris, 2012; Paris & Alim, 2017). As the kindergarten group begins building, one child starts placing blocks quickly, and the third child, whose drawing became the plan, quietly moves to the edge of the group and watches. Rather than continuing without her, another child stops and says, "Wait, she should put the pieces in since it was her idea." This moment of attentiveness, noticing a peer's withdrawal and responding to it, is itself part of enacting the solution, as much as any adjustment to the blocks.

Decide: Reflecting Collectively and Sustaining Shared Responsibility

Deciding is often presented as selecting a final or optimal solution, but within RPS it is better understood as an ongoing process of collective reflection and shared responsibility. The kindergarten group's decision does not end when they finish building. Later that day, the teacher invites the group to reflect on whether the way they worked together felt fair, and whether there is anything they would want to do differently next time a disagreement comes up. One child suggests they could make a rule that everyone shares their idea before anyone starts building together, and the others agree. This decision, reached through collaboration, reflects the ongoing nature of deciding within RPS. Decisions are not endpoints but commitments that evolve as children continue to participate in shared classroom life (Gilligan, 1982; Ladson-Billings, 1995; Rogoff, 1998).

Taken together across phases, the reframed EDP positions peer conflict and relational disruption not as interruptions to learning but as generative sites for collective inquiry. Children move from recognizing relational tensions as matters of shared concern, to learning through attentiveness to multiple perspectives, to negotiating plans that reflect

care, cultural values, and community expectations. Trying and testing solutions become moments of ethical enactment in which children attend to how their actions affect participation, relationships, and shared activity, while deciding remains open to revision as circumstances and understandings evolve. Rather than progressing linearly toward closure, the process unfolds as a recursive and socially mediated practice shaped by dialogue, responsibility, and cultural meaning making. In this way, the EDP operates as a curricular structure through which children engage in interpretive work, negotiate belonging, and sustain participation within their classroom communities. This reconceptualization challenges technical and individualistic accounts of engineering by foregrounding the social, moral, and cultural dimensions of design, positioning young children as capable contributors who use problem solving to respond to concerns that matter in their shared worlds.

Implications for Curriculum Theory

Reframing early childhood engineering through RPS carries significant implications for curriculum theory, particularly for how curriculum is understood in practice. From a curriculum implementation perspective, RPS aligns with views of curriculum as an interpretive and enacted practice rather than a fixed sequence of activities (Aoki, 2005; Pinar, 2019). Teachers do not simply deliver engineering tasks but continuously interpret and adapt them in response to children's interactions, concerns, and emerging relational dynamics.

A central implication is the need to expand what counts as a legitimate engineering problem. Traditional engineering tasks prioritize structural or functional outcomes (Crismond & Adams, 2012; Tank et al., 2018), whereas RPS positions

classroom community concerns, such as coordinating shared plans, negotiating participation, and responding to conflict, as authentic sites of engineering work. Recognizing these moments as engineering challenges disrupts the separation between technical and relational knowledge and supports curriculum designs that reflect children's lived participation in classroom communities (Aoki, 2005; Pinar, 2019).

RPS also reframes collaboration as an ethical and socially mediated dimension of curriculum rather than a procedural feature of design tasks. While existing engineering frameworks emphasize co-construction, they often foreground cognitive processes and underrepresent the moral responsibilities embedded in children's interactions (Fleer, 2021; Lippard et al., 2019). Through this lens, engineering involves decisions about whose needs are recognized, whose perspectives are included, and how shared activity is sustained (Leydens & Lucena, 2017). For curriculum theory, this underscores the importance of designing learning environments that support communication, negotiation, and shared responsibility as central components of engineering work.

Cultural context similarly becomes foundational for curriculum theorizing. Rather than treating culture as an external influence, RPS positions cultural knowledge and community values as integral to how problems are defined, solutions are developed, and outcomes are evaluated (Bang et al., 2007; Ladson-Billings, 1995; Paris & Alim, 2017). This shifts curriculum from the application of universal design principles to a practice that is accountable to the cultural contexts in which learning occurs.

Finally, RPS raises questions about agency and participation in curriculum implementation. When children contribute to defining problems, shaping processes, and evaluating outcomes, engineering becomes a site of democratic participation (Dewey,

1938; Rogoff, 2003). This aligns with curriculum traditions that view learning as co-constructed and positions teachers as designers of environments that support collective agency and shared responsibility (Biesta, 2015; Hopmann, 2009).

Implications for Practice

RPS understands engineering in ECE as a collaborative endeavor shaped by both teacher guidance and children's agency. Teachers create conditions for inquiry, model relational dispositions, and at times step in to name or redirect activity, while also stepping back to allow children to define problems, negotiate solutions, and take responsibility for outcomes. This dynamic, in which authority is shared and responsive rather than fixed, applies across both structured design tasks and the informal play through which children navigate social and material challenges.

When engineering is understood through RPS, teachers are called to attend to the social, ethical, and cultural dimensions of children's design activity as they emerge in practice, rather than treating these as separate concerns. This involves shifts in how teachers observe children, structure inquiry, and interpret the significance of engineering moments, including those that may not initially appear as engineering (van Es & Sherin, 2008). A teacher practicing RPS does not only ask, “Are my students following the design process?” but also, “Who is being heard in this group? Whose knowledge is shaping this solution? What relationships are being built or strained by this activity?”

A primary implication for practice is supporting children in defining problems that emerge from their social and cultural experiences. Teachers can observe patterns of peer conflict, exclusion, or uneven participation and use these observations to facilitate discussions in which children articulate shared concerns (Sherin & van Es, 2009). For

example, a teacher who notices that the same child is consistently overlooked during group planning might open a discussion by asking, “I noticed something about how we were working together today. Did anyone else notice something about that?” This move positions children as co-definers of the problem, draws on collective observation, attends to relational needs, and affirms that fairness and belonging are legitimate engineering concerns.

Another implication involves the creation of collaborative inquiry structures. Teachers can support this by designing engineering tasks that require joint planning, shared decision making, and coordinated action, such as prompting children to seek information from peers, consider multiple perspectives, and incorporate community knowledge into their reasoning (Crismond & Adams, 2012; Gutiérrez & Rogoff, 2003; Lee, 2020; Tank et al., 2018). For instance, a teacher might structure a planning conversation by asking children to share one thing they learned from a peer before proposing their own idea or invite a family member to contribute knowledge relevant to the design challenge. These practices position learning as distributed across the classroom community rather than centered solely on the teacher.

RPS also calls teachers to model the relational dispositions they aim to cultivate. This includes practicing active listening during disagreements, naming care and responsibility as part of engineering work, and guiding children in attending to one another's experiences throughout the design process (Goldstein, 1999; Noddings, 2013). A teacher who says, “Before we decide on a plan, let's think about how this will work for everyone,” is not only managing group dynamics but teaching children that engineering solutions are evaluated in part by their effects on relationships.

CRP provides additional guidance by emphasizing the integration of cultural knowledge into engineering. Teachers can create opportunities for children to bring experiences from home into the classroom, consult with family members, and draw on cultural narratives connected to the problems they identify (Ladson-Billings, 1995; Paris, 2012; Paris & Alim, 2017). They can also select materials and design contexts that reflect cultural practices and support continuity between school and community. These practices affirm children's identities and deepen the meaning of engineering work.

Importantly, RPS is not implemented by applying SCT, the EoC, and CRP separately or in sequence, but by holding them together as an integrated professional stance. Teachers who are attentive to social dynamics, responsive to relational needs, and grounded in cultural knowledge are better positioned to recognize the full range of engineering thinking children bring to the classroom and to design learning environments that support it.

Conclusion

This article has argued that narrow framing of engineering as a technical activity overlooks the relational, ethical, and culturally grounded dimensions of engineering that shape how young children learn and participate within their classroom communities. RPS, developed here by integrating SCT, the EoC, and CRP, conceptualizes engineering as a practice that emerges through shared inquiry, moral engagement, and cultural meaning making, challenging assumptions of neutrality and universality that have shaped STEM curriculum across diverse national and educational contexts (Bang et al., 2007; Noddings, 2013; Rogoff, 2003).

For teachers, RPS offers not a checklist but a professional orientation: a way of seeing engineering moments as simultaneously relational, ethical, and cultural, and of designing learning environments that honor the full range of thinking and knowing children bring to the classroom. For curriculum theorists, RPS identifies engineering as a generative site for questions of participation, care, and cultural accountability, concerns that curriculum theory is well equipped to advance. A central contribution of this article is the integration of SCT, the EoC, and CRP into a unified framework for understanding engineering as relational, ethical, and culturally situated curriculum practice. Framed through RPS, engineering becomes a form of democratic participation through which young children contribute to more caring and inclusive classroom communities (Biesta, 2015; Dewey, 1916).

References

Aoki, T. T. (2005). *Curriculum in a new key: The collected works of Ted T. Aoki* (W. F. Pinar & R. L. Irwin, Eds.). Lawrence Erlbaum Associates.

Apple, M. W. (2004). *Ideology and curriculum* (3rd ed.). Routledge.

Bagiati, A., & Evangelou, D. (2016). Practicing engineering while building with blocks: Identifying engineering thinking. *European Early Childhood Education Research Journal*, *24*(1), 67–85. https://doi.org/10.1080/1350293X.2015.1120521

Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education, 94*(6), 1008-1026. https://doi.org/10.1002/sce.20392

Bang, M., Medin, D., & Atran, S. (2007). Cultural mosaics and mental models of nature. *Proceedings of the National Academy of Sciences, 104*(35), 13868-13874. https://doi.org/10.1073/pnas.0706627104

Berland, L. K., & Steingut, R. (2016). Explaining variation in student efforts towards using math and science knowledge in engineering contexts. *International Journal of Science Education, 38*(18), 2742-2761. https://doi.org/10.1080/09500693.2016.1260179

Biesta, G. J. J. (2015). *Good education in an age of measurement: Ethics, politics, democracy.* Routledge.

Bucciarelli, L. L. (1996). *Designing engineers.* MIT Press.

Castagno, A. E., & Brayboy, B. M. K. J. (2008). Culturally responsive schooling for Indigenous youth: A review of the literature. *Review of Educational Research, 78*(4), 941–993. https://doi.org/10.3102/0034654308323036

Cech, E. A. (2014). Culture of disengagement in engineering education? *Science, Technology, & Human Values, 39*(1), 42-72. https://doi.org/10.1177/0162243913504305

Connelly, F. M., & Clandinin, D. J. (1988). *Teachers as curriculum planners: Narratives of experience*. Teachers College Press.

Crismond, D., & Adams, R. (2012). The informed design teaching and learning matrix. *Journal of Engineering Education, 101*(4), 738-797. https://doi.org/10.1002/j.2168-9830.2012.tb01127.x

Cunningham, C. M. (2018). Engineering in elementary STEM education: Curriculum design, instruction, learning, and assessment. Teachers College Press.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. Macmillan.

Dewey, J. (1938). *Experience and education*. Macmillan.

Dubosarsky, M., John, M. S., Anggoro, F., Wunnava, S., & Celik, U. (2018). Seeds of STEM: The development of a problem-based STEM curriculum for early childhood classrooms. In L. English & T. Moore (Eds.), *Early engineering learning* (pp. 249–269). Springer.

Fleer, M. (2021). A cultural-historical critique of how engineering knowledge is constructed through research in play-based settings: What counts as evidence and what is invisible? *Research in Science Education, 52*, 1355–1373. https://doi.org/10.1007/s11165-021-10012-y

Forman, G., & Fyfe, B. (2012). Negotiated learning through design, documentation, and discourse. In C. Edwards, L. Gandini, & G. Forman (Eds.), *The hundred languages of children: The Reggio Emilia experience in transformation* (3rd ed., pp. 247-272). Praeger. https://doi.org/10.5040/9798400667664.ch-014

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Harvard University Press.

Gold, Z. S., Elicker, J., Kellerman, A. M., Christ, S., Mishra, A. A., & Howe, N. (2021). Engineering play, mathematics, and spatial skills in children with and without disabilities. *Early Education and Development*, *32*(1), 49–65. https://doi.org/10.1080/10409289.2019.1709382

Goldstein, L.S. (1999). The relational zone: The role of caring relationships in the co-construction of mind. *American Educational Research Journal, 36*(3)*,* 647-673. http://doi.org/10.3102/00028312036003647

González, N., Moll, L. C., & Amanti, C. (2005). *Funds of knowledge: Theorizing practices in households, communities, and classrooms.* Routledge. https://doi.org/10.4324/9781410613462

Gutiérrez, K. (2008). Developing a sociocritical literacy in the third space. *Reading Research Quarterly, 43*(2), 148–164. https://doi.org/10.1598/RRQ.43.2.3

Gutiérrez, K., & Rogoff, B. (2003). Cultural ways of learning. *Educational Researcher, 32*(5), 19–25. https://doi.org/10.3102/0013189X032005019

Hopmann, S. (2009). No child, no school, no state left behind. *Journal of Curriculum Studies, 40*(4), 417–456. https://doi.org/10.1080/00220270801989818

Ingold, T. (2013). *Making: Anthropology, archaeology, art and architecture*. Routledge.

Johri, A., & Olds, B. M. (2011). Situated engineering learning: Bridging engineering education reserach. *Journal of Engineering Education, 100*(1), 151–185. https://doi.org/10.1002/j.2168-9830.2011.tb00007.x

Kolodner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., Puntambekar, S., & Ryan, M. (2003). Problem-based learning meets case-based reasoning in the middle-school science classroom: Putting Learning by Design™ into practice. *Journal of the Learning Sciences, 12*(4), 495–547. https://doi.org/10.1207/S15327809JLS1204_2

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465–491. https://doi.org/10.3102/00028312032003465

Lee, O. (2020). Making everyday phenomena phenomenal: Using phenomena to promote equity in science education. *Science and Children, 58*(1), 56-61. https://www.nsta.org/science-and-children/science-and-children-septemberoctober-2020/making-everyday-phenomena

Leydens, J. A., & Lucena, J. C. (2017). *Engineering justice: Transforming engineering education and practice*. Wiley.

Lippard, C. N., Lamm, M. H., Tank, K. M., & Choi, J. Y. (2019). Pre-engineering thinking and the engineering habits of mind in preschool classroom. *Early Childhood Education Journal*, *47*(2), 187–198. https://doi.org/10.1007/s10643-018-0898-6

Lottero-Perdue, P. S., & Parry, E. A. (2017). Elementary teachers' reflections on design failures and use of fail words after teaching engineering for two years. *Journal of Pre-College Engineering Education Research, 7*(1), Article 1. https://doi.org/10.7771/2157-9288.1160

Medin, D. L., & Bang, M. (2014). *Who's asking? Native science, western science, and science education.* MIT Press.

Moore, T. J., Glancy, A. W., Tank, K. M., Kersten, J. A., Smith, K. A., & Stohlmann, M. S. (2014). A framework for quality K-12 engineering education: Research and development. *Journal of Pre-College Engineering Education Research, 4*(1), Article 2. https://doi.org/10.7771/2157-9288.1069

National Research Council. (2012). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. National Academies Press.

Noddings, N. (1984). *Caring: A feminine approach to ethics and moral education.* University of California Press.

Noddings, N. (2013). *Caring: A relational approach to ethics and moral education* (2nd ed.). University of California Press.

Owens, L. M., & Ennis, C. D. (2005). The ethic of care in teaching: An overview of supportive literature. *Quest, 57*(4), 392-425. https://doi.org/10.1080/00336297.2005.10491864

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93-97. https://doi.org/10.3102/0013189X12441244

Paris, D., & Alim, H. S. (Eds.) (2017). *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world*. Teachers College Press.

Pawley, A. L. (2019). Learning from small numbers: Studying ruling relations that gender and race the structure of U. S. engineering education. *Journal of Engineering Education, 108*(1), 13-31. https://doi.org/10.1002/jee.20247

Pinar, W. F. (2019). *What is curriculum theory?* (3rd ed.). Routledge.

Ramanathan, G., Cosso, S., & Pool, J. (2024). Engineering in preschool: What little minds can teach us about big skills. *Early Childhood Education Journal, 52*, 1245–1257. https://doi.org/10.1007/s10643-023-01512-9

Ramani, G. B., & Brownell, C. A. (2014). Preschoolers' cooperative problem solving: Integrating play and problem solving. *Journal of Early Childhood Research*, *12*(1), 92–108. https://doi.org/10.1177/1476718X13498337

Riley, D. (2008). *Engineering and social justice.* Morgan & Claypool Publishers.

Rogoff, B. (1998). Cognition as a collaborative process. In W. Damon, D. Kuhn, & R. S. Siegler (Eds.), *Handbook of child psychology, vol. 2: Cognition, perception, and language* (pp. 679-744). Wiley.

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Sevenhuijsen, S. (1998). *Citizenship and the ethics of care*. Routledge.

Sherin, M. G., & van Es, E. A. (2009). Effects of video club participation on teachers' professional vision. *Journal of Teacher Education, 60*(1), 20-37. https://doi.org/10.1177/0022487108328155

Sikder, S. (2024). Studying children's small science and early engineering learning process to help shape their cultural identity in culturally valued play-based

experience. *Cultural Studies of Science Education, 19*, 231-255. https://doi.org/10.1007/s11422-023-10209-9

Tank, K. M., Rynearson, A. M., & Moore, T. J. (2018). Examining student and teacher talk within engineering design in kindergarten. *European Journal of STEM Education, 3*(3), Article 10. https://doi.org/10.20897/ejsteme/3870

Urban, M. (2008). Dealing with uncertainty: Challenges and possibilities for the early childhood profession. *European Early Childhood Education Research Journal, 16*(2), 135–152. https://doi.org/10.1080/13502930802141584

van Es, E. A., & Sherin, M. G. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education, 24*, 244-276. https://doi.org/10.1016/j.tate.2006.11.005

Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes*. Harvard University Press.

Wendell, K. B., Wright, C. G., & Paugh, P. (2017). Reflective decision-making in elementary students' engineering design. *Journal of Engineering Education, 106*(3), 356-397. https://doi.org/10.1002/jee.20173

MANUSCRIPT II

"What's the Problem?": Helping Children Use the Engineering Design Process to Work Through Peer Conflict

This manuscript is prepared for submission to the peer-reviewed journal *Young Children* and is the second of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

This article describes how one Science, Technology, Engineering, Art, and Math (STEAM) teacher used the engineering design process (EDP) to help kindergarten through second grade students navigate peer conflict. Through design challenges, social problem-solving stories, visual supports, and ongoing teacher reflection, students developed shared language and strategies for communicating, collaborating, and repairing relationships.

"What's the Problem?": Helping Children Use the Engineering Design Process to Work Through Peer Conflict

"Max has a problem. He wants to play with Lola at recess, but she wants to play a girls-only game. Max feels left out. What should he do?"

I read this scenario aloud to seven second graders gathered around a table, each with their own copy and a chart showing our familiar problem-solving steps. Students had markers to color in their charts as we worked through the scenario together. "Let's start with the first step," I said, pointing to the blue box at the top of the classroom chart. "What's the problem?"

During the lesson, one student made a connection to a previous problem-solving scenario. "I know why Lola didn't want to play with Max," he said. "Because last time, he kept grabbing all her stuff." Although I had written each scenario as a separate lesson, the shared language and routine gave students a way to carry problem-solving ideas forward and apply them to new situations.

The Engineering Design Process: A Shared Classroom Language

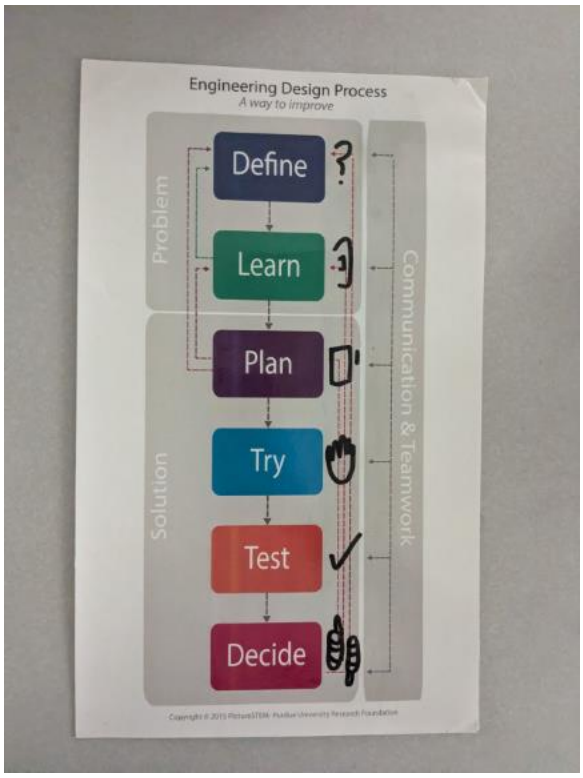
Moments like the one above became a regular occurrence in my Science, Technology, Engineering, Art, and Math (STEAM) classroom, where I taught kindergarten, first, and second grade students at a school on the Navajo Nation for approximately thirty minutes each week. Because our time together was limited, I intentionally built continuity across sessions. I noticed early on that the engineering design process (EDP) gave students a shared vocabulary, first during design challenges and later during peer conflict.

This article describes how I adapted an engineering design curriculum to support peer conflict resolution in my classroom. Applying the EDP to peer conflict was not a simple matter of introducing the steps and expecting children to use them independently. It required ongoing reflection and adjustment as I revised prompts, modeled problem-solving language, and decided when to step in, when to step back, and when to treat conflict as a problem-solving opportunity. My use of the EDP treats conflict as something children can work through thoughtfully and collaboratively, rather than as a disruption to end quickly. While this approach grew out of one classroom and community, teachers in other settings could adapt the same process to reflect their own students, relationships, and community values.

The EDP is a structured, iterative approach to solving problems (Blank & Lynch, 2018). I used the six EDP steps from the *PictureSTEM* curriculum: Define, Learn, Plan, Try, Test, and Decide (Tank et al., 2017). *PictureSTEM* makes these steps visible through a color-coded classroom chart and individual student copies, which helped my students track where they were in the process during a lesson. I added simple symbols alongside the colors to make the chart more accessible for pre-readers (see Figure 1).

Figure 1

EDP Color-Coded Chart



Note: PictureSTEM chart with symbols added by teacher.

In the *PictureSTEM* "Designing Paper Baskets" unit, students first used the EDP to solve a design problem for fictional characters named Max and Lola, who needed baskets for visitors to carry rocks home. Students defined the problem, learned about paper properties, planned and built a basket, tested its strength, and decided whether to recommend or revise their design. For the design work, I used *PictureSTEM* as a foundation while substituting many of the original picture books with books by Native authors that centered weaving and the Southwest, connecting the challenge to students' cultural heritage.

For the social-emotional work, I drew on the same six-step framework and developed my own Max and Lola problem-solving stories. As the semester unfolded, these stories became one place where reflection and adjustment mattered most. I revised

scenarios, prompts, and discussion questions as I noticed what students could do independently and where they needed more modeling, practice, or time.

Table 1 grew out of that sequence. After the design challenge, I introduced a classroom chart that mapped the EDP steps students already knew onto peer conflict situations. Rather than presenting the chart as finished, I built it with students as we worked through social scenarios. This allowed me to adjust questions and examples based on what students understood easily and what needed more modeling. Teachers in other contexts might connect the same steps to the values and language of their own communities.

Table 1

Guiding Questions for Applying the EDP to Design Challenges and Peer Conflict Resolution

EDP Step	In a Design Challenge	In a Peer Conflict
Define	Who has the problem? What do they need?	What is the problem?
Learn	What do we know about the materials? What has already been tried?	Notice your friend's face and body. Listen to your friend's words. What do you both like to do together?
Plan	What are some possible solutions? Which one should we try?	What are some ways to solve the problem? Which one should we try?
Try	Build your design.	Do the plan you decided on together.

Test	Did your design work? Does it meet the criteria?	Did your plan work? Are you both okay with the solution?
Decide	Is your design good enough, or do you need to try something different?	Did you solve your problem? Do you need to try something different? Did you bring your friendship back into harmony?

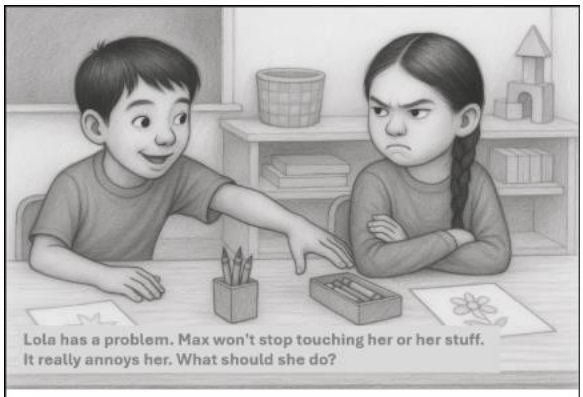
Three shifts were especially important when I translated the EDP from design work to peer conflict: redefining Define to focus on the situation rather than blame, expanding Learn to include perspective-taking and emotion recognition, and treating Decide as a relational judgment about whether harmony had been restored. In design challenges, Define begins by identifying the needs of the person with the problem, while in peer conflict, the question shifts to the situation itself to avoid assigning blame too quickly. Learn asks students to observe a friend's face, body language, and words before moving toward a solution. Decide shifts the goal from selecting the most efficient solution to reaching a consensus that restores the relationship. These shifts became clearer through practice as I revisited what each step meant when the "problem" was not a design challenge, but a relationship that needed repair.

For both applications, I reimagined Max and Lola as Navajo children, using AI-generated images and scenarios with settings my students would recognize. I wanted students to see children who looked more like them, since young children make meaning more readily when classroom materials reflect recognizable people, places, and relationships (NAEYC, 2019). Students began to treat Max and Lola as peers in their own cultural and social world. First graders used Navajo words to evaluate the characters'

choices, linking decisions to *k'é*, *na'nitin*, and *hózhó*. Second graders greeted new scenarios with “Oh yeah, Max and Lola!” and reasoned about the characters with the same relational memory they would use for classmates. The familiarity students built with these characters through engineering challenges carried into the social problem-solving stories (see Figure 2).

Figure 2

Sample Problem-solving Scenario Using the EDP for Peer Conflict Resolution



Define	What’s the problem?
Learn	How does Lola feel? How does Max feel?
Plan	What can they do to solve the problem?
Try	They try the plan.
Test	Did the plan work well?
Decide	Did they solve the problem?

Note: Image generated using ChatGPT.

My goal was not for students to execute all six steps perfectly or memorize the process. Instead, I wanted them to begin seeing conflict as something they could work through together. The EDP gave us a way to slow down, name the problem, listen to one another, and decide what to try next, rather than simply reacting in the moment.

From Design Problems to Relationship Problems: One Process, Two Contexts

In early childhood classrooms, children benefit from repeated opportunities to practice social problem-solving with teacher support (Ho & Funk, 2018). The following descriptions show how I used each EDP step across kindergarten, first grade, and second grade, adjusting the questions and scaffolds based on what I noticed students needed during lessons and peer interactions. Over time, these adjustments helped me use the steps less as a fixed procedure and more as a flexible support for helping children slow down, communicate, and repair relationships.

Define: Naming the Problem

In the recess scenario that opens this article, students identified the problem without hesitation: Max feels left out because Lola won't let him play. In my classroom, students were often able to name problems quickly but had more difficulty pausing long enough to consider possible responses. One early adjustment I made was to model problem definition in neutral, shared terms. Instead of asking who caused the problem, I helped students name what was happening so they could move toward problem solving rather than blame. During a kindergarten activity, students argued over a long piece of string. I stepped in and said, "It looks like you both want the same piece of string," shifting the focus toward the shared problem.

During another first-grade lesson, I introduced a scenario: "Lola has a problem. Max won't stop touching her or her stuff, and it really annoys her. What should she do?" A student named the problem immediately: "She doesn't want Max to touch her or her stuff." But when asked what Lola should do, one student suggested slapping Max's hands away. This pattern appeared across lessons: students could identify problems clearly but

often moved quickly to action without considering alternatives (Pieng & Okamoto, 2020). The EDP creates a pause between naming a problem and responding to it.

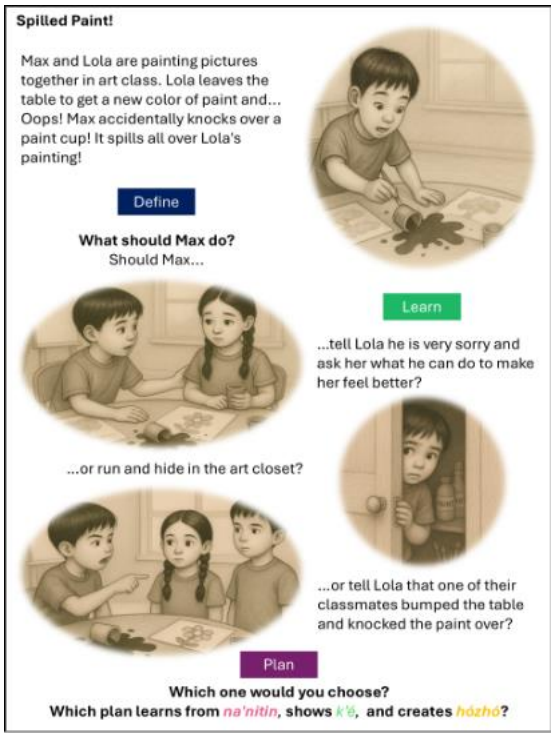
Learn: Listening to Understand

Working through the recess scenario, first graders were asked not only how Max felt when Lola excluded him, but how Lola felt. One student placed a sad face sticker on her chart for Max and a happy face for Lola, explaining, "Lola might just want to play with her other friends." That moment of perspective-taking, considering both sides rather than only the person who felt hurt, is what the Learn step asks young children to practice (Zinsser et al., 2015).

Because perspective-taking can be abstract, I sometimes acted out possible responses so students could compare how different choices might affect a friendship. In a second-grade lesson, I introduced a scenario in which Max accidentally knocked over a paint cup and ruined Lola's painting (see Figure 3). Another teacher and I acted out Max's possible choices: apologizing honestly, running and hiding, and blaming someone else. When asked which choice showed care and respect for Lola, students identified the apology without hesitation.

Figure 3

Define, Learn, and Plan Steps of "Spilled Paint!"



Note: Images generated using ChatGPT.

The Learn step also reminded me to slow down and study what children were actually doing. During a kindergarten lesson, the class seemed distracted, with children talking over each other and arguing about rocks. When I reflected back on the lesson, I realized that what first seemed like distraction was actually children pointing out differences in the rocks and meeting the lesson objectives. That realization helped me distinguish between off-task behavior and children's active meaning-making.

Plan: Generating More Than One Idea

Sometimes planning showed up in formal lessons, and sometimes it surfaced in everyday classroom life. One day at the lunch table, I overheard second-grade girls working through a friendship problem. One girl said, "Sometimes she's my friend, and sometimes she's not." Another agreed: "Sometimes she doesn't want to play with us at recess. I'll ask her if she wants to play today." They had named the problem, discussed

what they knew about their friend's preferences, and made a plan for the next recess. That conversation informed the recess scenario I later used with all three grades and reminded me that the most useful social stories came from the friendship problems students were already trying to solve.

The Plan step asks students to generate more than one possible solution before deciding what to do (Tank et al., 2017). Working through the recess scenario, I had prepared two choices for students to evaluate: Lola could play with other friends at first recess and with Max at second recess, or Max could get angry and disrupt the game. I expected first graders to choose the first option and move on. Instead, they generated their own ideas: "Boys and girls could play a game together." "Max could ask Lola nicely if he can play." "Maybe Lola would let him play." Planning may require scaffolding at first, but children are often capable of generating their own, more creative solutions (Vygotsky, 1986; Bairaktarova et al., 2011).

Try: Putting the Plan into Action

The Try step is where planning becomes doing. In engineering, students build their design and see what happens. In social scenarios, Try looks different because students cannot always try out the plan in real time. In the recess scenario, students imagined the outcome, which gave them practice thinking through consequences before acting (Ramanathan et al., 2024).

At other times, students saw real-life examples of trying a plan. During a first-grade lesson on Lola's problem with Max touching her, a student grabbed my arm while I was passing out materials. My first impulse was to redirect the behavior quickly, but the moment connected directly to the scenario. I turned to the class and said, "Oh, this just

happened to Lola. What could I do, like Lola? I could say, 'Please don't grab my arm.'" The student grinned and let go. Because we had already practiced Define, Learn, and Plan through stories, I used the moment to model what trying a respectful solution could sound like in real time. Naming the connection out loud helped students see that the same process we used in stories could apply to everyday interactions.

Test: Did It Work?

Testing in engineering means evaluating whether the design met the criteria: not whether it was good enough in general, but whether it solved the specific problem it was designed to solve (Moore et al., 2014). In conflict resolution, the same question applies (Yazzie, 1994): Did the plan make things better for everyone involved?

Working through the recess scenario, second graders evaluated a plan in which Lola played with other friends during first recess and Max during second recess. They concluded, "They both felt good about it." "Lola got to play with the girls." "Max played with new friends." Helping children evaluate whether a solution worked for everyone, not just one person, distinguishes conflict resolution from simply stopping a fight (Nielsen & Zion, 2005). Over time, I had to make this difference explicit: a plan had not really "worked" unless both people were okay with the outcome. In my classroom, evaluating whether a solution worked meant considering whether it restored the relationship in ways that aligned with shared values, not just whether the conflict stopped.

Decide: Reflecting and Moving Forward

The Decide step asks whether the solution is good enough, and if not, what comes next. In engineering, this might mean redesigning. In social situations, it means acknowledging what happened, choosing how to move forward, and carrying that

learning into the next situation (Stevahn et al., 2000). Working through the recess scenario, students across all three grades concluded that the plan had worked for both characters and the friendship was back in harmony.

Sometimes Decide happened during formal story discussions. Other times, it appeared in small classroom moments when children recognized that a plan needed to change. During a second-grade activity, two boys made identical lion masks without looking at each other's work. When the first boy said, "He copied mine!" I reframed it: "I think you both thought of a good idea at the same time." The first boy then said, "Well, don't do your ears the same as mine." The second boy chose a different color for his lion's ears, adjusting his plan to prevent the conflict from continuing. In peer conflict, Decide often looks like this: noticing what still needs attention and making a small change that helps the relationship move forward (Smetana & Killen, 2008).

Reflecting on When to Step In and When to Step Back

Reflection became one of the most important teaching habits I needed for helping students apply the EDP to peer conflict. I had to keep asking what kind of support each situation required: Should I step in and model the language, step back and give students time to try, or pause and name the conflict as a problem-solving opportunity? Over time, I understood these decisions as a balance between stepping in and stepping back.

Early in the semester, most conflicts needed direct mediation or redirection. By the end of the unit, many students were proposing their own compromise plans. This shift reminded me that teacher support changed over time. At first, I needed to model the language, name the steps, and help students slow down. Later, I could step back more often as students became ready to try the process with less adult direction. The timing of

intervention matters: more scaffolding is needed while students are learning the steps, and less as they internalize them (Vygotsky, 1986).

Stepping in is necessary when safety, boundaries, or respect are at stake (McRoy et al., 2022). In these moments, the EDP does not replace adult responsibility; it gives the teacher shared language to use while exercising it. I still needed to stop hurtful behavior, protect children's boundaries, and redirect unsafe choices, but I could often do so while naming the process: What is the problem? What does each person need? What could we try next? Not every conflict needs the same response; how much a teacher intervenes depends on what is actually happening (Myrtil et al., 2021).

Stepping back means resisting the impulse to resolve things quickly and creating space for children to use what they know. For me, this required reflection in the moment. I had to ask whether my intervention would help students use the EDP or whether it would take over the process for them. Early in the semester, I often stepped in too quickly, offering solutions that restored order but left fewer opportunities for children to practice the process and repair relationships themselves.

Later in the semester, I began to notice moments when stepping back created more room for children to respond to one another. During one activity, a first grader became upset about not getting the Play-Doh color she wanted and isolated herself. I decided to observe rather than intervene. A classmate stepped in with kindness and comfort. In moments like this, the goal was not simply to keep the lesson moving, but to create space for students to practice caring for one another.

Knowing when to step in and when to step back is not always clear in the moment. A useful reflective question to ask is: "What does this child need right now in

order to move forward?" Sometimes the answer is direct adult support. Other times, it is time and space to let children work through the conflict themselves. In my experience, the small supports that made this easier included a consistent visual reference, simple stories that let students practice the steps in low-stakes situations, and a willingness to name the steps out loud when conflicts arose: "What's the problem? What do we know? What could we try?"

Small Adjustments That Helped Students Use the EDP

Finding what helped students use the EDP independently took time. Early in the semester, I struggled with establishing routines, keeping instruction focused, and helping students remember the steps during lessons and peer interactions. Students cannot engage meaningfully with content if basic classroom routines and structure are not already in place (NAEYC, 2020). Over time, I found that several small adjustments made the process more visible, predictable, and usable for young children.

- **Make the steps visible.** I displayed a color-coded chart with all six steps and taped copies to student worktables so children could refer to the process during both building activities and peer interactions.
- **Add symbols for prereaders.** Simple symbols alongside the words made the chart more accessible for children who were not yet reading independently.
- **Use hand motions.** Pairing each step with a motion helped children physically rehearse the sequence during transitions and reviews.
- **Start with stories.** Opening each session with a Max and Lola story created a predictable routine and gave students a low-stakes way to practice problem-solving before applying the steps to real peer interactions.

- **Slow down the process.** Early on, I realized that moving through all six steps too quickly made the process feel rushed. Focusing on one or two steps at a time helped students slow down, verbalize their thinking, and understand what each part of the process was asking them to do.

Repetition was also key. Students needed many opportunities to hear the same language, revisit the same steps, and practice with familiar scenarios before they seemed comfortable using the process more independently. Together, these small adjustments helped the EDP become less like a separate lesson and more like a classroom routine students could return to when problems came up. Providing children with consistent routines, language, and opportunities to practice social problem-solving aligns with developmentally appropriate practice in early childhood settings (Ho & Funk, 2018).

Conclusion

The EDP gave my students a shared language for solving problems: first with materials, then with each other. As the teacher, I made that connection explicit, but I also had to revisit and adjust how the process worked in practice. Through repeated stories, visual supports, modeling, and reflection, students began making the connection independently. By the end of the unit, I began to hear this language beyond our lessons. During recess, I overheard a first grader remind a peer to “be fair and find a new idea” when a disagreement arose. In that moment, the language of the EDP had become part of their everyday interactions, not just something used during lessons.

Young children are capable of more sophisticated problem solving than we often give them credit for. They can hold two perspectives at once, generate plans, evaluate whether something worked, and decide to try again. The EDP does not create these

capacities; it gives them a structure and a name. When teachers make that structure visible, practice it in meaningful contexts, and adjust their support over time, children can carry it into moments that matter, contributing to their social competence and ability to build and maintain positive relationships (Heydenberk & Heydenberk, 2007).

References

Bairaktarova, D., Evangelou, D., Bagiati, A., & Brophy, S. (2011). Early engineering in young children's exploratory play with tangible materials. *Children, Youth and Environments*, *21*(2), 212–235. https://doi.org/10.7721/chilyoutenvi.21.2.0212

Blank, J., & Lynch, S. (2018). The design process: Engineering practices in preschool. *Young Children, 73*(4), 78–86. https://www.naeyc.org/resources/pubs/yc/sep2018/design-process-engineering-preschool

Heydenberk, W., & Heydenberk, R. (2007). More than manners: Conflict resolution in primary level classrooms. *Early Childhood Education Journal, 35*(2), 119–126. https://doi.org/10.1007/s10643-007-0185-4

Ho, J., & Funk, S. (2018). Promoting young children's social and emotional health. *Young Children, 73*(1). https://www.naeyc.org/resources/pubs/yc/mar2018/promoting-social-and-emotional-health

McRoy, K., Gerde, H. K., & Linscott, L. (2022). A three-step approach to help children navigate conflict. *Young Children, 77*(3). https://www.naeyc.org/resources/pubs/yc/fall2022/three-step-approach

Moore, T. J., Glancy, A. W., Tank, K. M., Kersten, J. A., Smith, K. A., & Stohlmann, M. S. (2014). A framework for quality K-12 engineering education: Research and development. *Journal of Pre-College Engineering Education Research (J-PEER)*, *4*(1), Article 2. https://doi.org/10.7771/2157-9288.1069

Myrtil, M. J., Lin, T.-J., Chen, J., Purtell, K. M., Justice, L., Logan, J., & Hamilton, A. (2021). Pros and (con)flict: Using head-mounted cameras to identify teachers' roles in intervening in conflict among preschool children. *Early Childhood Research Quarterly, 55*, 230–241. https://doi.org/10.1016/j.ecresq.2020.11.011

National Association for the Education of Young Children. (2019). *Advancing equity in early childhood education.* NAEYC. https://www.naeyc.org/resources/position-statements/equity

National Association for the Education of Young Children (2020). *Developmentally appropriate practice (DAP) position statement*. NAEYC. https://www.naeyc.org/resources/position-statements/dap

Nielsen, M. O., & Zion, J. W. (Eds.). (2005). *Navajo Nation peacemaking: Living traditional justice* (3rd ed.). University of Arizona Press.

Pieng, P., & Okamoto, Y. (2020). Examining preschool children's intention understanding and their conflict resolution strategies. *Early Childhood Education Journal, 48*(5), 597–606. https://doi.org/10.1007/s10643-020-01020-0

Ramanathan, G., Cosso, S., & Pool, J. (2024). Engineering in preschool: What little minds can teach us about big skills. *Early Childhood Education Journal*, *52*, 1245–1257. https://doi.org/10.1007/s10643-023-01512-9

Smetana, J. G., & Killen, M. (2008). Moral cognition, emotions, and neuroscience: An integrative developmental view. *European Journal of Developmental Science*, *2*(3), 324–339. https://doi.org/10.3233/DEV-2008-2309

Stevahn, L., Johnson, D. W., Johnson, R. T., & Schultz, R. (2000). Effects of conflict resolution training integrated into a kindergarten curriculum. *Child Development, 71*(3), 772–784. https://doi.org/10.1111/1467-8624.00184

Tank, K. M., Moore, T. J., Pettis, C., & Gajdzik, E. (2017). *Designing paper baskets* (*PictureSTEM* curriculum unit). Purdue University Research Foundation. https://picturestem.org/picturestem-units/kindergarten-baskets/

Vygotsky, L. (1986). *Thought and language*. MIT Press.

Yazzie, R. (1994). Life comes from it: Navajo justice concepts. *New Mexico Law Review*, *24*, 175–190. http://digitalrepository.unm.edu/nmlr/vol24/iss2/3

Zinsser, K. M., Denham, S. A., Curby, T. W., & Shewark, E. A. (2015). "Practice what you preach": Teachers' social-emotional interactions and children's social-emotional competence. *Early Education and Development*, *26*(7), 1–21. https://doi.org/10.1080/10409289.2015.1009320

MANUSCRIPT III

Designing Solutions, Repairing Relationships: Relational Problem Solving through Engineering Design and Navajo Peacemaking in a K–2 Classroom

This manuscript is prepared for submission to the peer-reviewed journal *The Qualitative Report* and is the third of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

This qualitative action research study examines how a teacher-researcher learned to adapt and enact an engineering-integrated STEM curriculum to support peer conflict resolution in a K–2 classroom on the Navajo Nation. Drawing on the *PictureSTEM* "Designing Paper Baskets" unit, I aligned the engineering design process (EDP) with Navajo peacemaking values, *hózhó* (harmony), *k'é* (relational accountability), and *na'nitin* (learning through listening, observation, and participation), to create a culturally grounded approach to collaborative problem-solving. Data were generated over a 15-week implementation through teacher reflections, analytic and planning memos, annotated curriculum documents, and informal consultation notes.

Analysis identified three themes: k'é as the relational foundation of curriculum adaptation, hózhó as both an aspiration and a tension when cultural ideals intersected with students' lived experiences, and na'nitin as a guide for parallel teacher and student learning. Findings suggest that adapting engineering design for culturally grounded conflict resolution required more than revising curriculum materials; it required sustained teacher learning, relational accountability, and reflective practice. Implications for teacher education include preparing teachers to adapt curriculum responsively, examine their assumptions through reflection, and engage cultural knowledge through sustained relationships with students, families, colleagues, and communities.

Keywords: early childhood engineering education, Navajo peacemaking, peer conflict, action research, relational problem solving

Designing Solutions, Repairing Relationships: Relational Problem Solving through Engineering Design and Navajo Peacemaking in a K–2 Classroom

On a Thursday morning in late October, a second-grade girl leaned across her table and began pointing, unprompted, to the engineering design process (EDP) steps taped to its edge. She and her classmates had just been presented with a social story about two children in conflict, and the class was working through how the characters might resolve their disagreement. She was pointing to the steps for the friend sitting across from her, guiding her through the framework step by step as a tool for thinking about the interpersonal problem. She had made a connection that the curriculum was designed to cultivate: the same steps used to design a paper basket could be used to repair a friendship.

This article documents how teacher learning and curriculum adaptation unfolded together to make that moment possible. It traces how I, as a teacher-researcher, adapted and implemented the *PictureSTEM* "Designing Paper Baskets" unit (Tank et al., 2017) across a 15-week cycle of action research in a K–2 STEM classroom on the Navajo Nation. In this context, children's daily experiences are shaped by kinship networks, storytelling traditions, and expectations for relational responsibility, which informed the alignment of the six steps of the EDP (Define, Learn, Plan, Try, Test, Decide) with Navajo peacemaking values (*hózhó, k'é, na'nitin*) as a culturally grounded scaffold for peer conflict resolution. The study sits at the intersection of three domains that early childhood curricula rarely bring together: engineering education, social-emotional learning (SEL), and Indigenous ways of knowing.

Despite growing attention to both STEM and SEL in early childhood settings, most curricula treat them as entirely separate domains. Some SEL programs, particularly those implemented in early elementary settings, rely on structured or scripted approaches that can position conflict as a problem to be managed rather than an opportunity for collaborative problem-solving (Cao et al., 2023; Jones et al., 2017). Engineering curricula, including widely used frameworks such as *PictureSTEM*, emphasize technical design thinking without attending to the relational or cultural dimensions of children's problem-solving (Bang et al., 2010; Lippard et al., 2019). For Diné (Navajo) children, this disconnect carries particular weight. Dominant STEM and SEL frameworks are rarely designed to reflect Indigenous relational worldviews or culturally grounded approaches to conflict; approaches that, in Navajo tradition, are not supplementary to learning but central to it (McCarty & Lee, 2014; Sabzalian, 2019). This separation highlights the need for integrated, culturally grounded approaches that position problem-solving as both a technical and relational process. It also raises questions about how teachers learn to adapt existing engineering curricula in ways that are relationally accountable to students, families, colleagues, and community values.

My positionality as a *bilagáana* (Anglo) teacher-researcher with long-standing relationships in the school community shaped every dimension of this inquiry. The study grew out of my everyday teaching responsibilities, as I worked to support children’s peer conflict in ways that honored the relational and cultural context of the school community. Those relationships made the study possible, while also requiring ongoing reflexivity about my responsibility as a non-Diné educator working with Navajo cultural values.

The purpose of this study was to examine how I, as a teacher-researcher, learned to adapt and enact an engineering-integrated STEM curriculum as a culturally grounded framework for peer conflict resolution in a K–2 classroom on the Navajo Nation. Rather than treating curriculum adaptation as a set of material revisions, the study traces how adaptation unfolded through reflection, community dialogue, instructional decision-making, and changes in my teaching practice. Three research questions guided the inquiry:

1. How did I, as a teacher-researcher, adapt the *PictureSTEM* curriculum to align engineering design with culturally grounded approaches to conflict resolution in a Navajo early childhood classroom?
2. How did students and teacher together enact the integrated framework during engineering activities, collaborative learning, and peer conflict?
3. How did ongoing reflection, positionality, and dialogue with community partners shape changes in my teaching practice across the action research cycle?

Together, these questions position curriculum adaptation as a process of teacher learning and relational accountability, shaped by ongoing changes in how I understood relationships, conflict, culture, and my role as a teacher-researcher.

Literature Review

Teaching young children to solve problems, whether with materials, with ideas, or with each other, is never a culturally neutral act. This review briefly examines four areas of literature: engineering education in early childhood, peer conflict and social problem-solving, culturally relevant pedagogy and Navajo peacemaking, and practitioner inquiry

and action research. The review concludes with the theoretical framework guiding the study.

Engineering Education

Engineering education has emerged as an important component of early STEM learning, offering young children opportunities to engage in problem-solving, creativity, and collaboration (Eckhoff, 2023). For example, in early childhood classrooms, children may be asked to design a bridge using classroom materials that can support weight, requiring them to test structures, revise their designs, and evaluate how well their solutions meet the criteria. The EDP provides a developmentally appropriate scaffold for this work, supporting iterative, exploratory problem-solving aligned with play-based learning, including trial and revision, open-ended exploration, and testing ideas through materials (Fleer, 2020; Tank et al., 2018). Curricula such as *PictureSTEM* extend the EDP by integrating engineering design with children's literature, making the process accessible to K–2 learners (Tank et al., 2018).

Engineering design tasks are inherently social. As children work together, they must negotiate roles, share materials, and coordinate ideas, processes that often involve disagreement or conflict (Lippard et al., 2019; Vossoughi et al., 2016). How children navigate these interactions directly shapes the quality of collaborative design work (Kim & Park, 2023). However, much of the current research focuses on older students, leaving limited guidance for how early childhood teachers might intentionally support these social dynamics within engineering instruction. This gap highlights the potential for engineering design to serve as a structured context for supporting both material and interpersonal problem-solving.

Peer Conflict and Social Problem-Solving

Peer conflict is a predictable and developmentally significant feature of early childhood classrooms and a key site for growth in empathy, moral reasoning, and emotional regulation (Chen et al., 2009; Smetana & Killen, 2008). When children are supported in working through conflict rather than avoiding it, they are more likely to develop and apply prosocial strategies in future interactions (Bierman et al., 2010).

Widely used SEL programs, such as the Pyramid Model and Conscious Discipline, support prosocial behavior, but scholars have raised concerns about the cultural assumptions embedded in SEL frameworks more broadly, particularly their grounding in individualistic approaches that may not reflect relational or community-centered approaches to conflict resolution (Castro-Olivo, 2014; Jagers et al., 2018; Sabzalian, 2019). For children whose development is grounded in kinship, storytelling, and community-based practices, these models may overlook the relational and cultural dimensions that give conflict resolution its meaning (McCarty & Lee, 2014; Brayboy et al., 2015). These limitations highlight the need for approaches that frame peer conflict as a shared, culturally grounded problem-solving process.

Culturally Relevant Pedagogy and Navajo Peacemaking

Culturally relevant pedagogy centers students' cultural identities and community knowledge as integral to learning (Ladson-Billings, 1995; Paris, 2012). For Indigenous children, whose ways of knowing are grounded in relationships, observation, and storytelling, culturally grounded curriculum is essential to both equity and belonging (Brayboy et al., 2015; Castagno & Brayboy, 2008).

Drawing directly on Diné scholarship and community-based knowledge, this study centers three values foundational to Navajo peacemaking and relational life. *Hózhó*, the principle of harmony and balance, serves as the guiding ideal for relationships and action. *K'é*, kinship and relational accountability, guides how individuals are expected to treat one another within extended family and community relationships. *Na'nitin*, teaching learned through listening, observing, and participating, positions learning as relational and grounded in shared experience (Bluehouse & Zion, 1993; McCarty & Lee, 2014). Together, these values reflect a Diné understanding of learning and relationship that guided both the design of the curriculum and the interpretation of classroom interactions.

Navajo peacemaking is a restorative, dialogue-based tradition that emphasizes relationship repair and the restoration of hózhó rather than assigning blame (Yazzie, 1994; Zion & Yazzie, 1997). When peacemaking values are reflected in classroom practices, students demonstrate stronger engagement and investment in collective well-being (Brayboy et al., 2015). However, little research has examined how peacemaking principles might be integrated with structured problem-solving frameworks such as the engineering design process in early childhood settings.

Practitioner Inquiry and Action Research

Practitioner inquiry positions teachers as active interpreters and adapters of curriculum, generating knowledge through systematic reflection on practice (Cochran-Smith & Lytle, 2009; Dana & Yendol-Hoppey, 2014). Practitioner inquiry often focuses on questions that emerge from teachers' own classrooms, making it well suited for examining how instructional decisions shift in response to students, relationships, and

local context. This stance is particularly important in early childhood settings, where relational dynamics and cultural context shape daily learning.

Action research provides a framework for this work by supporting iterative cycles of planning, acting, observing, and reflecting within real-world classroom contexts (Kemmis & McTaggart, 2005; Mertler, 2020). In Indigenous-serving settings, this approach aligns with principles of relational accountability and reciprocity, emphasizing responsiveness to community context and the responsibility to contribute meaningfully to those communities (Smith, 2021; Wilson, 2008). Without these commitments, research risks reproducing extractive approaches, underscoring the importance of designing inquiry processes that prioritize trust, collaboration, and mutual benefit.

Theoretical Framework

Three theoretical frameworks orient the study's design and interpretation. Sociocultural theory (Vygotsky, 1978) frames learning as socially situated and mediated by cultural tools, positioning the adapted curriculum as a shared mediating artifact that supports both engineering and conflict resolution. The ethic of care (Gilligan, 1982; Noddings, 1984) foregrounds empathy, responsiveness, and relational accountability, values that align directly with hózhó and k'é, and positions the teacher-researcher as a responsive practitioner attending to the moral and relational dynamics of classroom life. Culturally relevant pedagogy (Ladson-Billings, 1995) grounds the study's commitment to centering students' cultural identities and community knowledge, guiding both curriculum adaptation and ongoing consultation with the school community. Rather than functioning as separate lenses, these frameworks work together to position engineering design as a socially mediated, ethically grounded, and culturally situated

process through which children make sense of both material and relational problems in classroom life.

Together, these frameworks inform a relational problem-solving (RPS) framework, in which the engineering design process functions as a shared structure for navigating both technical and relational problems. As children engage in iterative design activities, they are supported in defining problems collectively, attending to multiple perspectives, and negotiating solutions that reflect both functional goals and relational responsibilities. Through repeated participation in these processes, supported by culturally grounded instructional practices, children begin to internalize the EDP not only as a structure for design but as a way of approaching interpersonal challenges. Within the RPS framework, engineering design becomes a bridge between technical and relational problem solving rather than a separate domain.

Methodology

Study Design, Participants, and Setting

This qualitative action research study unfolded across a complete action research cycle tied to the implementation of the adapted curriculum, with each phase generating distinct data sources (see Table 1). The study was conducted at a small private school on the Navajo Nation in the southwestern United States, serving approximately 50 students in pre-kindergarten through 8th grade. Although privately operated, the school does not charge tuition and serves low-income families in the local community.

The STEM class functioned as a rotating weekly special, with each group attending a 20- to 40-minute lesson once per week during the fall semester. All 17 K–2 students participated in the culturally adapted *PictureSTEM* curriculum as part of regular

instruction. The group included primarily Diné students, with a small number identifying as Anglo or multiracial.

Table 1

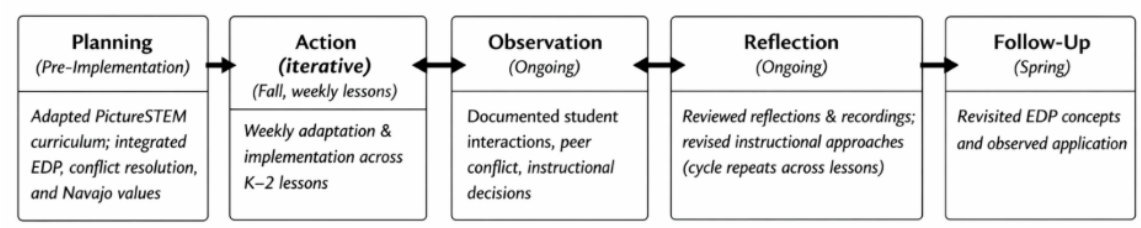
Action Research Cycle, Activities, and Data Sources

Phase	Activities	Data Sources Produced
Planning	Reviewed *PictureSTEM* unit; developed culturally responsive modifications integrating conflict resolution strategies and Navajo peacemaking values	Annotated curriculum planning documents; analytic and planning memos
Action	Implemented adapted unit across 15 weeks of STEM instruction; one-week spring follow-up session	Annotated lesson plans; analytic memos
Observation	Gathered data through systematic self-reflection; documented informal input from colleagues and community members to support interpretation and reflexive analysis	Structured reflections; informal consultation notes
Reflection	Analyzed implementation artifacts and memos after each lesson and multi-lesson sequence to assess what was working and what needed revision, while engaging in critical self-reflection to examine positionality and identify potential biases or blind spots	Analytic memos; structured reflections

Figure 1 provides a visual summary of how the action research cycle unfolded across the implementation phases of the study.

Figure 1

Iterative Action Research Cycle Across Implementation



Note. Figure created by the author using ChatGPT.

Critical Reflexivity and Teacher-Researcher Positionality

My role in this study was shaped by overlapping forms of insider and outsider positionality. I am an Anglo educator who founded the school's preschool program and maintained relationships with the school community for six years, including three years as a visiting STEM teacher while completing doctoral studies. These relationships made the study possible. They provided the trust, contextual knowledge, and relational access necessary for action research in a small school community. At the same time, my positionality as a non-Diné educator working with Navajo cultural values created an ethical tension that required ongoing reflexivity, consultation, and restraint in interpretation.

I approached this study not as an outside researcher implementing a culturally responsive curriculum, but as a teacher-researcher learning how to adapt instruction in response to students, colleagues, families, and community knowledge. This role was both a methodological strength and a source of responsibility. As the classroom teacher, I could observe how curriculum decisions unfolded in everyday interactions and revise

instruction in response to students' needs. As the researcher, I also had to examine how my assumptions, teaching habits, and cultural location shaped what I noticed, how I interpreted student interactions, and which instructional changes I viewed as meaningful.

Critical reflexivity was therefore embedded throughout the action research cycle. Structured reflections and analytic memos were used not only to document curriculum adaptation, but also to examine moments when my teaching practice shifted. These included moments when I moved from solving conflicts quickly to pausing and asking students to define problems, when I reconsidered whether classroom disruption might also reflect engagement, and when I recognized that relational availability outside formal lesson time was part of culturally responsive teaching. Informal consultation with school colleagues supported this reflexive process by helping me consider how my interpretations aligned, or did not align, with community perspectives.

This reflexive stance shaped the study's design and analysis. Rather than treating the teacher perspective as neutral, I treated it as part of the data. The study therefore examines curriculum adaptation as a process of teacher learning, in which instructional decisions, cultural interpretation, and relational accountability were continually revised through practice.

Curriculum Description

The curriculum draws from the *PictureSTEM "*Designing Paper Baskets" unit (Tank et al., 2017). Using children's literature as the narrative context, students are asked to design a basket from paper materials that is both strong and able to carry objects, working through the design process iteratively as they test and revise their solutions.

For this study, the same six EDP steps (Define, Learn, Plan, Try, Test, Decide) were used as both a design framework and a conflict resolution process, so that children could apply them not only to design challenges but also to peer disagreements. Each step was explicitly mapped onto strategies for addressing conflict and grounded in Navajo peacemaking values (hózhó, k'é, na'nitin), as shown in Table 2. Although the school serves a primarily Diné student population, Navajo language and cultural terminology were not consistently used in everyday classroom interactions in this setting. As a result, concepts such as hózhó, k'é, and na'nitin were intentionally introduced and revisited through explicit instructional supports during the unit.

Table 2

Alignment of EDP Steps, Conflict Resolution Strategies, and Navajo Peacemaking Values

EDP Step	Conflict Resolution Strategy	Navajo Peacemaking Value
Define: Identify the problem and criteria	Identify the disagreement or issue; agree on what needs to be solved together	Hózhó: Say the problem in a way that is fair to everyone
Learn: Gather information	Listen to each person's side of the story; ask respectful questions	Na'nitin: Learn by listening, observing, and participating
Plan: Brainstorm and choose a solution	Think of possible compromises; choose one that works for everyone	K'é: Show care and respect for relationships

Try: Create a prototype	Try the solution that everyone agreed on	Hózhó: Act in ways that help everyone get along
Test: See how it works	Check if the solution is working for everyone	Na'nitin: Notice what worked and what didn't so we can make it better
Decide: Keep or improve the design	Decide to keep, change, or try another solution together	K'é: Make decisions that strengthen relationships

These processes were introduced together within the same lessons, with early instruction emphasizing the application of the EDP to design tasks. To support students in applying the same framework to interpersonal situations, I developed a series of original social stories featuring the *PictureSTEM* characters Max and Lola. These stories presented friendship problems, such as disagreements about sharing materials or being included in play, and modeled how the EDP steps could be used to identify problems, consider perspectives, and evaluate possible solutions. Across lessons, these scenarios provided structured opportunities for students to engage with both design and interpersonal problem-solving using consistent language and routines.

Data Sources and Procedures

The study used a qualitative action research approach, generating data through structured reflections, analytic and planning memos, annotated curriculum documents, and informal consultation notes across iterative cycles of planning, acting, observing, and reflecting (Mertler, 2020; Stringer, 2014). Together, these sources provide complementary perspectives on instructional decision-making, classroom interaction, and curriculum adaptation over time.

Structured Reflections

Structured reflections (SRs) were completed following each lesson and supported by audio recordings of classroom instruction, which were used to revisit and verify observed interactions rather than analyzed as a separate data source. These reflections documented instructional decisions, student interactions, and peer conflict episodes, combining descriptive accounts with analytic interpretation of emerging patterns. This process supported ongoing reflexivity in instructional decision-making (Dana & Yendol-Hoppey, 2020; Herr & Anderson, 2015).

Reflections were guided by consistent prompts (see Appendix A) across four phases: a baseline reflection prior to implementation, weekly reflections throughout the semester, a summative reflection at the end of the semester, and a final reflection following a spring follow-up session.

Analytic and Planning Memos

Analytic and planning memos (APMs) were written throughout the study to document evolving interpretations, instructional decisions, and emerging questions. Unlike SRs, which focused on specific lessons, APMs supported reflection across multiple lessons and phases of the study.

These memos captured instructional dilemmas, cultural considerations, and shifts in practice, supporting both interpretation and forward-looking planning. As such, they represent the Plan and Reflect phases of the action research cycle (Dana & Yendol-Hoppey, 2020; Mertler, 2020).

Annotated Curriculum Planning Documents

Annotated curriculum planning documents (ACPDs) captured instructional decisions and revisions over time (see Appendix B for an example). Lesson plans and materials adapted from the PictureSTEM unit were annotated to document changes, challenges, and alignment with project goals.

Early adaptations focused on integrating Navajo peacemaking values (hózhó, k'é, na'nitin) into existing lessons. As the study progressed, adaptations increasingly emphasized explicit connections between the engineering design process and peer conflict through structured relational problem-solving scenarios. These documents functioned as living records of curriculum development across the implementation cycle.

Informal Consultation Notes

Informal consultation notes (ICNs) documented ongoing dialogue with school colleagues and community members, including the principal and the Diné language and culture teacher. These conversations focused on the cultural relevance of instructional decisions and interpretations of classroom interactions.

Consultations were documented without identifying information and used to support culturally grounded interpretation. They functioned as collaborative sensemaking, helping refine instructional decisions and align interpretations with community perspectives (Cammarota & Fine, 2008; Smith, 2021).

Data Analysis

Data analysis followed a three-cycle coding process based on Saldaña's (2021) framework, aligning with the iterative nature of action research and the study's tri-theoretical orientation. Data were organized using NotebookLM (Google, 2024) and

coded in Dedoose (2024). NotebookLM supported data organization and pattern identification but was not used to generate codes or replace manual analysis. A condensed codebook with definitions and examples is included in Appendix C.

The first cycle employed structural coding using a priori categories drawn from the six EDP steps and the three Navajo peacemaking values. For example, a reflection in which I guided students to name a disagreement, listen to perspectives, and restore harmony was coded across Define, na'nitin, and hózhó, capturing the integration of problem definition, listening, and relational repair within a single interaction. In another instance, students independently proposed compromise solutions during a social story discussion, which was coded as Plan and k'é, reflecting the close connection between generating solutions and maintaining relationships.

The second cycle used pattern coding to group related codes, with particular attention to recurring co-occurrence between EDP steps and peacemaking values. These patterns highlighted the ways each value functioned across instructional and interactional contexts, including guiding decision-making, framing relationships, and shaping how problems were understood. The third cycle involved thematic analysis following Braun and Clarke's (2006) recursive approach, through which themes were developed by examining how these patterns reflected distinct roles of each peacemaking value within the integrated framework.

Coding occurred iteratively throughout the action research cycle. Following each lesson, SRs and APMs were reviewed to inform instructional revisions. A comprehensive analysis was conducted after implementation to synthesize patterns across all data sources and address the research questions collectively.

Although all data sources contributed to each research question, they served distinct analytic roles. SRs captured instructional practice and peer conflict processes, APMs and ACPDs documented curriculum adaptation, and ICNs supported interpretation of cultural alignment. Together, these sources enabled triangulation across phases of the study.

Trustworthiness and Reflexivity

Trustworthiness was supported through prolonged engagement in the research setting, triangulation across data sources, and peer debriefing through weekly meetings with dissertation committee members. Ongoing consultation with colleagues supported culturally grounded interpretation by providing additional perspectives on classroom interactions.

Transferability was addressed through rich description of the classroom context and curriculum adaptations, and dependability was supported through an audit trail of curriculum revisions and coding processes. The study adhered to IRB guidelines and received exemption status, as data sources were limited to teacher-generated materials and contained no identifiable student data.

As described earlier, critical reflexivity was embedded throughout data generation and analysis. Structured reflections and analytic memos were used to revisit initial interpretations, consider alternative explanations, and document how instructional decisions changed over time. Informal consultation with colleagues supported this process by helping me examine potential blind spots in my interpretation of classroom interactions and cultural alignment. In this way, reflexivity functioned as both a trustworthiness strategy and a central analytic focus of the study.

Findings and Discussion

Data analysis identified three interrelated themes across iterative action research cycles. The first examines how curriculum adaptations were shaped by relationships (k'é), the second explores how students integrated engineering design and peacemaking values in practice (hózhó), and the third focuses on how teacher reflection and dialogue guided ongoing instructional revision (na'nitin). Together, these themes position curriculum adaptation as a relational process in which relationships (k'é), aspirations toward harmony (hózhó), and learning through reflection (na'nitin) function as key dimensions of teaching and learning.

Across the action research cycle, several small instructional pivots became important sites of teacher learning. These pivots were not major redesigns of the curriculum, but situated responses to classroom interactions, student needs, colleague feedback, and family/community encounters. Together, they show how curriculum adaptation unfolded through ongoing reflection and relational accountability rather than through materials revision alone. Table 3 traces several of these pivots, including what prompted the shift, what changed instructionally, and what I learned through the process.

Table 3

Instructional Pivots Across the Action Research Cycle

Prompting Moment	**Instructional Pivot**	**What Changed in Practice**	**Teacher Learning**
Students often worked independently	Increased intentional	Used shared charts, oral discussion, tighter grouping,	Collaboration needed to be scaffolded.

during engineering tasks.	structures for collaboration.	and whole-class routines.	
Lunch and recess conversations revealed recurring peer tensions.	Developed Max and Lola social stories based on observed conflicts.	Created scenarios about sharing, exclusion, honesty, and friendship problems.	Social stories were strongest when grounded in students' relational worlds.
Open House conversations emphasized family concern for teacher-student relationships.	Increased relational check-ins outside formal STEM lessons.	Spent more time with students during lunch, recess, after school, and transitions.	Relationship was part of curriculum enactment.
A kindergarten lesson initially felt unsuccessful because of students' self-regulation challenges.	Revisited the lesson through reflection and consultation.	Reinterpreted students' comments and questions as evidence of engagement.	My expectations shaped what I counted as learning.
Some conflicts did not result in mutual resolution.	Recognized partial repair and de-escalation as meaningful.	Emphasized naming problems, listening, de-escalating, and revisiting conflict.	Hózhó was an ongoing process, not a guaranteed outcome.

I often resolved conflicts quickly so the lesson could continue.	Paused before intervening and used EDP-aligned questions.	Asked students to define problems, consider perspectives, and suggest plans.	Supporting agency required slowing down my own responses.
Consultation highlighted the need for clearer cultural and relational alignment.	Revisited how peacemaking values were introduced.	Added visual supports, repeated language, color-coding, and story discussion.	Cultural grounding required repeated mediation.

K'é: Relationship as the Foundation of Curriculum Adaptation

This theme addresses the first research question by showing how curriculum adaptations were shaped through relationships (see Appendix B for an example of annotated lesson adaptation). Four key adaptations illustrate how relationships, rather than instructional logic alone, guided these decisions: (1) selecting culturally relevant texts, (2) redesigning characters to reflect students' identities, (3) shifting from individual to collective work structures, and (4) developing social stories grounded in observed peer interactions.

I began by adapting curriculum materials. Original *PictureSTEM* texts were replaced with books by Native authors or illustrators reflecting students' lived

experiences and local epistemologies, such as *Kunu's Basket* (Francis, 2015), *Beauty Beside Me: Stories of My Grandmother's Skirts* (Yazzie, 2011), and *The Goat in the Rug* (Blood & Link, 1990) (ACPDs, Lessons 4, 5, & 6). Similarly, the characters Max and Lola were reimagined as Navajo children (ACPD, Introduction Lesson), and individual worksheets were replaced with shared class charts and oral discussion to better align with collectivist and oral learning practices in the classroom (ACPDs, Lessons 3 & 6).

The development of social stories featuring Max and Lola represented the most explicit example of this process. These stories emerged from observations of students' social interactions. For instance, while sitting with second-grade girls at lunch, I overheard them describing a peer as "sometimes" their friend and "sometimes not," identifying a recurring tension (APM, 2025, October 7). In response, I developed a social story centered on resolving recess tensions. By structuring these interpersonal dilemmas through the same iterative framework used for engineering design, the curriculum positioned peer conflict as a shared problem-solving process, making visible the moral and relational dimensions of everyday classroom life (Noddings, 2002).

A conversation with a colleague (ICN, 2025, September 9) highlighted a tension between students' tendency to work independently and the collaborative goals of the curriculum. Although opportunities for pair or group work were provided, some students consistently chose to work on their own, which limited opportunities to engage in shared problem-solving. This tension was particularly notable given the study's emphasis on relational learning and Navajo peacemaking values, which center participation, shared responsibility, and learning through interaction. This prompted more intentional

structuring of shared problem-solving within lessons. In kindergarten, observations of distraction and conflict during open work time led me to seat students closer together around a shared workspace, keep materials within a common area, and guide participation through more explicit turn-taking and whole-group discussion. These changes created a more structured setting for collaboration and resulted in improved focus and cooperation (ACPD, Lesson 4AB).

Reflecting on students' preference for independence also prompted me to examine my own tendencies as a teacher. As I considered how students often chose to "do their own thing," I recognized a similar inclination in my own practice, particularly in how I structured my time and interactions. Following a colleague's comment about my availability to students outside of class, I reflected that I was "trying to be less selfish with my time" (APM, 2025, October 20), recognizing that k'é required not only structuring collaboration within lessons but also being consistently available to students. This led to changes in practice, including opening the classroom after school and spending time with students during lunch and recess.

As the semester progressed, these adaptations extended into a broader rethinking of the role of relationships in teaching and learning. A pivotal relational moment occurred at the school's Open House, where conversations with parents and family members revealed that families prioritized the quality of the teacher-student relationship over specific academic content. I understood parents' concerns as centered on trust and care: "Is my child doing okay? Are you having problems with my child? What's your relationship with my child?" (SR, 2025, October 21). These questions reflected the Diné value of k'é and, consistent with Diné understandings of relational accountability, shifted

how I understood the curriculum, positioning relationship not as a separate social-emotional goal but as central to instruction itself (Bluehouse & Zion, 1993; Lee, 2006).

In response, I placed greater emphasis on checking in with students throughout the day, particularly through informal conversations during lunch, recess, and after school. These interactions created opportunities for students to share their experiences with peers and allowed me to better understand their relational and emotional needs. This shift also influenced how I facilitated classroom interactions, including framing problem-solving discussions more intentionally around maintaining relationships. More broadly, it reinforced my decision to be consistently available to students beyond formal class time. In later reflections, I described students' evident "longing for connection" and recognized that attending to their emotional and relational needs was integral to teaching (SR, 2025, December 25).

Community interactions further clarified the broader aims of the curriculum. At a church gathering, a grandmother sought me out, engaging in conversation, prayer, and shared song. This interaction prompted reflection on what the curriculum was ultimately working toward: not only resolving immediate conflicts but also supporting students in developing enduring relationships where they would "have those deep friendships and have each other's backs" (SR, 2025, December 2). I began to consider how this emphasis on long-term relationships should be reflected in classroom practice. This prompted me to place greater emphasis on discussing how solutions might support ongoing relationships rather than only resolving immediate disagreements. This emphasis was also reflected in classroom interactions, where students often demonstrated care within established friendships but were less likely to extend that support across the group (SR,

2025, December 10), highlighting the need to more intentionally support relationship-building as part of problem-solving. Together, these shifts broadened the focus of classroom problem-solving discussions from resolving immediate conflicts to supporting longer-term relational development.

These experiences changed how I understood curriculum adaptation. At the beginning of the study, I approached relational work primarily as something to build into lessons through texts, collaborative structures, and social stories. Over time, I came to understand that relationships were not only content to be represented in the curriculum, but the condition through which the curriculum could be enacted responsibly. This shifted my teaching from planning relational examples into formal lessons toward making myself more consistently available to students across the school day. In this sense, k'é required changes not only to materials and activities, but also to my presence, availability, and responsiveness as a teacher. Across these adaptations, k'é functioned as a guiding principle that reshaped both curriculum and teaching practice, suggesting that culturally grounded engineering instruction requires ongoing responsiveness to relationships as the primary context shaping how learning occurs.

***Hózhó*: Harmony in Theory and in Practice**

This theme addresses the second research question by examining how students used the integrated framework during peer conflict and collaborative learning. Integration was most visible when students independently used the language and structure of the EDP to navigate interpersonal problems.

During a kindergarten lesson using *Talk and Work It Out* (Meiners, 2017), I intentionally used consistent color-coding to connect Navajo peacemaking values in the

classroom chart with related concepts in the text. One student noticed this visual alignment, using it to link problem-solving steps to prior discussions of peace. I reflected that students were recognizing that "these ideas about peace and respect go together with our problem-solving steps" (SR, 2025, December 2). Students were beginning to integrate relational values with procedural problem-solving, using visual cues to connect these domains.

During a second-grade mask-making session, two boys independently designed nearly identical lion muzzles. When one accused the other of copying, a conflict emerged. The first boy asked the second not to color his ears the same way, and the second boy chose to modify his design, changing his ear colors, "his way of adjusting the 'plan'" (SR, 2025, December 3). This response aligns with the Plan and Try phases of the EDP, taught for both design and peer problem-solving. In this instance, the student drew on that shared framework to revise his work in a way that addressed both the design problem and the interpersonal tension, showing how engineering decision-making functioned as a mechanism for relational repair. These interactions reflect a broader pattern of students using the steps of defining problems, listening to others, and testing possible solutions as a shared structure for both design work and peer conflict.

Social stories provided additional evidence of integration by explicitly linking EDP steps to conflict resolution. In a first-grade lesson, Max accidentally spilled paint on Lola's artwork, and students evaluated multiple response options. When the class selected the plan in which Max tells the truth and helps clean up, I affirmed: "Yes, that one shows na'nitin, he's learning what the right thing to do is; k'é, he's showing care and responsibility; and hózhó, he wants to make things peaceful" (SR, 2025, December 8).

Students then used these Navajo terms spontaneously to justify their reasoning. This spontaneous use of shared language shows students appropriating the integrated framework as a cultural tool (Vygotsky, 1978), using both the EDP structure and peacemaking values to interpret and evaluate social situations.

Across these moments, integration was most evident when students used the EDP as a flexible tool for understanding and responding to peer conflict. In later reflections, I noted that students were more likely to communicate their needs, ask for help, and work toward shared solutions rather than immediately disengaging or escalating conflict, reflecting movement toward hózhó (SR, 2026, February 15).

At the same time, the data revealed a tension between the ideal of hózhó and the lived realities students carried into the classroom. The Navajo Nation, like many Indigenous communities, bears the ongoing effects of colonization, forced assimilation, and intergenerational trauma, conditions that have disrupted relational systems that peacemaking traditions were designed to sustain (Denetdale, 2006; Smith, 2021). I reflected on students whose lives were marked by instability: “Their routines are so inconsistent. The only consistency is that there's inconsistency, and their brains and bodies are always on alert for danger” (SR, 2025, October 6). As Brayboy and Castagno (2008) caution, culturally grounded frameworks risk romanticization when structural realities are not acknowledged. I recognized this tension directly, reflecting the complexity of sustaining hózhó within broader social and historical conditions: “These peacemaking principles do agree with Navajo cultural values on paper. Then, in real life, it doesn't always line up with what you see happening in the community around you” (SR, 2026, February 15).

In response to these conditions, my instructional approach shifted to more intentionally scaffold students' use of the framework (Vygotsky, 1978; Wood et al., 1976). I incorporated increased modeling, structured discussions, and whole-class problem-solving routines, including teacher-generated social stories and guided questioning aligned with the EDP steps (SR, 2025, December 3). These adaptations reflected an understanding that students' ability to apply the framework developed through scaffolded participation, requiring instruction that was responsive to students' lived experiences beyond the classroom.

The limits of integration became particularly visible in moments when mutual participation in conflict resolution was not possible. Midway through the semester, I noted: "You can't make people be at peace with each other. There has to be a desire on both sides for peace. Otherwise, it's a false peace" (SR, 2025, October 6). At the same time, I observed that the framework could still retain value for an individual student, "a win in the sense that it at least might keep something from escalating."

This tension became clearer in a later incident involving two second-grade boys. According to another teacher, when the boys were upset with each other, she asked them what they had learned about problem solving in STEM class (ICN, 2025, December 10). One boy was unwilling to engage in working through the problem, but the other chose not to escalate the conflict and instead moved on, drawing on strategies introduced in class. His response reflected partial use of the process, including recognizing the problem and selecting a response that reduced further conflict, even in the absence of mutual resolution.

This incident changed how I interpreted evidence of integration. Earlier in the study, I was more likely to look for complete problem-solving sequences, moments when students named a problem, listened to one another, generated a plan, and reached mutual resolution. Over time, I came to recognize that this expectation could oversimplify both conflict and hózhó. Some conflicts did not end in visible reconciliation, and some students were not ready or willing to participate in mutual repair. In those moments, non-escalation, choosing to walk away, asking for help, or making a small adjustment could still represent meaningful movement toward balance. This changed my teaching by helping me value partial repair and de-escalation as legitimate outcomes of RPS rather than treating them as failed implementation. These moments suggest that integration did not depend on full mutual resolution to be meaningful, aligning with Diné understandings of hózhó as an ongoing process of restoring balance rather than achieving immediate agreement. In this context, teaching hózhó did not guarantee reconciliation but provided a structure for de-escalation, perspective-taking, and more intentional response. **Na'nitin: Teaching, Listening, and Learning Together**

This theme addresses the third research question by illustrating how ongoing reflection and dialogue informed instructional revision. Across data sources, I engaged in the same iterative process I was asking of students: defining problems, listening, revising plans, and reconsidering outcomes. This parallel process was evident prior to implementation, when I noted: “I think this semester is going to be about me working on how I can resolve conflict as I interact in multiple cultures. As a teacher, I need that as much as the students” (SR, 2025, August 12).

The value of na'nitin, grounded in Diné approaches to learning through listening, observing, and participation, functioned as a practical guide for this process. Rather than relying on initial plans, I treated classroom interactions, student responses, and conversations with colleagues as sources of insight for instructional decisions. This stance aligns with understandings of curriculum as enacted and continually adapted in response to students and context, rather than implemented as a fixed plan (Remillard, 2005). Midway through implementation, I described "listening and observing" as my primary orientation for navigating tensions related to time, development, and collaboration, noting that each lesson required adjustment rather than fixed solutions (APM, 2025, October 1).

This orientation was most visible in moments of difficulty, where collaborative and individual reflection intersected. Following a challenging kindergarten lesson in which students frequently talked over me, I initially interpreted the session as unsuccessful. In consultation with the school principal, this interpretation was reframed: students' difficulty with self-regulation was not a barrier but a reason for continued emphasis on listening and perspective-taking within the Learn phase of the EDP (ICNs, 2025, August 26/28). Weeks later, reviewing the audio transcript of the same lesson, a different interpretation emerged. Despite disruptions, students were actively engaged, asking questions and identifying differences in materials (APM, 2025, October 19). This shift showed my initial judgment had been shaped by classroom management expectations, prompting me to reconsider what counted as evidence of learning. Together, these moments position interpretation as iterative, shaped through listening, revisiting evidence, and revising conclusions. This iterative process aligns with action

research frameworks that position teaching as a cycle of reflection, revision, and responsive decision-making (Mertler, 2017; Stringer, 2014).

These experiences illustrate how na'nitin functioned not only as an instructional value but as a methodological stance. Listening extended beyond students' immediate responses to include revisiting classroom events, incorporating colleagues' perspectives, and reanalyzing evidence rather than relying on initial impressions. In this sense, reflective practice mirrored the Test and Decide phases of the EDP, where judgments were revisited and revised based on new evidence.

The parallel process deepened as I applied the same problem-solving framework to my own instructional decisions. In my summative reflection, I acknowledged, "Early on in the semester, I was often guilty of taking the easy way out in moments of conflict by offering quick solutions that would squash the issue so we could move on with the lesson. I was still learning to apply the process myself" (SR, 2025, December 25). Recognizing this pattern prompted a deliberate shift in practice. Rather than intervening immediately, I began to pause, ask guiding questions aligned with the EDP, and create space for students to define problems, consider multiple perspectives, and generate solutions collaboratively. This shift aligns with Noddings' (2012) concept of motivational displacement, as instructional decisions became oriented toward supporting students' agency rather than resolving conflicts efficiently.

As instructional practice shifted, corresponding changes became visible in student participation. During a first-grade lesson, after I presented two possible solutions to a social scenario, students moved beyond the provided options and generated their own alternatives, suggesting ways Max and Lola could work together or resolve the conflict,

reflecting the Plan phase of the EDP (SR, 2025, November 3). In second grade, a student unprompted pointed to the posted EDP steps to guide a peer through a social problem, independently applying the Define and Learn phases (SR, 2025, October 30). Earlier in the semester, these situations required direct teacher mediation; over time, students took greater ownership of defining problems and generating solutions. These moments suggest that shifts toward pausing, questioning, and shared problem-solving created conditions for students to use the integrated framework more autonomously across both design and social contexts.

This pattern extended beyond the initial implementation. During a follow-up lesson, students revisited the EDP within both a design challenge and a social scenario involving Max and Lola. When a student spontaneously referenced “peace” while working through the activity, I connected the idea back to hózhó, reinforcing the relationship between problem-solving and relational repair (SR, 2026, February 29). Unlike earlier lessons, where these connections were more explicitly prompted, this moment reflected student-initiated integration, suggesting that the framework had become a shared tool for interpreting both design challenges and interpersonal situations.

This shift also changed how I understood my role in the classroom. I began the semester thinking primarily about how to help students use the EDP to solve peer conflicts, but I ended the implementation recognizing that I also had to learn the process as a teacher. My own teaching followed the logic of both the EDP and the action research cycle: I had to define instructional problems more carefully, listen before interpreting, test changes in practice, observe what happened, and decide what to revise based on

evidence from students and colleagues. In this way, na'nitin reframed teaching itself as a form of ongoing participation, listening, reflection, and adjustment.

The parallel process functioned as a reciprocal system in which teacher inquiry shaped instruction, and instruction shaped how students engaged with problem-solving. Na'nitin operated not only as a value within the curriculum but as a guiding principle for both teaching and learning, reflecting a Diné orientation to knowledge as relational, experiential, and continually refined through interaction. This reciprocal process is consistent with conceptions of teacher inquiry as embedded within practice rather than separate from it (Cochran-Smith & Lytle, 2009).

Implications

The three themes converge around a central insight: adapting engineering design for culturally grounded conflict resolution required more than revising curriculum materials. It required sustained teacher learning, relational accountability, and reflective practice. Across the action research cycle, I came to understand curriculum adaptation as a process of learning with and from students, colleagues, families, and community values. The curriculum became more responsive not only because I changed texts, characters, activities, or visual supports, but because I changed how I interpreted conflict, how I responded to students, and how I understood relationships as central to teaching. This suggests that the effectiveness of culturally grounded engineering instruction depends not only on curriculum design, but on how teachers enact, question, and revise that curriculum within relationships.

First, teacher education programs should prepare teachers to understand curriculum adaptation as a process of teacher learning rather than a one-time act of

materials revision. In this study, early adaptations included replacing texts, redesigning characters, and adding visual supports. However, the most consequential changes emerged through practice, including the development of social stories based on observed peer tensions, the shift toward more structured collaboration, and the decision to pause rather than resolve conflicts quickly for students. Teacher preparation programs can support this kind of responsiveness by engaging candidates in analyzing classroom interactions, revising lesson plans based on observed needs, and documenting how instructional decisions evolve over time. This approach positions curriculum not as a fixed plan to implement, but as a relational practice shaped by students' responses and community context.

Second, culturally grounded teaching requires relational accountability. In this study, Navajo peacemaking values could not be treated as concepts simply added to an engineering unit. Their meaning had to be approached through relationships, including ongoing interaction with students, informal consultation with school colleagues, and attention to family and community priorities. Consistent with Goldstein (2002), caring cannot be reduced to technique but must be practiced through attentive responsiveness. For teacher educators, this suggests the need to prepare teachers, especially teachers working across cultural difference, to engage cultural knowledge with humility, consultation, and sustained presence. Community-connected field experiences, structured reflection on positionality, and opportunities to learn from families and local educators may help teacher candidates understand culturally responsive teaching as an ethical and relational responsibility rather than a set of strategies.

Third, reflective practice should help teachers examine how they interpret conflict, participation, and evidence of learning within the broader conditions shaping children's lives. Across the study, my understanding shifted from viewing unresolved conflict or disruptive participation as signs that instruction had not worked toward recognizing partial repair, de-escalation, questioning, and peer support as meaningful evidence of RPS. This shift required revisiting classroom events, consulting with colleagues, and reconsidering my first interpretations. While Noddings (2005) argues that an ethic of care must be honest about suffering, this study illustrates how that honesty can take shape through sustained attention to students' lived realities and a willingness to adjust instruction in response to context. Teacher education programs might support this kind of reflection through video or audio review, peer debriefing, analytic memoing, and guided reflection on classroom dilemmas. These practices can help teachers notice how their assumptions shape what they see and how they respond.

Taken together, these implications point to the need for teacher preparation that treats culturally responsive curriculum work as reflective, relational, and ethically complex. In early childhood engineering education, this means preparing teachers not only to facilitate design challenges, but also to attend to the social and cultural relationships through which children solve problems together. For teachers working in Indigenous-serving contexts, and more broadly for teachers working across cultural differences, cultural grounding requires more than representational inclusion. It requires sustained attention to community values, historical and structural conditions, and the teacher's own positionality. As Fraser-Burgess (2020) notes, many preservice teachers have limited experience with culturally different communities, making it essential for

teacher education programs to create structured opportunities for engagement with families and reflection on how context and personal assumptions shape interpretations of student behavior. The study therefore contributes to early childhood STEM education by showing that engineering design can support RPS when teachers engage in the reflective and accountable work needed to adapt it responsibly.

Limitations and Directions for Future Research

As a single-site, single teacher-researcher study, these findings are deeply contextual. Because this study centers teacher-researcher learning, the reliance on teacher-generated data is both appropriate to the action research design and a limitation. All findings are filtered through my perspective and do not include student or family voices in their own words. The purpose of this study is not to produce generalizable outcomes but to offer a detailed account of how curriculum adaptation unfolded in practice. However, the practices described here may offer points of consideration for educators in other settings who attend closely to students' interactions and adapt instruction accordingly.

Although I do not frame my positionality as a limitation, it does shape the boundaries of this study's interpretation. As an Anglo educator working in a Navajo community, my interpretations of Navajo cultural values and peacemaking traditions were informed by sustained relationships and consultation, but not by lived Diné cultural experience. This required ongoing reflexivity, restraint in interpretation, and attention to the risk of simplifying complex cultural concepts. This positionality also reflects broader patterns in which many teachers in schools serving American Indian students are non-Native (NCES, 2020), raising important questions about how educators navigate cultural

interpretation and responsibility in their practice. The dual role of teacher and researcher also shaped the study. During instruction, my primary responsibility was teaching rather than observation, which influenced what was documented in the moment. I also noted the possibility of confirmation bias, as by mid-semester I questioned whether increased evidence of integration reflected changes in student behavior or my growing attention to it.

Building on these limitations, several directions for future research emerge. Future studies could extend this work across early childhood contexts, both within Indigenous communities and in culturally diverse settings, to examine how integrating engineering design and culturally grounded conflict resolution functions when the cultural framework shifts. Additional studies might explore the role of family engagement, including whether parallel learning opportunities for caregivers strengthen children's use of these frameworks. Research examining how teachers' backgrounds influence their ability to implement culturally responsive STEM curricula would also inform teacher education. Finally, longitudinal studies could investigate how early exposure to integrated engineering and conflict resolution approaches shapes children's long-term social problem-solving and relational development.

Conclusion

Noddings (2002) argues that a curriculum of care places human relationships at the center of schooling. This study shows that engineering design and Navajo peacemaking values can function as a shared structure for navigating both material and relational problems. In this classroom, the engineering design process became a way for

students to define problems, listen to one another, and work toward solutions that supported both design goals and relationships.

At the same time, the findings reveal tensions that cannot be resolved through curriculum design alone. Efforts to support hózhó, or harmony, were shaped by the realities students brought with them, including experiences of conflict, inconsistency, and broader structural challenges. Supporting relational repair required more than teaching strategies; it required time, presence, and a willingness to respond to students' needs as they emerged. In this context, engineering design functioned not as a neutral problem-solving tool but as a structure through which these tensions could be engaged, rather than avoided.

For teacher educators, these findings suggest that preparing teachers for culturally responsive, relationally grounded practice requires more than introducing frameworks or strategies. It involves preparing teachers to work within uncertainty, to attend closely to relationships, and to remain responsive to the communities they serve. This includes creating opportunities for sustained engagement with communities, supporting reflective practices that examine assumptions over time, and preparing teachers to navigate the structural conditions that shape students' lives.

This study contributes to early childhood education by demonstrating how engineering design can function as a bridge between technical and relational learning when grounded in cultural values and sustained through teacher reflection, relational accountability, and ongoing instructional change. Through the lens of RPS, this integration was visible in how students and teacher together engaged in defining problems, listening to perspectives, and revising solutions across both design challenges

and interpersonal conflicts. As a framework, RPS offers a way to conceptualize engineering not only as a technical process but as a relational practice that supports shared meaning-making, ethical decision-making, and culturally grounded participation in early childhood classrooms. More broadly, the study suggests that teaching children to solve problems also requires teachers to examine how they define problems, listen to students and communities, revise their own responses, and remain accountable to the relationships through which learning occurs.

References

Bang, M., Medin, D., Washinawatok, K., & Chapman, S. (2010). Innovations in culturally based science education through partnerships and community. In M. Khine & I. Saleh (Eds.), *New science of learning* (pp. 569–592). Springer. https://doi.org/10.1007/978-1-4419-5716-0_28

Bierman, K. L., Coie, J. D., Dodge, K. A., Greenberg, M. T., Lochman, J. E., McMahon, R. J., & Pinderhughes, E. (2010). The effects of a multiyear universal social–emotional learning program: The role of student and school characteristics. *Journal of Consulting and Clinical Psychology, 78*(2), 156-168. https://doi.org/10.1037/a0018607

Blood, C., & Link, M. (1990). *The goat in the rug*. Aladdin Paperbacks.

Bluehouse, P., & Zion, J. W. (1993). Hozhooji Naat'aanii: The Navajo justice and harmony ceremony. *Mediation Quarterly, 10*(4), 327-337. https://doi.org/10.1002/crq.3900100403

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 777-101. https://doi.org/10.1191/1478088706qp063oa

Brayboy, B. M. J., Faircloth, S. C., Lee, T. S., Maaka, M. J., & Richardson, T. A. (2015). Sovereignty and education: An overview of the unique nature of Indigenous education. *Journal of American Indian Education*, 54(1), 1–9. https://doi.org/10.1353/jaie.2015.a835529

Brayboy, B. M. J., & Castagno, A. E. (2008). How might Native science inform "informal science learning"? *Cultural Studies of Science Education*, 3, 731-750. https://doi.org/10.1007/s11422-008-9125-x

Cammarota, J., & Fine, M. (Eds.). (2008). *Revolutionizing education: Youth participatory action research in motion*. (1st ed.). Routledge.

Cao, Y., Wang, H., Lv, Y., & Xie, D. (2023). The influence of children's emotional comprehension on peer conflict resolution strategies. *Frontiers in Psychology*, *14*, 1142373. https://doi.org/10.3389/fpsyg.2023.1142373

Castagno, A. E., & Brayboy, B. M. J. (2008). Culturally responsive schooling for Indigenous youth: A review of the literature. *Review of Educational Research, 78*(4), 941–993. https://doi.org/10.3102/0034654308323036

Castro-Olivo, S. M. (2014). Promoting social-emotional learning in adolescent Latino ELLs: A study of the culturally adapted Strong Teens program. *School Psychology Quarterly, 29*(4), 567-577. https://doi.org/10.1037/spq0000055

Chen, X., Wang, L., & Wang, Z. (2009). Shyness-sensitivity and social, school, and psychological adjustment in rural Chinese children. *Child Development, 80*(5), 1499-1513. https://doi.org/10.1111/j.1467-8624.2009.01347.x

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation*. Teachers College Press.

Dana, N. F., & Yendol-Hoppey, D. (2020). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry* (4th ed.). Corwin Press.

Dedoose. (2024). *Dedoose* (Version 9.2.12) [Software]. SocioCultural Research Consultants, LLC. https://www.dedoose.com

Denetdale, J. N. (2006). Chairmen, presidents, and princesses: The Navajo Nation, gender, and the politics of tradition. *Wicazo Sa Review, 21*(1), 9-28. https://doi.org/10.1353/wic.2006.0004

Eckhoff, A. (2023). Engineering to understand: Reflections on a learning and teaching partnership for preservice early grades teachers and preschoolers. *Journal of Early Childhood Teacher Education, 44*(1), 118-142. https://doi.org/10.1080/10901027.2021.2015492

Fleer, M. (2020). Studying the relations between motives and motivation – How young children develop a motive orientation for collective engineering play. *Learning, Culture and Social Interaction*, *24*, Article 100355. https://doi.org/10.1016/j.lcsi.2019.100355

Francis, L. D. (2015). *Kunu's basket: A story from Indian island.* Tilbury House Publishers.

Fraser-Burgess, S. (2020). Accountability & troubling the caring ideal in the classroom: A call to teacher citizenry. *Educational Studies, 56*(5), 456-581. https://doi.org/10.1080/00131946.2020.1799216

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Harvard University Press.

Goldstein, L. (2002). *Reclaiming caring in teaching and teacher education*. Peter Lang Publishing.

Google. (2024). *NotebookLM* [Large language model]. https://notebooklm.google.com

Herr, K., & Anderson, G. L. (2015). *The action research dissertation: A guide for students and faculty* (2nd ed.). SAGE Publications.

Jagers, R. J., Rivas-Drake, D., & Borowski, T. (2018). *Equity & social and emotional learning: A cultural analysis*. Collaborative for Academic, Social, and Emotional Learning (CASEL). https://drc.casel.org/uploads/sites/3/2019/02/Equity-Social-and-Emotional-Learning-A-Cultural-Analysis.pdf

Jones, S. M., Barnes, S. P., Bailey, R., & Doolittle, E. J. (2017). Promoting social and emotional competencies in elementary school. *The Future of Children, 27*(1), 49-72. https://doi.org/10.1353/foc.2017.0003

Kemmis, S., & McTaggart, R. (2005). Participatory action research: Communicative action and the public sphere. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (3rd ed., pp. 559–603). SAGE.

Kim, J. E., & Park, J. (2023). Elementary students' management of conflicts in an engineering design process and its effects on their group interaction progress. *Asia-Pacific Science Education, 9*(1), 174-193. https://doi.org/10.1163/23641177-bja10060

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465-491. https://doi.org/10.3102/00028312032003465

Lee, T. S. (2006). "I came here to learn how to be a leader": An intersection of critical pedagogy and Indigenous education. *InterActions: UCLA Journal of Education and Information Studies, 12*(1), article 3. http://repositories.cdlib.org/gseis/interactions/vol2/iss1/art3

Lippard, C. N., Lamm, M. H., Tank, K. M., & Choi, J. Y. (2019). Pre-engineering thinking and the engineering habits of mind in preschool classroom. *Early Childhood Education Journal, 47*(2), 187-198. https://doi.org/10.1007/s10643-018-0898-6

McCarty, T. L., & Lee, T. S. (2014). Critical culturally sustaining/revitalizing pedagogy and Indigenous education sovereignty. *Harvard Educational Review, 84*(1), 101–124. https://doi.org/10.17763/haer.84.1.q83746nl5pj34216

Meiners, C. J. (2017). *Talk and work it out.* Free Spirit Publishing Inc.

Mertler, C. A. (2020). *Action research: Improving schools and empowering educators* (6th ed.). SAGE Publications.

National Center for Education Statistics. (2020). *Race and ethnicity of public school teachers and their students.* https://nces.ed.gov/pubs2020/2020103/index.asp

Noddings, N. (1984). *Caring: A feminine approach to ethics and moral education.* University of California Press.

Noddings, N. (2002). *Educating moral people: A caring alternative to character education*. Teachers College Press.

Noddings, N. (2005). *The challenge to care in schools: An alternative approach to education* (2nd ed.). Teachers College Press.

Noddings, N. (2012). The caring relation in teaching. *Oxford Review of Education, 38*(6), 771-781. https://doi.org/10.1080/03054985.2012.745047

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93-97. https://doi.org/10.3102/0013189X12441244

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research, 75*(2), 211-246. https://doi.org/10.3102/00346543075002211

Sabzalian, L. (2019). *Indigenous children's survivance in public schools.* Routledge. https://doi.org/10.4324/9780429427503

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). SAGE.

Smetana, J. G., & Killen, M. (2008). Moral cognition, emotions, and neuroscience: An integrative developmental view. *European Journal of Developmental Science, 2*(3), 324–339. https://doi.org/10.3233/DEV-2008-2309

Smith, L. T. (2021). *Decolonizing methodologies: Research and Indigenous peoples* (3rd ed.). Zed Books.

Stringer, E. T. (2014). *Action research: A handbook for practitioners* (4th ed.). SAGE Publications.

Tank, K. M., Moore, T. J., Pettis, C. & Gajdzik, E. (2017). *PictureSTEM: Designing paper baskets.* Purdue University Research Foundation.

Tank, K. M., Moore, T. J., Dorie, B. L., Gajdzik, E., Sanger, M. T., Rynearson, A. M. & Mann, E. F. (2018). Engineering in early elementary classrooms through the integration of high-quality literature, design, and STEM+C content. In L. English and T. Moore, (Eds.), *Early engineering learning* (pp. 175-201). Springer.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wilson, S. (2008). *Research is ceremony: Indigenous research methods.* Fernwood Publishing.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89-100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Yazzie, R. (1994). Life comes from it: Navajo justice concepts. *New Mexico Law Review, 24*, 175–190. http://digitalrepository.unm.edu/nmlr/vol24/iss2/3

Yazzie, S. G. (2011). *Beauty beside me: Stories of my grandmother's skirts.* Salina Bookshelf, Inc.

Zion, J. W., & Yazzie, R. (1997). Navajo restorative justice: The law of equity and harmony. In G. Bazemore & L. Walgrave (Eds.), *Restorative juvenile justice: Repairing the harm of youth crime* (pp. 123–141). Criminal Justice Press.

Appendix A. Structured Reflection Prompts and Sample Excerpt

Structured reflections were used throughout the action research cycle to support ongoing teacher inquiry, critical reflexivity, and documentation of instructional decision-making. Prompts were organized across three phases: prior to implementation, during implementation, and after implementation.

Before Curriculum Implementation

1. What do I currently understand about how young children experience and manage peer conflict? What strategies do I typically observe them using?
2. What are my goals for this curriculum? What do I hope children will learn about conflict resolution?
3. Why am I using the engineering design process (EDP) as a framework for teaching conflict resolution? What do I anticipate about children's responses?
4. What challenges or tensions do I anticipate during implementation? How do I plan to support children's social-emotional learning and reflect on my teaching throughout the process?
5. How do I currently understand the relationship between Navajo peacemaking values and classroom learning? What role do I see culture playing in this curriculum?
6. What are my hopes and concerns about integrating Navajo values into engineering and conflict resolution instruction?

During Implementation

1. What did I notice about how students responded this week to the curriculum, to each other, and to me?

2. How did my teaching shift from what I originally planned? How do I feel about this?
3. What challenges emerged, and how did I respond?
4. Am I noticing children using the engineering design process outside of my classroom?
5. Did I observe any peer conflict episodes this week? If so, how did students attempt to resolve them, and which EDP steps or Navajo values were evident?
6. What did I notice about how students connected cultural knowledge to the engineering process?

After Implementation

1. How do I now understand how young children experience and manage conflict? What changes did I observe over the course of the curriculum?
2. In what ways did the engineering design process influence or support children's conflict resolution strategies?
3. How did the integration of Navajo values influence both my teaching and student learning?
4. What moments stood out during the curriculum? What surprised me in children's responses or in my own teaching?
5. How did my dual role as teacher and researcher shape my interactions with children during conflict? What did I learn about myself as an educator?
6. What did I learn about culturally responsive pedagogy through this experience?

7. What would I revise in future implementations, and how has this experience shaped my understanding of teaching social-emotional learning in early childhood?

Sample Structured Reflection Excerpt

Prompt: What challenges or surprises emerged during the lesson? How did students respond to peer conflict or problem-solving situations?

Reflection (Excerpt): During a transition at the end of the lesson, one student became visibly upset after another student selected the last available Play-Doh color she wanted. Rather than intervening immediately, I chose to observe how she would respond, given our recent discussions about solving problems with peers. The student withdrew and sat alone, and when I checked in, she declined help. A peer who was not directly involved approached her and attempted to support her, suggesting possible solutions. Although the student did not re-engage with peers during the class session, I later learned that the situation was resolved outside of class when the students negotiated sharing materials. This moment highlighted for me that conflict resolution does not always occur within the structured lesson time and may unfold across contexts. It also raised questions about when to intervene versus when to allow students space to work through problems independently. In future lessons, I plan to follow up more intentionally on unresolved conflicts and revisit the EDP/problem-solving steps with students after a delay to support transfer across situations.

Appendix B. Sample Annotated Lesson

This appendix provides a reconstructed example of how lesson planning documents were annotated during the curriculum adaptation process. Rather than presenting the original document with margin notes, this example makes visible the types of revisions, alignments, and reflections that were recorded across planning documents. The lesson illustrates how engineering design steps were explicitly aligned with peer conflict resolution strategies and Navajo peacemaking values during instruction.

Lesson Overview

Lesson Title: Defining the Problem (Introduction Lesson)

Grade Level: First Grade

Date: August 18, 2025

Original Objective: Students are introduced to the engineering design process (EDP) through a client-based problem scenario, identify the problem, and define criteria for a solution.

Key Adaptations (Annotated Reconstruction)

Original Plan (*PictureSTEM*): Students are introduced to the problem through email interactions with their clients, Max and Lola.

Annotation/Revision: The email format was condensed and restructured into a more interactive narrative format to better fit time constraints and maintain student engagement across grade levels. The scenario was revised to position both Max and Lola as active participants, addressing gender representation, and to reflect students' lived experiences through place-based details (e.g., collecting rocks in familiar locations). Visual supports

were also added, including AI-generated images that depicted Max and Lola as Navajo children, to ensure students could see themselves reflected in the problem context.

Original Plan (*PictureSTEM*): Introduce the engineering design process (EDP) as a sequence of steps used to solve design problems.

Annotation/Revision: The EDP steps were expanded to serve as both a design framework and a peer conflict resolution process. Each step was explicitly aligned with conflict resolution strategies and Navajo peacemaking values (hózhó, k'é, na'nitin) using simplified language and a visual comparison chart.

Original Plan (*PictureSTEM*): Students define the problem and identify criteria through teacher-led questioning and discussion.

Annotation/Revision: The lesson was reframed to emphasize that defining a problem applies to both engineering challenges and interpersonal situations. Students were prompted to consider fairness, shared understanding, and collaborative solutions, connecting the Define phase to relational problem-solving.

Original Plan (*PictureSTEM*): Instruction includes verbal explanation and discussion supported by visual tools, such as laminated EDP charts.

Annotation/Revision: Additional interactive and kinesthetic supports were introduced through the co-construction of visual representations. The class collaboratively discussed what symbols could represent each EDP step, the teacher modeled these on the laminated chart, and students then added corresponding drawings to their own charts. Hand motions were also incorporated to reinforce each step, supporting engagement and understanding across developmental levels.

Original Plan (*PictureSTEM*): Students complete structured activities individually.

Annotation/Revision: Instructional structures were adjusted to emphasize shared discussion and collective participation, reflecting the relational emphasis of Navajo peacemaking values and supporting collaborative problem-solving.

Connection to Engineering Design Process (EDP)

- All six EDP steps were introduced, with a focus on Define.
- Students identified the problem and criteria for solutions.
- Visual and kinesthetic supports (drawing, hand motions) were used to reinforce understanding.

Conflict Resolution (CR) Opportunities

Students were introduced to the idea that peer conflict can be addressed using the same EDP steps. During discussion, the teacher prompted students to identify shared problems, consider fairness, and think about solutions that work for everyone.

Alignment with Navajo Peacemaking Values

- Hózhó (harmony): Framing problems in ways that are fair and balanced
- K'é (relational accountability): Emphasizing collaboration and shared responsibility
- Na'nitin (learning from teaching through participation): Encouraging listening, observing, and contributing during group discussion

Students were asked to share their understandings of hózhó, k'é, and na'nitin. These ideas were then used to guide discussion connecting the values to the EDP/CR problem-solving process.

Reflection and Instructional Decisions

Following implementation, several instructional insights informed future revisions:

- Students demonstrated strong engagement and were able to define problems and identify criteria independently.
- Visual supports (drawing on EDP charts) and hands-on elements increased participation.
- Strong pre-existing relationships supported open discussion and collaboration.
- Instructional flow varied based on student responses, highlighting the need for flexible pacing.
- Future lessons were revised to include more hands-on and repetitive elements to support understanding across grade levels.

Note on Iteration Across Grade Levels

These annotations reflect patterns observed across multiple versions of the lesson implemented with kindergarten, first grade, and second grade groups, with adjustments made in response to student engagement, participation, and developmental needs.

Appendix C. Condensed Codebook with Examples from Data

Code	Definition	Example from Data
Define	Students state what the problem is before solving it	A second grader stated her friendship problem clearly (APM, 2025, October 7)
Learn	Gathering information about the problem	First graders discussed how characters felt in a social story (SR, 2025, November 3)
Plan	Generating and selecting solutions	First graders brainstormed a new game to play together (SR, 2025, November 3)
Try	Enacting a selected solution or strategy	A first grader used hot glue to put her design together (SR, 2025, December 1)
Test	Evaluating how well a solution or strategy worked	Kindergarteners tested the strength of their basket designs with rocks (2025, October 21)
Decide	Choosing to keep, revise, or change a solution	A second grader decided to change the color of his design (SR, 2025, December 3)
Hózhó	Maintaining or restoring harmony, balance, or fairness in interactions	Kindergarteners shared paper weaving strips unprompted (SR, 2025, October 8)

K'é	Demonstrating relational accountability, respect, and care	A first grader volunteered to help a classmate with a broken arm weave his basket (SR, 2025, October 6)
Na'nitin	Learning from teaching through listening, observing, and participation	A second grader shared how she learned to weave from watching and imitating her grandmother (SR, 2025, October 8)
Sociocultural Theory	Learning as socially mediated through interaction, tools, and context	A second grader used the EDP steps to guide her friend through problem solving (SR, 2025, October 30)
Culturally Relevant Pedagogy	Instruction that centers students' cultural identities and community knowledge	Teacher displayed examples of Navajo basket and rug weaving (ACPD, 2025, September 11)
Ethic of Care	Teaching grounded in empathy, responsiveness, and relational responsibility	Teacher decides to intentionally connect with a kindergartener outside of the classroom to improve her relationship with him (APM, 2025, September 18)

APPENDIX A: PROSPECTUS

UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

CONNECTING ENGINEERING THINKING, CONFLICT RESOLUTION, AND CULTURAL VALUES IN EARLY CHILDHOOD CURRICULUM

A PROSPECTUS

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

By

ANNE MOFFITT
Norman, Oklahoma
2026

CONNECTING ENGINEERING THINKING, CONFLICT RESOLUTION, AND CULTURAL VALUES IN EARLY CHILDHOOD CURRICULUM

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF INSTRUCTIONAL LEADERSHIP AND ACADEMIC CURRICULUM

BY

Dr. Amber Beisly, Chair

Dr. Elizabeth Zumpe

Dr. Vickie Lake

Dr. Kathleen Gallagher

Table of Contents

LIST OF TABLES 115

LIST OF FIGURES 116

Chapter 1: Introduction 118

Educational Problem 119

Purpose of the Study 121

Research Questions 121

Theoretical Framework 122

Conceptual Framework 125

Significance of the Study 128

Definition of Terms 130

Engineering Education in Early Childhood 132

The Rationale for Engineering in K–2 Classrooms 133

The Engineering Design Process (EDP) as a Developmentally Appropriate Framework 134

Engineering Design as a Social Process 135

Peer Conflict and Social Problem-Solving in Early Childhood 136

The Nature and Role of Peer Conflict 136

Social and Emotional Learning (SEL) Approaches in Early Elementary 137

Reframing Conflict as Design Work 138

Curriculum Adaptation and Culturally Sustaining Pedagogy 139
Relational Foundations of Indigenous Pedagogies 140
The Need for Culturally Responsive STEM Education 141
Examples of Adapted STEM or SEL Curricula 142
Relational Learning as a Bridge for Curriculum Adaptation 143
Navajo Peacemaking and Cultural Values 144
Overview of Navajo Peacemaking 144
Educational Applications of Peacemaking 146
Connecting Peacemaking with the EDP and Classroom Conflict 147
Teacher-Researcher Role and Action Research in Early Childhood STEM/SEL 149
Synthesis and Gaps in the Literature 152
Chapter 3: Methodology 155
Researcher Role/Positionality 155
Study Design 156
Participants and Setting 160
Curriculum Description 161
Data Sources and Procedures 162
Structured Reflections 163
Analytic and Planning Memos 164
Annotated Curriculum Planning Documents 164

Informal Consultation Notes 165
Peer Observation Notes 166
Analytic Rubric for Integrated Framework 166
Data Analysis 166
Preparing for Analysis: Familiarization and Memoing 167
Level 1: Structural Coding Guided by Conceptual Framework 168
Level 2: Pattern Coding 169
Level 3: Thematic Analysis Guided by Theoretical Framework 169
Trustworthiness 170
Ethical Considerations 171
Potential Limitations 172
References 175
Appendix A: Prompts for Structured Reflections 186
Appendix B: Structured Template for Analytic and Planning Memos 188
Appendix C: Annotated Curriculum Planning Template 190
Appendix D: Informal Consultation Notes Template 192
Appendix E: Peer Observation Notes Template 194
Appendix F: Rubric for Analyzing Children's Understanding of the Integrated Framework 195
Timetable 198

Publishable Articles 200

Article 1: Theoretical 200

Article 2: Practical 201

Article 3: Empirical..... 202

LIST OF TABLES

Table 1. Alignment of the Engineering Design Process, Conflict Resolution Steps, and Navajo Peacemaking Values ……..…158

Table 2. Alignment of Research Questions, Data Sources, Analytic Strategies, and Action Research Cycle …….……..…168

LIST OF FIGURES

Figure 1. Tri-theoretical Framework for Culturally Grounded Engineering Curriculum

……..……135

Figure 2. Engineering Design Process Framework…….136

Figure 3. Integrated Conceptual Framework……...138

Abstract

This qualitative action research study explores how a teacher-researcher adapts and implements a culturally responsive STEM curriculum to support conflict resolution in a Navajo early childhood classroom. Grounded in a tri-theoretical framework (sociocultural theory, culturally relevant pedagogy, and the feminist ethic of care), the study investigates how the engineering design process (EDP) can be aligned with Navajo peacemaking values to support both engineering thinking and social-emotional learning (SEL). Using structured reflections, curriculum planning artifacts, analytic memos, and consultation notes as data sources, the study examines curriculum adaptations, the integration of cultural and engineering practices, and the role of teacher reflection in guiding instructional decision-making. Data analysis follows a three-level coding process: descriptive coding to inventory content, pattern coding to track adaptation logic, and thematic analysis guided by the study's conceptual and theoretical frameworks. Findings will contribute to early childhood research and practice by offering a culturally grounded framework for integrating STEM and SEL, with implications for curriculum development, teacher preparation, and Indigenous education.

Keywords: early childhood education, engineering design process, culturally relevant pedagogy, peer conflict, action research, Navajo education

Chapter 1: Introduction

As the field of early childhood education continues to evolve, educators must be able to integrate social-emotional learning (SEL) and academic content within daily classroom curriculum and routines. Children's daily experiences in early elementary classrooms are filled with peer interactions that require communication, negotiation, and emotional regulation, particularly during moments of conflict. Although conflict can be a source of frustration or disruption in these settings, it is also an essential component of children's social, emotional, and cognitive development as they learn how to resolve disagreements constructively (Cao et al., 2023; Stevahn et al., 2000). Traditional approaches to conflict resolution in early childhood often emphasize adult-directed interventions or standardized scripts that do not always align with children's lived experiences or promote autonomy in problem-solving (Corsaro, 2003).

In parallel, national reforms such as the Next Generation Science Standards (NGSS) (National Research Council, 2013) have increased attention toward engineering design practices across all grade levels, including adaptations for the early elementary years. While NGSS was not specifically designed for early childhood settings, its emphasis on engineering practices has prompted a growing interest in developmentally appropriate frameworks that introduce design thinking to younger learners. Engineering education, particularly when embedded in meaningful, play-based contexts, has been shown to support critical thinking, persistence, and collaboration among children in kindergarten through second grade (Evangelou et al., 2010; Lippard et al., 2019). The engineering design process (EDP), which includes steps such as defining a problem, generating ideas, testing solutions, and revising plans, offers a structured yet flexible

framework that supports inquiry and iteration in early learning contexts (Tank et al., 2018). However, the potential for engineering design to support social problem-solving, especially during peer conflict, has yet to be widely explored in research or practice.

This study emerges from the intersection of these two domains: conflict resolution and engineering education. Rather than viewing them as separate components of the curriculum, this research investigates how the structured steps of the EDP can be applied during peer conflict as a tool for promoting collaborative, autonomous, and meaningful resolution strategies. In doing so, it also examines how children's engagement in engineering-infused peer play may reflect culturally grounded approaches to problem-solving.

Educational Problem

Despite growing attention to both SEL and early engineering education, there is little research on how to connect these practices in meaningful, developmentally appropriate ways. Peer conflict is a common occurrence in preschool classrooms, yet it is often addressed through adult-led interventions or standardized behavioral strategies that limit children's opportunities to engage in authentic, autonomous problem-solving (Cao et al., 2023). At the same time, the EDP, which is widely promoted in early STEM education, emphasizes exactly the kinds of iterative, collaborative thinking that conflict resolution requires: defining a problem, testing ideas, and making adjustments (Moore & Tank, 2014; Tank et al., 2018). However, current literature rarely explores how the engineering design framework might be used as a tool for navigating peer conflict.

This gap leaves early childhood educators without integrated models for supporting children's SEL through inquiry-based methods. Most curricula treat social-

emotional development and engineering design as separate areas of focus, missing the opportunity to leverage engineering thinking as a natural, child-centered approach to resolving interpersonal challenges. Research is needed to investigate whether and how children might draw on engineering design steps in the context of peer conflict, and how this might shift teacher support, curriculum design, and children's own sense of agency in problem-solving.

Therefore, this study responds to a critical gap in early childhood education: while young children are expected to develop both social-emotional and problem-solving skills, existing classroom strategies often separate these domains. Current curriculum structures tend to isolate SEL from STEM instruction. Conflict resolution is generally managed through adult-centered behavioral programs, while engineering design appears in discrete STEM units with little attention to children's interpersonal experiences. The absence of an integrated, child-centered framework limits both developmental coherence and cultural relevance in the early childhood curriculum. This research addresses that gap by exploring how engineering thinking might serve as a meaningful approach to navigating peer conflict in a way that is developmentally appropriate and grounded in local cultural values.

In addition, early engineering curricula are rarely designed with cultural responsiveness in mind. Many widely used STEM programs assume universal developmental norms and emphasize technical problem-solving without attending to the cultural values, community knowledge, or relational practices of the learners they serve (Bang et al., 2012; McCarty & Lee, 2014). For Indigenous and rural communities in particular, this disconnect can contribute to feelings of dissonance or marginalization in

STEM learning. Teachers, therefore, must often adapt existing curricula to better reflect students' cultural identities, ways of knowing, and social realities. This study is grounded in the recognition that meaningful integration of engineering and SEL requires not only changes in instructional methods, but also culturally grounded curriculum design.

Purpose of the Study

The purpose of this qualitative action research study is to investigate how a culturally adapted engineering curriculum can support young children's efforts to resolve peer conflict in a developmentally appropriate and culturally grounded way. Through the iterative adaptation and implementation of the "Designing Baskets" *PictureSTEM* unit in a rural early childhood STEM classroom serving Navajo children, this study explores how the EDP can be aligned with conflict resolution strategies and Navajo peacemaking values.

As a teacher-researcher, I aim to document how curriculum design decisions, classroom implementation, and reflective practice contribute to the integration of engineering thinking and SEL. This research examines whether and how engineering design steps can serve as a meaningful scaffold for children's peer conflict resolution in a specific cultural context.

Research Questions

The study is guided by the following research questions:

1. How does the teacher-researcher adapt the *PictureSTEM* curriculum to align engineering design with culturally grounded approaches to conflict resolution in a Navajo early childhood classroom setting?

2. In what ways does the implementation of the adapted curriculum demonstrate integration, as evidenced by the concurrent presence of engineering design process steps (Define, Learn, Plan, Try, Test, Decide) and Navajo peacemaking values (*hózhó, k'é, na'nitin*) during classroom conflict and collaborative learning?
3. How does ongoing teacher reflection, informed by dialogue with community partners, guide revisions to curriculum strategies that support both engineering thinking and culturally responsive conflict resolution?

Theoretical Framework

This study is grounded in a tri-theoretical framework that integrates sociocultural theory, the feminist ethic of care, and culturally relevant pedagogy. Together, these perspectives provide an epistemological foundation that centers relational learning, critical reflection, and cultural grounding in curriculum development and instructional practice. This framework guides the teacher-researcher's interpretation of curriculum adaptation, reflective decision-making, and pedagogical choices in a Navajo early childhood classroom.

Sociocultural theory (Vygotsky, 1978) emphasizes that learning is socially situated and mediated by cultural tools such as language, routines, and shared symbols. Within this perspective, knowledge is co-constructed through interaction and shaped by the sociocultural contexts in which learners participate (Rogoff, 2003). For the teacher-researcher, sociocultural theory provides a foundation for understanding curriculum as a mediating tool that supports children's collaborative problem-solving and social meaning-making. It also informs the teacher's reflection on how culturally grounded

practices and classroom discourse mediate learning during both STEM activities and peer conflict situations.

The feminist ethic of care (Gilligan, 1982; Noddings, 1984) highlights the moral dimensions of teaching, learning, and interpersonal relationships. This framework challenges abstract, rule-based models of moral development by emphasizing empathy, responsiveness, and relational accountability. In the context of curriculum adaptation, the feminist ethic of care positions the teacher-researcher as a responsive practitioner who attends to the emotional and relational dynamics of classroom life. It supports critical reflection on how conflict is framed, how classroom norms are co-constructed, and how care is enacted through curriculum design (Goldstein, 1998). Noddings' (2012) emphasis on receptivity, dialogue, and relational trust further reinforces the teacher's role in creating ethical and inclusive learning environments. In this study, the ethic of care provides a practical lens for aligning engineering design steps with *hózhó, k'é*, and *na'nitin*, guiding curriculum decisions that prioritize relational harmony. It also shapes the analysis by highlighting how children's use of the engineering design process reflects care, attentiveness, and responsibility in moments of peer conflict.

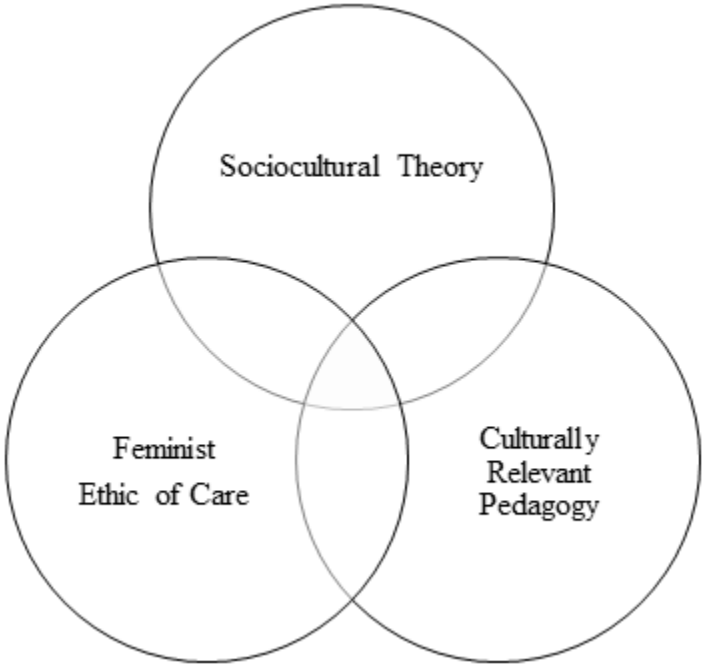
Culturally relevant pedagogy (Ladson-Billings, 1995) centers students' cultural identities and community knowledge as essential components of effective teaching. This framework asserts that culturally responsive instruction affirms learners' backgrounds, promotes academic success, and develops critical consciousness. In the present study, culturally relevant pedagogy guides the adaptation of the PictureSTEM unit to align with Navajo values and community priorities. It informs the teacher-researcher's commitment to integrating *hózhó* (balance), *k'é* (relationality), and *na'nitin* (teaching that is learned

through listening, observing, and participating) into curriculum decisions and classroom practices (Lee, 2015; McCarty & Lee, 2014). This orientation also supports the teacher's engagement in ongoing consultation with local educators to ensure cultural grounding and relational accountability.

Together, these three frameworks (see Figure 1) guide the study's methodology and interpretation. They position the teacher-researcher not only as an implementer of curriculum, but as a reflective, relational actor whose decisions are shaped by social, cultural, and ethical considerations. They also support a view of curriculum as a living, culturally situated practice that evolves in response to classroom dynamics, community insights, and iterative reflection.

Figure 1

Tri-Theoretical Framework for Culturally Grounded Engineering Curriculum



Note. This figure illustrates the intersection of three theoretical lenses used in the study: sociocultural theory, culturally relevant pedagogy, and the feminist ethic of care. These

frameworks collectively inform the design, implementation, and interpretation of the curriculum adaptation process, emphasizing relational, cultural, and iterative dimensions of teacher practice.

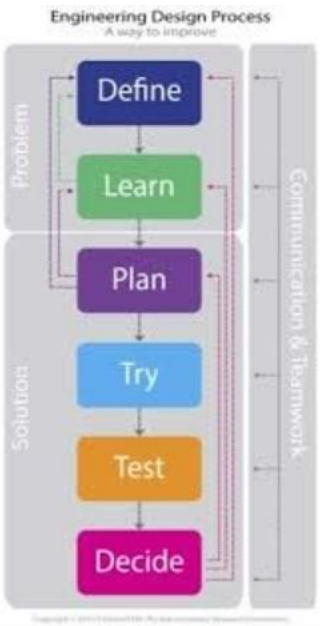
Conceptual Framework

While the theoretical framework provides the broad epistemological grounding for this study, the conceptual framework specifies how key constructs (engineering design, peer conflict, and cultural values) interact within the study design.

This study uses the EDP as a conceptual framework to examine how the teacher-researcher adapts and implements a culturally responsive early childhood STEM curriculum. The EDP (see Figure 2), as structured in the *PictureSTEM* curriculum (Tank et al., 2018), includes a sequence of developmentally appropriate steps (Define, Learn, Plan, Try, Test, Decide) that guide young children through real-world problem-solving. Although originally created for STEM design challenges, this framework also mirrors the types of iterative thinking, collaboration, and evaluation needed to navigate peer conflict in the classroom.

Figure 2

Engineering Design Process Framework (Moore & Tank, 2014)



Rather than treating engineering and conflict resolution as separate domains, this study conceptualizes the EDP as both a curricular scaffold and a lens for interpreting instructional choices and teacher reflection. Each step in the EDP offers opportunities for teachers to support children's autonomy, social reasoning, and collaborative negotiation, while also providing a structure to evaluate the cultural relevance of curricular adaptations.

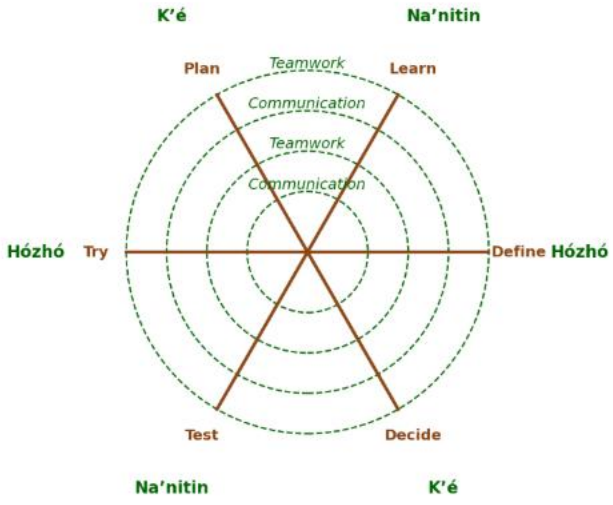
To deepen this analysis, the study draws on three core Navajo peacemaking values that are central to both community-based education and peacemaking traditions (Bluehouse & Zion, 1993; Denetdale, 2006; Judicial Branch of the Navajo Nation, 2004; McCarty & Lee, 2014). These values offer a culturally specific logic that enriches how problem-solving, conflict resolution, and classroom interactions are understood. The concept of *hózhó*, which refers to harmony, balance, beauty, and wellness, serves as a guiding principle for both curriculum design and the goals of conflict resolution. It shapes the overarching aim of restoring and maintaining relational and communal balance within classroom life. *K'é*, or kinship and relational accountability, informs how the curriculum

centers respect, mutual care, and responsibility across peer and teacher-student interactions. *Na'nitin*, or teaching, which emphasizes learning what is being taught through observation, experience, and listening, provides a methodological guide for the teacher-researcher's reflexive practice and interpretation of emerging insights.

These cultural values, when aligned with the EDP, form an integrated conceptual framework that grounds inquiry-based instructional decisions in culturally meaningful ways. This framework enables the teacher-researcher to examine curriculum adaptation not only in terms of academic outcomes, but also through the lens of relationality, cultural continuity, and community-defined values. A visual representation of this integrated framework is provided in Figure 3.

Figure 3

Integrated Conceptual Framework: EDP Steps Woven with Navajo Peacemaking Values for Conflict Resolution



The woven basket motif emphasizes iteration, relationality, and cultural grounding. By adding iterative rings of communication and teamwork, the framework makes visible that problem-solving is not only technical but also relational, requiring ongoing dialogue and

collective responsibility. This integrated framework is further unpacked in Table 1 (see p. 34), which demonstrates how each EDP step aligns with specific conflict resolution strategies and Navajo peacemaking values. The integration provides a structured, culturally grounded pathway that aligns engineering iteration with relational repair.

Significance of the Study

This study contributes to the field of early childhood education by advancing an inquiry-driven model of curriculum adaptation that integrates engineering design with culturally grounded approaches to conflict resolution. Specifically, it documents how a teacher-researcher adapts and implements the *PictureSTEM* "Designing Baskets" unit to align engineering design with Navajo peacemaking values while promoting SEL. Rather than focusing on student outcomes, this research centers the curriculum design process itself as a site of reflective and culturally responsive practice (Gay, 2018; Ladson-Billings, 1995; Paris & Alim, 2017).

By aligning the EDP with Navajo values, the study provides a concrete example of how STEM instruction can reflect Indigenous epistemologies while maintaining academic rigor (Bluehouse & Zion, 1993; Denetdale, 2006; McCarty & Lee, 2014; Wilson, 2008). These adaptations go beyond simply contextualizing instruction. They redefine engineering as a relational and iterative process shaped by cultural and ethical commitments, challenging dominant portrayals of STEM as objective or culturally neutral (Bang et al., 2012; Brayboy & Castagno, 2008).

This study also contributes to national conversations around the integration of STEM and SEL in early childhood classrooms. Many SEL programs emphasize scripted behavior interventions or externally imposed regulation strategies (Jones et al., 2017;

Schonert-Reichl, 2019) and fail to support children's agency in resolving peer conflict or adapting solutions to cultural contexts. Likewise, early engineering curricula tend to focus on material problem-solving rather than social interactions (Lippard et al., 2019; Nathan et al., 2017). By framing conflict resolution as a form of collaborative engineering thinking, this study presents an alternative approach that is both developmentally appropriate and culturally sustaining (Evangelou et al., 2010; Tank et al., 2018).

Theoretically, the study contributes to scholarship on relational learning and culturally mediated instruction. Drawing on sociocultural theory, the feminist ethic of care, and culturally relevant pedagogy, it frames curriculum adaptation as a pedagogical and ethical process shaped by context, identity, and community knowledge (Gilligan, 1982; Noddings, 1984; Vygotsky, 1978). The study extends current understandings of engineering as not only cognitive but also relational and ethical, affirming that how we teach problem-solving matters as much as what we teach (Cunningham & Kelly, 2017; Lee & Campbell, 2020).

Professionally, the findings offer insight for educators, curriculum developers, and teacher educators seeking to design STEM learning experiences that support children's social and emotional development in ways that are culturally grounded. The study provides a framework for reflective, inquiry-based practice that can be adapted to other settings, particularly those serving Indigenous or culturally diverse communities (Brayboy, 2005; McCarty & Lee, 2014; Whyte et al., 2015). It affirms that meaningful early STEM education must center not only content mastery but also the values, relationships, and ways of knowing that shape children's lived experiences.

For the children in this classroom, the adapted curriculum is designed to improve daily educational circumstances by offering concrete strategies to resolve conflicts collaboratively and autonomously, reducing reliance on adult-directed discipline. By embedding *hózhó, k'é,* and *na'nitin* into engineering design activities, the curriculum affirms cultural values and strengthens children's sense of identity and belonging. These adaptations also enhance engagement with STEM learning by linking technical problem-solving to relational responsibility and community values. In practice, this integration supports classroom harmony, nurtures children's agency as problem-solvers, and fosters a learning environment where social, emotional, and academic growth are interconnected.

Definition of Terms

The following operational definitions of key terms and concepts will be used throughout this study to support clarity and consistency:

1. Engineering Design Process (EDP) – A cyclical framework used in STEM education to guide problem-solving through steps such as defining a problem, generating ideas, testing solutions, and improving designs. In this study, the EDP follows Tank et al.'s (2018) version adapted for early childhood education, using simplified language (Define, Learn, Plan, Try, Test, Decide) and serving both as an instructional scaffold and an analytic lens for curriculum adaptation.
2. Navajo Peacemaking Values –A set of interrelated principles that guide moral reasoning, community life, and educational practice in *Diné* (Navajo) culture. In this study, these include:
    a. *Hózhó* – The principle of harmony, balance, beauty, and wellness in one's relationships, thoughts, and actions (Bluehouse & Zion, 1993).

b. *K'é* – The ethic of kinship, respect, and relational accountability that defines how individuals are expected to treat one another within and beyond family systems (Denetdale, 2006).

c. *Na'nitin* – The value of learning what is being taught through observation, experience, and oral tradition, emphasizing respectful listening and embodied understanding (McCarty & Lee, 2014).

These values inform how curriculum is designed, implemented, and interpreted in a culturally grounded way.

3. Peer Conflict – Disagreements or tensions that arise between children during collaborative activities, often involving shared materials, space, or differing goals (Abuhatoum & Howe, 2013; Myrtil et al., 2021). In this study, peer conflict is viewed as an opportunity for collaborative learning and is used to inform instructional adaptation.
4. *PictureSTEM* – An interdisciplinary curriculum that integrates STEM content with children's literature and storytelling to support engineering thinking in early childhood (Tank et al., 2018). This study uses a culturally adapted version of the "Designing Baskets" unit, modified to support conflict resolution and reflect Navajo peacemaking values.
5. Social–Emotional Learning (SEL) – The development of skills that support emotional regulation, empathy, relationship-building, and responsible decision-making (Denham, 2006). This study examines how instructional strategies, rather than discrete SEL programs, can support children's social competencies through engineering-integrated curriculum.

Chapter 2: Review of Literature

Early childhood classrooms are increasingly recognized as spaces where children construct knowledge not only about academic content but also about relationships, identity, and community. As the field of early childhood education expands to include integrated STEM learning, educators and researchers are called to examine how engineering, social-emotional development, and cultural responsiveness intersect in the experiences of young learners. This chapter reviews relevant literature on four interconnected domains: the role of engineering education in early childhood settings, peer conflict and social problem-solving in the early grades, curriculum adaptation through culturally sustaining pedagogy, and the principles and educational applications of Navajo peacemaking. Together, these areas give insight into the developmental and cultural complexities of teaching problem-solving in early learning environments and reveal critical gaps in how current curricula address both interpersonal conflict and cultural identity. The following sections synthesize findings across disciplines to establish a foundation for integrative, equity-centered approaches to early learning.

Engineering Education in Early Childhood

Engineering education has emerged as a vital component of early STEM learning, as reflected in national standards that emphasize design-based thinking from the earliest grades (National Research Council, 2013), offering young children meaningful opportunities to engage in problem-solving, creativity, and collaboration. Researchers have documented the benefits of engineering tasks in promoting persistence, metacognition, and conceptual understanding even among preschool and early primary students (Bers, 2022; Cunningham & Kelly, 2017; Lippard et al., 2019). Engineering

experiences build on children's natural curiosity and align with play-based pedagogies, making them developmentally appropriate for K–2 settings (Fleer, 2020; National Research Council, 2012). Curricula that incorporate the EDP, such as *Engineering is Elementary* and *PictureSTEM*, have shown promising outcomes in enhancing both STEM content knowledge and 21st-century learning skills like collaboration and reflection (Cunningham & Lachapelle, 2014; Tank et al., 2018). As national standards continue to emphasize engineering practices alongside science and math (National Research Council, 2013), it becomes increasingly important to explore how engineering can be effectively introduced and adapted in early learning environments.

The Rationale for Engineering in K–2 Classrooms

Young children are natural problem-solvers who engage in exploration and construction through play. These dispositions provide a strong foundation for early engagement with engineering tasks that require iteration, planning, and creativity (Bers, 2022; Lim et al., 2024; Lippard et al., 2019). Introducing engineering at the K–2 level supports cognitive and social growth, particularly in areas such as spatial reasoning (Verdine et al., 2017), executive function (Clements et al., 2016), and oral language development (Gold & Elicker, 2020). Early engineering experiences are also associated with positive affect and motivation, especially when children are encouraged to make choices, test ideas, and work with peers (Fleer, 2021).

The *Next Generation Science Standards* explicitly include engineering practices in all grade bands, promoting practices such as defining problems, developing models, and testing solutions (National Research Council, 2013). However, engineering practices are often underrepresented in early childhood classrooms (McClure et al., 2017), and

many teachers report a lack of confidence in facilitating engineering learning for young children (Chevalier et al., 2020; Wendell et al., 2010). Curriculum models such as *Engineering is Elementary* (Cunningham & Lachapelle, 2014) and *PictureSTEM* (Tank et al., 2016) address this gap by providing developmentally appropriate, inquiry-based lessons that connect engineering design with literacy, science, and math.

The Engineering Design Process (EDP) as a Developmentally Appropriate Framework

The EDP typically involves a sequence of steps (e.g., defining a problem, generating ideas, creating and testing prototypes, and improving upon designs) that mirrors the ways engineers solve real-world problems (Cunningham & Kelly, 2017). When simplified and visually supported, this process becomes accessible to young learners and provides a clear structure for collaborative exploration (Bers, 2022; Chevalier et al., 2020). Research has shown that even kindergarteners can articulate design goals, identify constraints, and revise their work when engaged in structured design experiences (English & King, 2015; Tank et al., 2018).

The *PictureSTEM* curriculum adapts the EDP into six accessible steps (Define, Learn, Plan, Try, Test, Decide) that are supported through narrative-based design challenges. In these lessons, students solve problems for storybook characters, integrating engineering with literacy and authentic problem contexts (Tank et al., 2016). This literacy-integrated approach has been shown to improve content knowledge while enhancing children's ability to engage in sustained reasoning and reflection (Gold & Elicker, 2020; Tank et al., 2018).

Moreover, the EDP promotes essential engineering habits of mind such as systems thinking, creativity, and persistence (Lucas et al., 2013). Systems thinking refers to the

ability to recognize how different parts of a problem or process are interconnected and how changes in one element may affect the whole (Lucas et al., 2013; National Research Council, 2009). Young learners benefit from the structure and predictability of the EDP while also engaging in flexible thinking and iterative problem-solving (Bers, 2022). Cunningham and Kelly (2017) argue that the EDP encourages children to see failure as part of the learning process, supporting resilience and a growth mindset.

Engineering Design as a Social Process

In early learning environments, engineering design is inherently social. Children often solve problems together, discussing ideas, assigning roles, and negotiating shared goals. These social interactions create space for perspective-taking, compromise, and shared ownership of solutions (Fleer, 2020; Lippard et al., 2019; Pyle et al., 2020). Research on engineering play has highlighted how design tasks foster both cognitive and interpersonal development, particularly when children engage in collaborative reasoning and material exploration (Cejka et al., 2006; Fleer, 2021; Vossoughi et al., 2016).

Socially mediated engineering, where young learners collaboratively plan, design, test, and refine ideas with peers, supports children's communication and language development. It allows children to explain, justify, and revise their work based on peer feedback, consequently engaging in rich discourse that fosters metacognitive processing and learning across domains (Siry et al., 2012). These collaborative design processes mirror relational problem-solving central to SEL and culturally responsive pedagogy: children negotiate shared goals, resolve disagreements, and build on each other's ideas in ways that develop holistic social, emotional, and academic competence (Gold & Elicker, 2020; Lippard et al., 2019).

When framed intentionally, the EDP can serve as both a cognitive and relational scaffold. Its emphasis on shared planning, testing, and decision-making provides young children with a framework for working through social as well as material challenges. This opens up new possibilities for integrating engineering with conflict resolution, especially when aligned with community-oriented values and culturally sustaining practices.

Peer Conflict and Social Problem-Solving in Early Childhood

As young children engage in collaborative play and inquiry-based learning, they frequently encounter social challenges that involve negotiation, disagreement, and repair. Peer conflict is not only developmentally typical, but also a key context for building foundational skills in empathy, communication, and moral reasoning (Chen et al., 2009; Smetana & Killen, 2008). These interactions allow children to explore autonomy and fairness, test social norms, and practice perspective-taking, particularly during cooperative learning tasks or shared imaginative play (Jones et al., 2015; Rubin et al., 2006; Thornberg, 2007). Sociocultural theorists emphasize that children co-construct knowledge and identities through everyday social participation, making peer conflict a site of both cognitive and relational development (Corsaro, 2003; Rogoff, 2003). While often treated as a behavioral issue, peer conflict offers rich opportunities for teachers to support emotional growth and community-building when addressed through developmentally appropriate and culturally responsive strategies (McCarty & Lee, 2014; Zinsser et al., 2015).

The Nature and Role of Peer Conflict

Peer conflict typically involves disputes over materials, space, rules, or roles, issues that arise naturally as children work and play together (Chen et al., 2009). These

moments, while often brief and emotionally charged, provide children with important opportunities to learn how to express themselves, listen to others, and negotiate solutions. Smetana and Killen (2008) found that children as young as four can evaluate conflicts using principles of fairness, intentionality, and relationship quality. Similarly, Thornberg (2007) observed that peer disputes often become forums for developing social rules and moral reasoning within children's peer cultures.

Frequent, developmentally appropriate exposure to conflict resolution processes can foster self-efficacy, empathy, and relational competence (Denham et al., 2012; Zinsser et al., 2015). Children who are guided through problem-solving conversations rather than simply redirected or disciplined are more likely to internalize prosocial strategies and engage in cooperative behavior in future interactions (Bierman et al., 2010; Ladd et al., 2012). In this way, conflict can serve as a catalyst for SEL development rather than a sign of failure or misbehavior.

Social and Emotional Learning (SEL) Approaches in Early Elementary

Social and emotional learning (SEL) is widely promoted in early childhood as a foundation for school readiness, peer relationships, and long-term mental health (CASEL, 2020; Jones et al., 2015). Programs such as *Second Step*, *PATHS*, and *Conscious Discipline* aim to cultivate self-awareness, emotional regulation, empathy, and responsible decision-making in developmentally appropriate ways (Domitrovich et al., 2007; Durlak et al., 2011). These programs often include scripted lessons, puppets, emotion vocabulary, and story-based scenarios to engage young children in SEL skills.

While research supports the general effectiveness of SEL interventions in improving prosocial behavior and reducing aggression (Bierman et al., 2008; Durlak et

al., 2011), critiques have emerged regarding their cultural assumptions and one-size-fits-all design (Jagers et al., 2019; McCarty & Lee, 2014). Most SEL models are grounded in individualistic frameworks and may overlook relational, communal, or culturally specific modes of emotional expression (Castro-Olivo, 2014; Sabzalian, 2019). This mismatch can be especially pronounced in Indigenous or rural contexts, where emotional development is often embedded in kinship, storytelling, and community-based learning. These cultural limitations are not only evident in instructional models but also embedded in the assessment tools used to evaluate social-emotional development.

Tools such as the *DESSA Mini* allow educators to assess SEL domains quickly and quantitatively (LeBuffe et al., 2018), while the *Social Skills Improvement System Social-Emotional Learning Edition* (SSIS SEL) provides comprehensive multi-rater assessments aligned with CASEL's five competencies (Gresham & Elliott, 2017), and the *Behavioral and Emotional Screening System* (BASC-3 BESS) offers efficient behavioral and emotional screening (Kamphaus & Reynolds, 2015). However, these tools rarely incorporate culturally grounded understandings of social behavior. A child who observes before participating or uses indirect communication may be mischaracterized as socially withdrawn or lacking in relationship skills when evaluated through a standardized, Western lens (Paris & Alim, 2017; Zinsser et al., 2015). As a result, there is a growing call for more flexible, culturally sustaining SEL frameworks that attend to community values and context.

Reframing Conflict as Design Work

One emerging approach to early conflict resolution is to treat peer conflict not as a disruption, but as a design-worthy problem, a challenge that invites creativity,

perspective-taking, and collaborative reasoning (Bers, 2022). This framing is consistent with sociocultural theories of learning that emphasize the role of meaningful, shared activity in cognitive development (Rogoff, 2003; Vygotsky, 1978) and aligns with the problem-solving orientation of the EDP (Cunningham & Kelly, 2017).

Each step of the EDP can be mapped onto conflict resolution strategies: children define the problem by articulating what went wrong, learn by listening to each other's perspectives, plan a solution together, try their approach, test how well it works, and decide how to move forward. This process not only mirrors engineering practices but also invites children to practice relational responsibility and shared decision-making (Fleer, 2021; Tank et al., 2018). Importantly, it situates conflict within a constructive, child-centered framework that values process over punishment and sees mistakes as learning opportunities.

By integrating conflict resolution into the EDP, educators can support both cognitive and social development in a unified framework. This approach also opens up opportunities to embed culturally specific values such as harmony, reciprocity, and collective responsibility into everyday classroom practices (Bluehouse & Zion, 1993; Pinto, 2000). Reframing conflict as design work holds particular promise for early learning environments where collaborative STEM tasks are already central and where relational values are emphasized in the surrounding community.

Curriculum Adaptation and Culturally Sustaining Pedagogy

The integration of STEM and SEL in early childhood education has gained traction in recent years, with studies showing how engineering play supports communication, negotiation, and peer collaboration in preschool and primary classrooms

(Bers, 2022; Lippard et al., 2019). Yet much of this work has been developed without adequate attention to cultural and community contexts, a critique long raised in scholarship on Indigenous and rural education (Azano & Stewart, 2015; Castagno & Brayboy, 2008; McCarty & Lee, 2014). For Indigenous, rural, and linguistically diverse learners, curriculum adaptation is not just a matter of relevance; it is a matter of educational equity and belonging. Culturally sustaining pedagogy calls for learning environments that affirm and extend students' cultural identities while equipping them with tools to thrive in an ever-changing world (Paris & Alim, 2017). In early childhood, this requires not only recognizing the social and emotional competencies children bring to the classroom but also designing learning experiences that align with local ways of knowing, communicating, and problem-solving (Brayboy et al., 2015; McCarty & Lee, 2014).

Relational Foundations of Indigenous Pedagogies

Indigenous pedagogies are fundamentally relational. Learning is viewed not as the acquisition of isolated skills, but as participation in the life of a community—learning by observing, listening, and contributing to shared goals (Kawagley, 2006; Rogoff, 2014). This relational orientation is visible in the use of story, ceremony, and collaborative tasks, where knowledge is co-constructed through interaction with elders, peers, and the natural world (Kimmerer, 2013; McCarty & Lee, 2014). For many Indigenous communities, including the *Diné*, teaching is embedded in daily life and grounded in values such as *hózhó* (harmony and balance), *k'é* (kinship and relationship), and *na'nitin* (teaching through traditional stories and experience) (Bluehouse & Zion, 1993; Lee, 2006). These

values highlight that curriculum adaptation must do more than translate materials; it must reflect the relational foundations of learning and the community's own epistemologies.

The Need for Culturally Responsive STEM Education

STEM education in early grades is often grounded in generalized developmental frameworks or national standards that prioritize technical accuracy and individual mastery over cultural relevance and relational learning (Bang et al., 2010). While such standards promote consistency, they frequently overlook the sociocultural foundations of children's thinking and the community knowledge systems in which STEM concepts are already embedded. For children from Indigenous or rural communities, this disconnect can result in disengagement or the perception that STEM is disconnected from their lived realities (Castagno & Brayboy, 2008; McCarty & Lee, 2014). Several scholars have argued that STEM learning must be reframed not as culturally neutral but as culturally situated, shaped by values, languages, and practices that vary across communities (Bang et al., 2012; Brayboy et al., 2015; Tan et al., 2021).

Culturally responsive STEM approaches have been shown to increase student engagement, identity formation, and conceptual understanding by embedding scientific inquiry and engineering design within local ecological, linguistic, or relational contexts (Bell et al., 2012; Medin & Bang, 2014; National Research Council, 2009). In early elementary classrooms, where learning should be grounded in play, relationships, and sensory experience, such contextualization is especially important. As Gay (2018) notes, cultural responsiveness is not limited to representation; it must also shape instructional processes, classroom interactions, and curriculum goals. For early engineering education

to be truly inclusive, it must attend to the values and epistemologies of the communities it serves, not just the mechanics of design.

Examples of Adapted STEM or SEL Curricula

Despite the growing recognition of the need for culturally grounded instruction, few early STEM curricula have been adapted to meet the needs of Indigenous, bilingual, or rural learners. Many commercially available engineering and SEL programs, such as *Engineering is Elementary*, *Second Step*, or *PATHS*, offer only superficial accommodations for cultural or linguistic variation (Castro-Olivo, 2014; Jagers et al., 2019). Where adaptations do exist, they are often limited to translated materials or token inclusion of multicultural content rather than substantive shifts in pedagogy, community involvement, or cultural framing.

Some promising models have emerged in both research and practice. For instance, the *Culturally Based Education* model developed for Native Hawaiian students integrates traditional ecological knowledge, place-based inquiry, and family partnerships into STEM instruction, resulting in improved academic and cultural outcomes (Kanaʻiaupuni & Kawaiʻaeʻa, 2008). Similarly, the *Growing Math* initiative provides bilingual, culturally responsive STEM and agriculture lessons for Indigenous-serving schools in the Southwest, blending food sovereignty themes with math and science skills (Burns Ortiz & Taken Alive, 2022). In the SEL domain, the *Circle of Courage* framework and adaptations of the *Strong Kids* program have been tailored for Indigenous youth by incorporating storytelling, visual metaphors, and values like belonging and mastery (Brendtro et al., 2009; Castro-Olivo, 2014).

There are currently no existing models that intentionally integrate STEM, SEL, and culturally sustaining pedagogy in early childhood classrooms. This intersection, where children can simultaneously develop engineering habits of mind, social-emotional competencies, and cultural identity, is an underexplored but crucial area of research. Particularly for Indigenous children, whose ways of knowing are often grounded in relationships, observation, and storytelling, the integration of these domains offers a more holistic and equitable model of learning (Brayboy & Castagno, 2009; Yazzie-Mintz, 2007). The lack of comprehensive frameworks at this intersection underscores the need for new curriculum adaptations that bridge STEM content with community-centered SEL and cultural relevance.

Relational Learning as a Bridge for Curriculum Adaptation

Relational learning also shifts the role of the teacher from transmitter to facilitator. In Indigenous-centered classrooms, educators often serve as guides who create space for children to observe, reflect, and engage with materials and peers in meaningful ways (Barajas-López & Bang, 2015; Brayboy et al., 2015). These approaches align well with early engineering tasks that involve open-ended problem-solving, iteration, and collaboration. Moreover, they provide a strong foundation for conflict resolution practices that emphasize dialogue, restoration, and collective well-being over individual correction or compliance (Pinto, 2000; Zion & Yazzie, 1997).

In early childhood education, integrating Indigenous pedagogies into STEM and SEL instruction means designing activities where knowledge is built through shared inquiry, and where materials and challenges are connected to children's cultural experiences and community knowledge. It also means valuing the relational dimensions of learning, not

only between children and teachers, but also among peers as they navigate conflict, co-create solutions, and develop a sense of mutual responsibility. These values are central to both Navajo peacemaking and engineering design, offering a promising convergence for curriculum adaptation.

Navajo Peacemaking and Cultural Values

Navajo peacemaking is a restorative justice tradition grounded in cultural values of harmony, relationality, and collective responsibility. Rooted in *Diné* epistemologies, peacemaking emphasizes dialogue, respect, and healing as central to resolving conflict and restoring balance (Bluehouse & Zion, 1993; Yazzie, 1994; Zion & Yazzie, 1997). Unlike punitive or adversarial systems common in Western schooling and judicial systems, peacemaking seeks not to assign blame but to rebuild relationships and reestablish *hózhó*, a condition of balance, wellness, and relational harmony (Denetdale, 2006; Lee, 2006). In both traditional and institutional forms, peacemaking has been practiced in familial, legal, and increasingly, educational settings (Pinto, 2000; Zion, 1998). As a culturally grounded approach to conflict, peacemaking provides a compelling alternative to dominant school discipline practices and aligns with Indigenous conceptions of development, justice, and relational learning (Brayboy et al., 2015; Sabzalian, 2019).

Overview of Navajo Peacemaking

Historically, peacemaking has been used within *Diné* communities to resolve interpersonal and intergroup conflict through structured, ceremonial dialogue led by respected community members or elders (Bluehouse & Zion, 1993; Pinto, 2000). Rather than focus on individual wrongdoing or retributive justice, peacemaking emphasizes the

interconnectedness of all participants and the goal of restoring harmony within the community (Zion & Yazzie, 1997; Lee, 2006). Stories, metaphors, and oral histories (*na'nitin*) are central to the process, allowing participants to engage with conflict resolution as a shared moral and spiritual journey, rather than a private transaction (Denetdale, 2006; Yazzie, 1994).

The contemporary Navajo Nation Judicial Branch institutionalized traditional peacemaking practices in the 1980s and 1990s by formally recognizing a Peacemaking Division, which operates alongside the tribal court system (Pinto, 2000; Zion, 1998). Unlike Western legal models that often remove conflict from its social context, Navajo peacemaking remains rooted in community, cultural values, and restorative goals (Coker, 2006; Zion, 1998). A key part of this approach involves the intentional inclusion of cultural teachings and the active involvement of community members in guiding participants toward *hózhó* (Yazzie, 1994; Zion, 1998).

Three foundational values inform this process. First, *hózhó* refers to beauty, balance, wellness, and the harmonious ordering of life (Lee, 2006; Yazzie, 1994). It is both a personal and communal ideal, and restoring *hózhó* is the ultimate purpose of peacemaking. Second, *k'é* signifies kinship, respect, and relational accountability. It reflects the idea that every individual is part of a network of responsibilities that should guide behavior and decision-making (Denetdale, 2006; Zion & Yazzie, 1997). Third, *na'nitin* emphasizes learning through traditional knowledge systems, especially through stories, observations, and teachings passed down by elders (Bluehouse & Zion, 1993; Cajete, 1994; Lee, 2006). These values work together to position conflict not as an

interruption to be managed, but as an opportunity for teaching, listening, and restoring right relationships.

Educational Applications of Peacemaking

The principles of Navajo peacemaking have increasingly informed educational practices in schools serving Indigenous children, particularly as an alternative to punitive discipline models (Lee, 2015; Zion, 1998). In these contexts, peacemaking circles and dialogue-based interventions have been used to address peer conflicts, foster school belonging, and reconnect classroom life with community values (Coker, 2006; McCarty & Lee, 2014; Yazzie-Mintz, 2007). Elders, teachers, and students often participate together in restorative conversations that emphasize emotional safety, story-sharing, and mutual understanding.

These practices align with child development research that underscores the importance of relational learning and narrative in supporting early emotional and moral development (Denham et al., 2012; Rogoff, 2003; Smetana & Killen, 2008). Unlike behaviorist approaches to discipline, which rely on reward-punishment cycles, peacemaking fosters perspective-taking, empathy, and shared responsibility through meaningful participation (Sabzalian, 2019; Zinsser et al., 2015). Moreover, it offers a contextually grounded approach to SEL that reflects Indigenous worldviews and community norms, which is something most mainstream SEL curricula fail to do (Jagers et al., 2019; Paris & Alim, 2017).

Culturally responsive educators have argued for the inclusion of peacemaking and similar Indigenous justice models in school settings to counter the alienation often felt by Native students within Western educational institutions (Castagno & Brayboy, 2008;

McCarty & Lee, 2014). Research has shown that when Indigenous values such as *hózhó* and *k'é* are reflected in classroom practices, students demonstrate higher engagement, stronger identity development, and deeper investment in collective well-being (Brayboy et al., 2015; Kanaʻiaupuni & Kawaiʻaeʻa, 2008). In addition to supporting SEL competencies like emotional regulation and relationship skills (CASEL, 2020), school-based peacemaking aligns with the holistic nature of Indigenous learning, where emotional, cognitive, spiritual, and relational dimensions are seen as inseparable (Kawagley, 2006; Kimmerer, 2013).

Connecting Peacemaking with the EDP and Classroom Conflict

The structure and values of Navajo peacemaking have parallels with the EDP, particularly as it is used in early childhood to scaffold collaborative problem-solving. Both frameworks involve defining a shared problem, listening to multiple perspectives, generating solutions, and revising decisions through reflection (Fleer, 2021; Tank et al., 2018). In peacemaking, participants co-create a path forward through dialogue and relational accountability; in engineering, children co-construct solutions through planning, testing, and iteration. Each emphasizes process over product, and each treats failure as a learning opportunity rather than a moral failing (Bers, 2022; Lucas et al., 2013; Yazzie, 1994).

As noted earlier in Figure 3, the conceptual framework integrates engineering design with Navajo peacemaking. Table 1 illustrates this alignment in detail by mapping each EDP step to conflict resolution strategies and peacemaking values.

Table 1
Alignment of the Engineering Design Process, Conflict Resolution Steps, and Navajo Peacemaking Values

Engineering Design Process Step	Conflict Resolution Step	Navajo Peacemaking Value
Define – Identify the problem and criteria	Identify the disagreement or issue; agree on what needs to be solved together	**Hózhó** – Say the problem in a way that is fair to everyone
Learn – Gather information	Listen to each person's side of the story; ask respectful questions	**Na'nitin** – Learn by listening and observing
Plan – Brainstorm and choose a solution	Think of possible compromises; choose one that works for everyone	**K'é** – Show care and respect for relationships
Try – Create a prototype	Try the solution that everyone agreed on	**Hózhó** – Act in ways that help everyone get along
Test – See how it works	Check if the solution is working for everyone	**Na'nitin** – Notice what worked and what didn't so we can make it better
Decide – Keep or improve the design	Decide to keep, change, or try another solution together	**K'é** – Make decisions that strengthen relationships

Note. This table illustrates how the engineering design process (EDP) aligns with conflict resolution strategies and Navajo peacemaking values, providing a culturally grounded scaffold for addressing classroom conflict.

This side-by-side framework makes explicit the conceptual bridge between engineering thinking and peacemaking, showing how the same structured steps can serve both technical and relational purposes. When conflict is reframed as a design-worthy challenge rather than a behavioral problem, children can engage in developmentally appropriate forms of peacemaking using the EDP as a scaffold. With teacher support, they move through the process by defining the conflict, listening to one another, planning solutions, trying them, testing outcomes, and deciding how to move forward (Tank et al., 2016). This alignment mirrors both the EDP and the restorative logic of peacemaking, reinforcing SEL competencies in culturally grounded ways.

The practical implications of integrating Navajo peacemaking into engineering-based curricula are significant. For Navajo and other Indigenous children, this model affirms their cultural identities and draws on relational values they likely already

encounter at home and in community (Lee, 2012; Yazzie-Mintz, 2007). For early childhood educators, it provides a relational, developmentally appropriate method for addressing conflict while simultaneously reinforcing core STEM practices. From a curriculum design standpoint, this integration offers a culturally sustaining, interdisciplinary approach that bridges STEM, SEL, and Indigenous pedagogy, three areas that often operate in isolation in mainstream educational frameworks (Brayboy et al., 2015; McCarty & Lee, 2014; Paris & Alim, 2017).

Teacher-Researcher Role and Action Research in Early Childhood STEM/SEL

The role of the teacher as researcher has been increasingly recognized as a critical component of educational inquiry. Rather than viewing teachers as passive implementers of externally designed curricula, scholars emphasize the importance of teachers generating knowledge from their own practice (Cochran-Smith & Lytle, 2009; Zeichner, 2003). This perspective reframes teachers as intellectuals and change agents who continuously interpret and adapt curriculum to meet the needs of their students and communities. In early childhood settings, where relational dynamics, play, and cultural context shape daily learning, the teacher-researcher stance is especially vital. Goldstein (1998) argues that teaching in early childhood is inherently moral and relational, requiring teachers to make ongoing decisions about how to respond to children in ways that honor their needs, voices, and lived experiences. Similarly, Noddings (2012) underscores that educators are not only responsible for transmitting knowledge but also for cultivating relationships of care, trust, and dialogue. A teacher-researcher framework thus aligns with the feminist ethic of care by situating inquiry within the ongoing moral, relational, and cultural dimensions of teaching.

Action research provides a methodological structure for this reflective and responsive stance. Defined as a cyclical process of planning, acting, observing, and reflecting, action research allows teachers to systematically investigate their practice while simultaneously seeking improvement (Kemmis & McTaggart, 2005; Mertler, 2020). It is grounded in the principle that those closest to the problems of practice are best positioned to generate meaningful solutions. In early childhood education, action research has been employed to refine instructional strategies, integrate developmental goals, and strengthen family partnerships (Dana & Yendol-Hoppey, 2020). Because of its iterative and participatory nature, action research is particularly well suited to classrooms where learning is dynamic, relational, and deeply contextualized. It also supports educators in aligning curriculum with cultural and community priorities, which is essential in Indigenous-serving contexts where standardized approaches often overlook local values and epistemologies (McCarty & Lee, 2014).

Within early STEM and SEL education, however, the use of action research remains limited. Much of the literature on STEM integration in the early grades is based on top-down interventions, fidelity-of-implementation studies, or researcher-designed curricula (Cunningham & Kelly, 2017; Lippard et al., 2019). Similarly, evaluations of SEL programs often rely on large-scale, decontextualized measures that do not capture the relational and cultural nuances of classroom practice (Jagers et al., 2019). While some studies illustrate the potential of teacher-led action research in early STEM (e.g., Chen & Tippett, 2022; Emembolu et al., 2020) and in SEL (e.g., Carter, 2021; San Antonio, 2018), these efforts typically address each domain in isolation.Lack of teacher-driven research that intentionally integrates the two domains represents a significant gap, as the

integration of the EDP with SEL requires responsiveness to both interpersonal dynamics and technical problem-solving. Teacher-researchers are uniquely positioned to navigate these intersections, attending to children's ideas, relationships, and cultural contexts while facilitating STEM learning.

The absence of action research in this area is particularly notable in Indigenous education. While culturally sustaining pedagogies emphasize the centrality of local knowledge, relationships, and community participation (Paris & Alim, 2017; Brayboy et al., 2015), most early STEM and SEL curricula are not adapted through collaborative, community-centered processes. Existing adaptations often remain superficial, focusing on translation or representation rather than substantive shifts in pedagogy (Castagno & Brayboy, 2008). Action research offers a way to bridge this gap by positioning the teacher as a reflective practitioner who can iteratively adapt curriculum to honor community values while addressing academic standards. This approach also resonates with Indigenous pedagogies of relational learning, which frame teaching as embedded in daily life, observation, and shared responsibility (Kawagley, 2006; Rogoff, 2014).

In this way, action research contributes both methodologically and philosophically to the integration of STEM and SEL in culturally sustaining ways. Methodologically, it provides a structured yet flexible process for refining curriculum in response to classroom realities. Philosophically, it affirms the agency of teachers and communities in shaping education, rather than positioning outsiders as the sole experts in curriculum design and implementation. As Zeichner (2003) argues, teacher research not only improves practice but also democratizes knowledge production in education. For early childhood contexts, this is particularly crucial, as children's social interactions,

cultural identities, and developmental trajectories are deeply interconnected with their learning. The scarcity of action research in STEM/SEL integration highlights a gap in understanding how teachers can act as both facilitators and researchers in developing responsive, culturally relevant curriculum.

Synthesis and Gaps in the Literature

The literature reviewed in this section establishes a strong conceptual and empirical foundation for integrating engineering design, peer conflict resolution, and culturally sustaining pedagogy in early childhood education. Research confirms that young children are capable of engaging in engineering design thinking when supported by developmentally appropriate frameworks, such as story-based challenges and scaffolded design processes (Bers, 2022; Cunningham & Lachapelle, 2014; Lippard et al., 2019; Tank et al., 2018). These experiences promote problem-solving, metacognition, perseverance, and collaborative reasoning, all of which are considered essential habits of mind for early STEM learners (Fleer, 2020; Lucas et al., 2013). Simultaneously, peer conflict is recognized as a normal and constructive feature of early childhood classrooms, one that provides essential opportunities for practicing perspective-taking, negotiation, and emotional regulation (Chen et al., 2009; Smetana & Killen, 2008). These two domains, engineering design and conflict resolution, are both rooted in iterative, collaborative processes, yet they have rarely been studied or implemented jointly (Gold & Elicker, 2020).

In addition to this underexplored integration of engineering and SEL, the literature highlights a broader need for early childhood curricula that reflect the cultural identities, knowledge systems, and relational practices of Indigenous learners. Culturally

sustaining pedagogies emphasize the importance of honoring local epistemologies and community values within classroom learning, positioning culture not as a barrier to overcome but as a foundation for meaningful engagement (McCarty & Lee, 2014; Paris & Alim, 2017). Although some initiatives have successfully adapted STEM or SEL programs for use in Indigenous or rural contexts (Brayboy et al., 2015; Castro-Olivo, 2014; Kanaʻiaupuni & Kawaiʻaeʻa, 2008), most early learning materials continue to rely on Western developmental models that may not align with relational worldviews or community-based approaches to teaching and learning (Bang et al., 2012; Jagers et al., 2019; Sabzalian, 2019). These disconnects are especially evident in standardized SEL assessments and scripted STEM curricula, which often treat learning as individual and decontextualized rather than social and culturally situated (Tan et al., 2021; Zinsser et al., 2015).

The literature also reveals a distinct lack of research connecting Navajo peacemaking practices to classroom-based models of engineering or SEL. While peacemaking has been well documented as a restorative justice tradition rooted in *hózhó*, *k'é*, and *na'nitin* (Bluehouse & Zion, 1993; Lee, 2006; Pinto, 2000; Yazzie, 1994), there is little scholarship examining how these values might inform STEM-integrated instruction or be translated into early learning settings through culturally relevant, hands-on processes. The absence of this connection is notable given the congruence between peacemaking and both sociocultural theories of learning (Rogoff, 2003; Vygotsky, 1978) and relational models of conflict resolution in early childhood (Denham et al., 2012; Thornberg, 2007). In schools that serve *Diné* children, this represents both a missed

opportunity and a potential pathway toward greater curricular coherence, cultural affirmation, and child-centered learning.

Together, these gaps point to a need for curriculum models that intentionally connect engineering design, social problem-solving, and Indigenous knowledge systems in early childhood education. The absence of such models not only limits children's opportunities for integrated learning but also contributes to the continued marginalization of cultural frameworks, such as Navajo peacemaking, that offer developmentally appropriate, ethically grounded alternatives to dominant approaches in both STEM and SEL (Castagno & Brayboy, 2008; McCarty & Lee, 2014; Sabzalian, 2019). By building on existing strengths in engineering education, SEL, and culturally sustaining pedagogy, new integrative approaches have the potential to expand the conceptual boundaries of early childhood curriculum and to affirm the cultural identities and relational capacities of all children.

The core problem of practice this study addresses is the lack of culturally sustaining approaches for supporting young children in navigating peer conflict within early engineering play. Existing STEM and SEL curricula often treat these domains separately, rely on standardized program models, or fail to account for Indigenous cultural values and relational ways of knowing (Jagers et al., 2019; McCarty & Lee, 2014; Medin & Bang, 2014). Action research provides the most appropriate methodology for approaching this problem because it positions the teacher as a reflective practitioner who can iteratively adapt curriculum in response to children's social dynamics, cultural contexts, and emerging needs (Zeichner, 2003). By using cycles of planning, acting, observing, and reflecting, action research allows for the development of a curriculum that

is both academically rigorous and relationally responsive. In this study, the adapted *PictureSTEM* unit will serve as a vehicle for integrating the EDP with conflict resolution strategies grounded in Navajo peacemaking values. Evidence of the curriculum's potential to address the problem of practice will be generated through the teacher-researcher's systematic reflections, annotated lesson materials, and analytic memos, which together document how children's engineering problem-solving and peer conflict interactions are supported by the adapted design.

Chapter 3: Methodology

Researcher Role/Positionality

The teacher-researcher is a *bilagáana* (Anglo) educator who established the preschool program at the school, taught there for three years, and served as a visiting STEM teacher for an additional three years while completing doctoral studies. These longstanding relationships with students, families, and staff have helped establish trust and sustain engagement with the community. The decision to adapt the "Designing Baskets" *PictureSTEM* unit for this study emerged in dialogue with school leadership, who expressed interest in curriculum that would both strengthen academic instruction and support children's social problem-solving. Conversations with students and colleagues will continue to inform how the curriculum is culturally adapted and aligned with the values of the school and the local community. In this way, the project reflects a collaborative process rather than an externally developed program.

To ensure community voices shape and validate the research process, informal consultations with school staff members will serve not only as input during curriculum adaptation but also as opportunities for member-checking interpretations of data. Their

insights will help confirm whether emerging themes resonate with community values and classroom realities. Findings will be shared back with the school through a brief presentation at a teacher meeting at the end of the semester, along with a summary report and a copy of the adapted curriculum unit saved on the school's computer drive for staff access. Midway through the semester, children's learning will also be shared with families at the school's Open House through documentation of curriculum activities, with families invited to provide feedback. These reciprocal practices embody relational accountability by ensuring that the study's interpretations are grounded in community perspectives and that dissemination supports the school's educational mission rather than external audiences alone.

As a teacher with longstanding relationships in this school community, I am uniquely positioned to carry out this inquiry. My experience teaching STEM and early social-emotional skills in this setting, along with my sustained ties to children, families, and colleagues, provides a foundation of trust, cultural understanding, and pedagogical expertise. Unlike an external researcher bringing in a prefabricated intervention, I approach this work as an insider educator whose ongoing practice shapes and is shaped by the curriculum. This positioning is a strength of the study and aligns directly with the principles of action research.

Study Design

Building on the problem of practice identified earlier, how engineering design principles can be adapted to support children's conflict resolution in culturally responsive ways, this study employs action research as a methodology aligned with both the context and the teacher-researcher's positionality. This study will use a qualitative action research

design grounded in the teacher-researcher's classroom practice in a K–2 STEM setting on the Navajo Nation. Action research is a participatory and practitioner-oriented methodology that involves iterative cycles of planning, acting, observing, and reflecting (Mertler, 2020; Stringer, 2014). It is designed to address real-world problems of practice and supports locally grounded improvements to teaching and learning. Rather than generating generalizable findings, action research privileges situated knowledge and professional growth (Cochran-Smith & Lytle, 2009).

Table 2 provides a summary of how the research questions are aligned with data sources, analytic strategies, and the phases of the action research cycle. This alignment establishes the coherence of the study design and highlights how methodological choices are directly tied to the core problems of practice under investigation.

Table 2

Alignment of Research Questions, Data Sources, Analytic Strategies, and Action Research Cycle

Research Question	Primary Data Sources	Analytic Strategies	Action Research Phases
RQ1: How does the teacher-researcher adapt the *PictureSTEM* curriculum to align engineering design with culturally grounded approaches to conflict resolution in a Navajo early childhood classroom setting?	Annotated curriculum planning documents, analytic/planning memos, informal consultation notes	Descriptive coding of curriculum artifacts and memos; pattern coding to trace adaptation decisions and cultural integration over time	Plan, Act, Reflect
RQ2: In what ways does the implementation of the adapted curriculum demonstrate integration, as evidenced by the concurrent presence of engineering design	Structured reflections (including documentation of conflict episodes), annotated	Pattern coding to identify instances where EDP steps and Navajo values co-occur; development of integration	Observe, Reflect

process steps (Define, Learn, Plan, Try, Test, Decide) and Navajo peacemaking values (*hózhó, k'é, na'nitin*) during classroom conflict and collaborative learning?	curriculum, informal consultation notes, peer observation notes	indicators (e.g., lesson moments where Navajo peacemaking values are applied within an EDP step); triangulation across reflections, annotated curriculum, and consultation notes to confirm integration	
RQ3: How does ongoing teacher reflection, informed by dialogue with community partners, guide revisions to curriculum strategies that support both engineering thinking and culturally responsive conflict resolution?	Structured reflections, analytic/planning memos	Chronological tracking of reflection entries; thematic coding of dilemmas, decisions, and revisions; memoing to document iterative reasoning and growth	Plan, Reflect

This study will investigate how engineering design principles can be adapted to support conflict resolution in culturally responsive ways. The study will unfold across a complete cycle of action research, with each phase directly tied to instructional decisions and reflective practice.

- Planning Phase: The teacher-researcher will review existing lessons from the "Designing Baskets" *PictureSTEM* unit and design culturally responsive modifications that explicitly integrate conflict resolution strategies and Navajo values (e.g., *hózhó, k'é, na'nitin*). Planning memos and curriculum maps will document the alignment between engineering design steps, social problem-solving goals, and cultural frameworks.

- Action Phase: The adapted unit will be implemented over a 15-week period of regular STEM instruction. Although the unit will be delivered to K–2 students, no student data will be collected for this study. Instead, implementation will be documented through reflections, annotated lesson plans, and memos focusing exclusively on the teacher-researcher's facilitation practices.
- Observation Phase: Observational data will be gathered through systematic teacher self-reflection and personal video logs. The focus will be on identifying how the curriculum supports peer collaboration, conflict resolution opportunities, and expressions of cultural values during engineering play. Informal input from trusted colleagues (e.g., a *Diné* Navajo language and culture teacher and the Anglo school principal) will be captured in consultation notes to support community and cultural alignment.
- Reflection Phase: After each lesson and at the end of each multi-lesson sequence, the teacher-researcher will analyze implementation artifacts, adaptation memos, and reflections to assess what is working, what needs revision, and how values-based conflict resolution is emerging through engineering activities. These reflections will guide ongoing curriculum refinement and contribute to the development of practical knowledge for other educators working in Indigenous early childhood contexts.

This approach is particularly appropriate for Indigenous-serving educational settings, where research has often been extractive and disconnected from community priorities. Action research, by contrast, emphasizes relational accountability, responsiveness to context, and reciprocity (Brayboy et al., 2015; Smith, 2021; Wilson,

2008). It positions the teacher-researcher not as an outsider studying a population, but as a community-embedded educator working in partnership with children and families to co-construct meaningful learning experiences. The longstanding relationships between the teacher-researcher and the school community further strengthen the trust, cultural humility, and commitment required for this inquiry.

The study will also be guided by a tri-theoretical framework (sociocultural theory, culturally relevant pedagogy, and the feminist ethic of care) that together emphasize the importance of relational learning, culturally grounded practice, and critical self-reflection. Within this framework, the research will center on how the teacher-researcher adapts and facilitates engineering activities that support children's social-emotional growth and honor community values. The data sources, which include curriculum documents, teacher reflections, and consultation notes, will be used to document the evolution of practice over time.

Participants and Setting

This study will take place in a K–2 specials classroom at a small private elementary school located on the Navajo Nation in the southwestern United States. The school has been operating in the community since 1948, serving as a long-standing educational institution with deep ties to local families and cultural life. Although privately operated, the school does not charge tuition or fees and is designed to serve low-income families in the local community. It serves approximately 50 students in pre-kindergarten through 8th grade each year. The school's Christian orientation emphasizes values such as compassion, responsibility, and reconciliation, which resonate with both

the conflict resolution goals of this study and the peacemaking values embedded in Navajo culture.

The STEM class will function as a rotating weekly special for each homeroom class, with each group attending a 20- to 40-minute engineering-integrated lesson once per week during the fall semester. Over the course of the study, all Kindergarten through 2nd grade students (approximately 20 children) will engage in a culturally adapted version of the "Designing Baskets" *PictureSTEM* curriculum unit as part of their regular instruction. The structure of the STEM classroom, involving weekly contact across three grade levels, consistent curricular routines, and recurring design challenges, offers an authentic environment for implementing and refining culturally responsive curriculum adaptations within a real instructional context.

Curriculum Description

The curriculum for this study draws from the *PictureSTEM* integrated STEM literacy unit "Designing Baskets", a paper-basket design challenge (Tank et al., 2018). This unit introduces young learners to the EDP through an accessible and developmentally appropriate task: creating baskets from paper materials that are both strong and able to carry objects. The unit uses children's literature as an entry point into design challenges and situates problem-solving within real-world contexts, helping students connect literacy, science, and engineering. The six steps of the EDP (Define, Learn, Plan, Try, Test, and Decide) provide a structured framework for approaching the design problem, encouraging iteration, reflection, and collaboration.

For this study, the original EDP sequence and design challenge serve as the foundation, but the curriculum is intentionally adapted to extend beyond technical design.

The same six EDP steps are used as the conflict resolution process, so that children apply Define, Learn, Plan, Try, Test, and Decide not only to design challenges but also to peer disagreements. Each step is explicitly mapped onto strategies for addressing conflict and grounded in Navajo peacemaking values (*hózhó, k'é, na'nitin*). For example, Define involves naming the problem clearly in order to work toward restoring balance (*hózhó*), while Plan emphasizes generating possible solutions collaboratively in ways that honor respect and relational accountability (*k'é*). By weaving these layers together, the adapted curriculum positions the EDP as both a technical and relational framework, making visible that engineering design, like peacemaking, is an iterative process of problem-solving, balance, and repair.

Data Sources and Procedures

Data will be collected over a 15-week action research cycle, which includes 13 weeks of curriculum implementation (one *PictureSTEM* lesson per week per grade level) and 2 additional weeks for pre- and post-implementation planning and reflection. The study will follow a multi-method qualitative approach focused on the teacher-researcher's instructional practices, professional reflections, and curriculum artifacts.

This design supports an inquiry stance that is feasible given the teacher-researcher's ongoing role in the classroom and long-standing relationship with the school. All activities will be embedded within regular instruction and guided by culturally responsive and developmentally appropriate teaching practices. The five data sources listed below are grounded in the principles of action research, which emphasize iterative cycles of planning, acting, observing, and reflecting (Mertler, 2020; Stringer, 2014), and

in practitioner inquiry as a vehicle for generating local, context-sensitive knowledge (Cochran-Smith & Lytle, 2009; Dana & Yendol-Hoppey, 2020).

Structured Reflections

The teacher-researcher will engage in structured reflections throughout the implementation of the *PictureSTEM* unit. Reflections may take written, audio, or video form depending on what best captures the immediacy and depth of insights after each lesson. This practice supports critical reflexivity, which is a core element of action research, as the teacher-researcher examines their own assumptions, dilemmas, and emerging understandings over time (Dana & Yendol-Hoppey, 2020; Herr & Anderson, 2015; Mertler, 2020).

Structured reflections will be guided by a set of semi-structured prompts developed by the teacher-researcher and designed to bring to the surface patterns in teacher thinking related to conflict resolution, peer dynamics, and the integration of Navajo peacemaking values (see Appendix A). Each reflection will function both as a record of classroom experiences and as a space for interpretive meaning-making, allowing the teacher-researcher to track evolving responses to curriculum and context. The structured reflections will occur in three phases: a baseline reflection in Week 1 to articulate goals and positionality, weekly entries after each *PictureSTEM* lesson from Weeks 2 to 14, and a final summative reflection in Week 15 to synthesize learning and plan future adjustments. These reflections contribute to the Plan and Reflect phases of the action research cycle and serve as a cornerstone of the study's inquiry-driven approach to practice.

The structured reflection instrument includes prompts for documenting instructional shifts, challenges, and observations of student engagement, as well as episodes of peer conflict. Reflections will describe how conflicts emerged, the strategies students used to resolve them, and which engineering design steps or Navajo values were evident in their responses. These narrative accounts provide practice-based evidence of how the curriculum shapes children's social interactions and problem-solving processes, complementing other data sources with insight into student experiences.

Analytic and Planning Memos

A series of analytic and planning memos will be written before, during, and after implementation to capture the teacher-researcher's evolving thinking about curriculum decisions, instructional goals, and classroom dynamics. These memos will include reflections on observed needs, cultural considerations, and instructional shifts made in response to informal consultation or structured reflection. They represent the Plan and Reflect phases of the action research cycle by capturing the internal reasoning and interpretive thinking that informs instructional decisions (Dana & Yendol-Hoppey, 2020; Mertler, 2020). See Appendix B for a structured template for memos developed by the teacher-researcher.

Annotated Curriculum Planning Documents

All lesson plans, instructional materials, and curriculum maps developed or adapted from the "Designing Baskets" *PictureSTEM* unit (Tank et al., 2016) will be collected and annotated with notes documenting decisions, challenges, and alignment with project goals (see Appendix C for template example). These artifacts function as *living documents* (daSilva et al., 2025) that illustrate how engineering design steps were

merged with conflict resolution strategies and Navajo peacemaking values. Annotations will be used to record changes made in response to teacher reflections or informal consultations with colleagues, including cultural or developmental considerations. They represent the Act and Observe phases of the action research cycle by documenting how lessons were implemented and adapted in real time. These documents provide a rich record of curriculum evolution and support analysis of how culturally responsive instructional design unfolds over time (Mertler, 2020).

Informal Consultation Notes

Throughout the study, the teacher-researcher will engage in informal, ongoing dialogue with two trusted school colleagues: the *Diné* Navajo language and culture teacher and the Anglo school principal. These conversations will focus on the cultural relevance of instructional decisions, classroom observations, and the alignment of engineering and conflict resolution strategies with community values. Key insights from these discussions will be documented as informal consultation notes, without including names, direct quotations, or identifiable information.

This form of collaborative sensemaking reflects the participatory and relational values of both action research and Indigenous research methodologies (Cammarota & Fine, 2008; Smith, 2021). It contributes to the Observe and Reflect phases of the action research cycle by grounding interpretation in dialogue and honoring the cultural expertise of community partners. These notes also support relational accountability by ensuring that curriculum adaptations are responsive to both educational and cultural priorities.

Peer Observation Notes

To add an additional perspective beyond teacher-researcher self-documentation, the school principal and the *Diné* language and culture teacher will each be invited to observe at least one class session during the implementation phase. They will be asked to focus their notes on classroom dynamics, peer conflict episodes, and evidence of Navajo values in practice. These observations will be triangulated with teacher reflections, analytic memos, and annotated curriculum documents, providing an external lens on how engineering and peacemaking integration unfolds. Peer observations strengthen trustworthiness by balancing insider and outsider perspectives and by enhancing democratic validity in the action research design (Herr & Anderson, 2015).

Analytic Rubric for Integrated Framework

In addition, a rubric was created to support consistency in analyzing children's application of the integrated framework. The rubric focuses on how students demonstrate understanding of the EDP steps, conflict resolution strategies, and Navajo peacemaking values during classroom interactions. It was not used as an assessment tool with children but rather as an analytic guide for the teacher-researcher, ensuring that observations and reflections were interpreted in a systematic and culturally grounded way (see Appendix F).

Data Analysis

This study will employ a three-cycle coding process based on Saldaña's (2016) qualitative coding framework. This layered approach reflects the iterative and reflective nature of action research and aligns with the study's tri-theoretical framework. The goal of analysis is to examine how the teacher-researcher's thinking and instructional practice

evolve over time, particularly in integrating engineering design, conflict resolution strategies, and Navajo peacemaking values into curriculum design and implementation.

In this study, the constructs of engineering design thinking, peer conflict, and Navajo peacemaking values are interpreted as they emerge through the teacher-researcher's reflections, curriculum annotations, analytic memos, and informal consultation notes. Integration of constructs will be evidenced through the intentional and concurrent presence of one or more engineering design process (EDP) steps (Define, Learn, Plan, Try, Test, Decide) and one or more Navajo peacemaking values (*hózhó*, *k'é* and *na'nitin*) within the same instructional moment, activity, or decision. This will guide the coding and analysis process, ensuring that the identification of integration is grounded in observable evidence rather than general interpretation. Evidence will be drawn from multiple data sources and confirmed through triangulation.

Preparing for Analysis: Familiarization and Memoing

All data sources will be uploaded to NotebookLM (Google, 2024), a digital workspace designed to support qualitative researcher reflection, organization, and synthesis, and to Dedoose (2024), a secure web-based qualitative analysis platform. During the familiarization phase, NotebookLM will be used as an organizational aid to cluster teacher reflections, analytic memos, and curriculum annotations, ensuring that all materials are systematically reviewed and supporting transparency in how broad patterns are surfaced across a large dataset. The teacher-researcher will iteratively review these materials within the platform, tagging relevant content, linking concepts, and memoing about emerging patterns, dilemmas, and insights (Miles et al., 2020; Saldaña, 2016). These memos will serve as critical thinking tools to document evolving interpretations,

record emerging theoretical insights, and explore the integration of engineering, conflict resolution, and cultural values in classroom practice. NotebookLM will not be used to generate codes or replace manual interpretation; rather, its summaries will function only as a supplementary aid, with potential risks such as algorithmic bias or misrepresentation mitigated by cross-checking outputs against raw data and maintaining manual coding as the primary analytic strategy. To support systematic coding and theme development, all documents will also be uploaded to Dedoose, which will be used to conduct the study's three-cycle coding process and to visualize code relationships across sources. Using NotebookLM for reflective exploration alongside Dedoose for structured analysis provides a balance between practitioner insight and methodological rigor, supporting the iterative nature of action research.

Level 1: Structural Coding Guided by Conceptual Framework

The first cycle of analysis will begin with structural coding (Saldaña, 2021) using a priori categories drawn directly from the study's integrated conceptual framework: the six steps of the EDP (Define, Learn, Plan, Try, Test, Decide), applied to both design problems and conflict resolution, and the three Navajo peacemaking values (*hózhó, k'é, na'nitin*). Structural codes will be applied across reflections, annotated curriculum documents, consultation notes, and memos to index data segments according to which step or value they represent. By using this approach, the analysis is anchored in both technical and relational dimensions and ensures that cultural values are woven into the coding process from the start. A rubric (Appendix F) was developed to guide this process, providing criteria that ensure consistency in how evidence of EDP steps, conflict resolution strategies, and Navajo values is identified across data sources.

Level 2: Pattern Coding

In the second coding cycle, pattern coding will be used to group related structural codes into broader categories that reflect recurring strategies, dilemmas, and shifts in thinking (Saldaña, 2016). This stage will also focus on identifying points of integration across frameworks, such as moments where EDP steps and Navajo peacemaking values co-occur in children's or the teacher-researcher's responses to conflict. In Dedoose, related codes will be organized into code families or hierarchies to facilitate comparisons across time, documents, and constructs. Analytic memos generated during this stage will help link emerging categories to the study's theoretical framework, for example by identifying patterns of relational care, culturally grounded adaptation, or engineering-informed problem-solving.

Level 3: Thematic Analysis Guided by Theoretical Framework

The third and final cycle will build on the integrative categories identified during pattern coding by synthesizing them into overarching themes that speak directly to the research questions. This phase will follow Braun and Clarke's (2006) principles of thematic analysis while remaining grounded in the action research orientation. Their recursive, flexible process of coding, theme development, and interpretation allows for both inductive insights and theoretically driven analysis, making it especially compatible with reflective, practitioner-oriented research.

Dedoose's tools for code co-occurrence and visualization will support the construction of themes by showing how EDP steps, conflict resolution strategies, and Navajo peacemaking values intersect across multiple reflections, memos, and curriculum artifacts. Themes will be interpreted through the tri-theoretical framework of

sociocultural theory, culturally relevant pedagogy, and the feminist ethic of care to illuminate how meaning-making and practice evolve within a culturally grounded classroom setting.

Trustworthiness

To ensure the trustworthiness of this qualitative action research study, strategies will be used that align with Lincoln and Guba's (1985) criteria of credibility, transferability, dependability, and confirmability. Credibility will be supported through prolonged engagement in the research setting, triangulation of data sources, and ongoing peer debriefing through weekly meetings with a dissertation committee member to discuss research progress, emergent themes, and analytical decisions. Analytic memoing will also be used to track evolving interpretations. Structured reflections will further support credibility by documenting peer conflict episodes, providing practice-based evidence of how students engaged with engineering design steps and Navajo values in the context of social interaction. Informal member checking with the Navajo language and culture teacher and the principal will help clarify cultural meanings and support accurate interpretation of instructional decisions. Transferability will be addressed through rich, detailed descriptions of the classroom context, instructional practices, and curriculum adaptations, enabling readers to assess the applicability of findings to other settings. Dependability will be enhanced through a clear audit trail of curriculum revisions, planning decisions, and coding processes. Confirmability will be supported by ongoing reflexive journaling and positionality statements that make visible the teacher-researcher's assumptions, decision-making, and cultural stance. These strategies are

embedded across all phases of the study to strengthen its transparency, rigor, and ethical grounding.

While Lincoln and Guba's (1985) criteria provide a foundation for qualitative rigor, action research also emphasizes its own set of validity criteria that reflect the cyclical, participatory, and change-oriented nature of the methodology (Herr & Anderson, 2015) . In this study, process validity, or the adequacy of the research process itself, is addressed by systematically documenting each cycle of planning, acting, observing, and reflecting through structured reflections, analytic memos, and annotated curriculum artifacts. Democratic validity, or the extent to which multiple perspectives inform the inquiry, is supported through ongoing consultation with school colleagues, whose insights are recorded in consultation notes and used for member checking. Catalytic validity, or the degree to which the research stimulates transformative action, is advanced by the study's aim of not only generating knowledge but also improving curriculum practices in real time for the benefit of the classroom and school community. Finally, dialogic validity, or the role of critical dialogue in testing interpretations, is addressed through peer and committee review of analytic memos and emerging findings. Taken together, these strategies ensure that the study is trustworthy both as qualitative inquiry and as action research grounded in relational accountability.

Ethical Considerations

This study will adhere to ethical guidelines established by the University of Oklahoma's Institutional Review Board (IRB) and will seek a formal determination of exemption or "Not Human Subjects Research" (NHSR) status. Because no identifiable data will be collected from or about students, and the data sources are limited to the

teacher-researcher's own instructional materials, reflections, and planning documents, the study does not meet the federal definition of human subjects research. Nonetheless, the study will be conducted with careful attention to privacy, cultural respect, and community accountability.

All data sources will document the teacher-researcher's evolving thinking and instructional practice during a regular STEM curriculum cycle. No recordings, work samples, or direct observations involving student identities or behaviors will be collected. Informal conversations with school staff will be summarized without using names or quotations, and all documentation will be securely stored and accessible only to the researcher and dissertation committee.

As a teacher-researcher embedded in the school community, particular attention will be paid to power dynamics, professional boundaries, and relational accountability. Structured reflections will include prompts to examine ethical dilemmas and the implications of instructional decisions. Ongoing consultation with the school's Navajo language and culture teacher and the principal will support cultural responsiveness and ensure that curricular adaptations are interpreted with care and respect. These ethical safeguards are integrated throughout the study design to honor the values of the school community and the principles of responsible, community-embedded research.

Potential Limitations

As with all qualitative research, this study is shaped by the particularities of its context, and several limitations may influence the scope and interpretation of findings. First, because this is a practitioner-led action research project situated in a single classroom within a small Navajo Nation school, the study's findings are not intended to

be broadly generalizable. Instead, the goal is to generate contextually grounded insights that may inform culturally responsive curriculum design and teaching practices in similar Indigenous or rural early childhood settings. Readers should interpret conclusions with an understanding of the unique cultural, institutional, and relational dynamics at play.

Rather than examining student outcomes or behaviors, this study is intentionally limited to the teacher-researcher's curriculum design decisions, facilitation strategies, and reflective practice. By narrowing the scope in this way, the inquiry centers on how an educator can adapt and implement STEM activities to foster conflict resolution in culturally responsive ways. While this means that direct evidence of children's experiences is not collected, the focus on instructional practice provides valuable insight into the processes by which teachers integrate the EDP, SEL, and community values into early childhood education.

However, the teacher-researcher's dual role may create unintended assumptions about what is observed, remembered, or valued in the data. To address this, the study embeds prompts in reflective journaling to surface potential bias and includes a transparent audit trail documenting instructional decisions, curriculum changes, and analytic interpretations. Still, the interpretive nature of practitioner inquiry means that the data are shaped by the researcher's positionality, relationships, and evolving understanding throughout the study.

Despite these limitations, the value of this research lies in its contribution to practice. Even if outcomes vary or fail to produce clear alignment between engineering design and conflict resolution, the process itself will generate valuable insight into culturally responsive teaching, curriculum adaptation, and teacher learning. Rather than

seeking specific outcomes, the study embraces the evolving nature of practice and the importance of ongoing reflection. As such, it contributes to a broader understanding of how action research can support meaningful, localized educational change in early childhood settings.

References

Abuhatoum, S., & Howe, N. (2013). Power in sibling conflict during early and middle childhood. *Social Development, 22*(4), 738-754. https://doi.org/10.1111/sode.12021

Azano, A. P., & Stewart, T. T. (2015). Exploring place and practicing justice: Preparing preservice teachers for success in rural schools. *Journal of Research in Rural Education, 30*(9), 1-12. https://jrre.psu.edu/sites/default/files/2019-08/30-9.pdf

Bang, M., Medin, D., Washinawatok, K., & Chapman, S. (2010). Innovations in culturally based science education through partnerships and community. In M. Khine & I. Saleh (Eds.), *New science of learning* (pp. 569–592). Springer. https://doi.org/10.1007/978-1-4419-5716-0_28

Bang, M., Warren, B., Rosebery, A. S., & Medin, D. (2012). Desettling expectations in science education. *Human Development, 55*(5–6), 302–318. https://doi.org/10.1159/000345322

Barajas-López, F., & Bang, M. (2018). Indigenous making and sharing: Claywork in an Indigenous STEAM program. *Equity & Excellence in Education*, 51(1), 7–20. http://doi.org/10.1080/10665684.2018.1437847

Bell, P., Tzou, C., Bricker, L. A., & Baines, A. D. (2012). Learning in diversities of structures of social practice: Accounting for how, why and where people learn science. *Human Development, 55*(5-6), 269-284. http://doi.org/10.119/000345315

Bers, M. U. (2022). *Beyond coding: How children learn human values through programming*. The MIT Press.

Bierman, K. L., Coie, J. D., Dodge, K. A., Greenberg, M. T., Lochman, J. E., McMahon, R. J., & Pinderhughes, E. (2010). The effects of a multiyear universal social–emotional learning program: The role of student and school characteristics. *Journal of Consulting and Clinical Psychology, 78*(2), 156-168. https://doi.org/10.1037/a0018607

Bierman, K. L., Domitrovich, C. E., Nix, R. L., Gest, S. D., Welsh, J. A., Greenberg, M. T., Blair, C., Nelson, K. E., & Gill, S. (2008). Promoting academic and social-emotional school readiness: The Head Start REDI program. *Child Development, 79*(6), 1802–1817. https://doi.org/10.1111/j.1467-8624.2008.01227.x

Bluehouse, P., & Zion, J. W. (1993). Hozhooji Naat'aanii: The Navajo justice and harmony ceremony. *Mediation Quarterly, 10*(4), 327–337. https://doi.org/10.1002/crq.3900100403

Brendtro, L. K., Brokenleg, M., & Van Bockern, S. (2009). *Reclaiming youth at risk: Our hope for the future* (Rev. ed.). Solution Tree.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brayboy, B. M. J. (2005). Toward a tribal critical race theory in education. *The Urban Review, 37*(5), 425–446. https://doi.org/10.1007/s11256-005-0018-y

Brayboy, B. M. J., & Castagno, A. E. (2008). How might Native science inform "informal science learning"? *Cultural Studies of Science Education*, 3, 731-750. https://doi.org/10.1007/s11422-008-9125-x

Brayboy, B. M. J., & Castagno, A. E. (2009). Self-determination through self-education: Culturally responsive schooling for Indigenous students in the USA. *Teaching Education, 20*(1), 31-53. https://doi.org/10.1080/10476210802681709

Brayboy, B. M. J., Faircloth, S. C., Lee, T. S., Maaka, M. J., & Richardson, T. A. (2015). Sovereignty and education: An overview of the unique nature of Indigenous education. *Journal of American Indian Education, 54*(1), 1-9. https://doi.org/10.1353/jaie.2015.a835528

Burns Ortiz, M. & Taken Alive, J. (2022). *Integrating Indigenous culture across curriculum with growing math* [Conference presentation]. North Dakota Indian Education Summit, Bismarck, ND, United States.

Cajete, Gregory A. (1994). *Look to the mountain: An ecology of Indigenous education*. Kivaki Press.

CASEL. (2020). *What is SEL?* Collaborative for Academic, Social, and Emotional Learning. https://casel.org/what-is-sel/

Cammarota, J., & Fine, M. (Eds.). (2008). *Revolutionizing education: Youth participatory action research in motion*. (1st ed.). Routledge.

Cao, Y., Wang, H., Lv, Y., & Xie, D. (2023). The influence of children's emotional comprehension on peer conflict resolution strategies. *Frontiers in Psychology*, *14*, 1142373. https://doi.org/10.3389/fpsyg.2023.1142373

Carter, J. (2021). *The impact of social emotional learning in an elementary classroom: An action research study* (Master's thesis). Northwestern College. https://nwcommons.nwciowa.edu/education_masters/363/

Castagno, A. E., & Brayboy, B. M. J. (2008). Culturally responsive schooling for Indigenous youth: A review of the literature. *Review of Educational Research, 78*(4), 941–993. https://doi.org/10.3102/0034654308323036

Castro-Olivo, S. M. (2014). Promoting social-emotional learning in adolescent Latino ELLs: A study of the culturally adapted Strong Teens program. *School Psychology Quarterly, 29*(4), 567-577. https://doi.org/10.1037/spq0000055

Cejka, E., Rogers, C., & Portsmore, M. (2006). Kindergarten robotics: Using robotics to motivate math, science, and engineering literacy in elementary school. *International Journal of Engineering Education, 22*(4), 711-722. https://www.ijee.ie/articles/Vol22-4/03_ijee1804.pdf

Chen, X., Wang, L., & Wang, Z. (2009). Shyness-sensitivity and social, school, and psychological adjustment in rural Chinese children. *Child Development, 80*(5), 1499-1513. https://doi.org/10.1111/j.1467-8624.2009.01347.x

Chen, Y.-L., & Tippett, C. D. (2022). Project-based inquiry in STEM teaching for preschool children. *Eurasia Journal of Mathematics, Science and Technology Education, 18*(4), em2093. https://doi.org/10.29333/ejmste/11899

Chevalier, M., Giang, C., Piatti, A., & Mondada, F. (2020). Fostering computational thinking through educational robotics: A model for creative computational problem solving. *International Journal of STEM Education, 7*, 39. https://doi.org/10.1186/s40594-020-00238-z

Clements, D. H., Sarama, J., & Germeroth, C. (2016). Learning executive function and early mathematics: Directions of causal relations. *Early Childhood Research Quarterly, 36*, 79-90. https://doi.org/10.1016/j.ecresq.2015.12.009

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation*. Teachers College Press.

Coker, D. (2006). Restorative justice, Navajo Peacemaking and domestic violence. *Theoretical Criminology, 10*(1), 67-85. https://doi.org/10.1177/1362480606059983

Corsaro, W. A. (2003). *We're friends, right?: Inside kids' culture*. Joseph Henry Press. https://nap.nationalacademies.org/read/10723

Cunningham, C. M., & Kelly, G. J. (2017). Epistemic practices of engineering for education. *Science Education, 101*(3), 486–505. https://doi.org/10.1002/sce.21271

Cunningham, C. M., & Lachapelle, C. P. (2014). Designing engineering experiences to engage all students. In S. Purzer, J. Strobel, & M. Cardella (Eds.), *Engineering in*

pre-college settings: Synthesizing research, policy, and practices (pp. 117–140). Purdue University Press.

Dana, N. F., & Yendol-Hoppey, D. (2020). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry* (4th ed.). Corwin Press.

daSilva, M., Hang, S. T., & Sibbald, S. L. (2025). Living documents: A longitudinal data collection method for health services research. *SSM - Qualitative Research in Health, 7*, 100513. https://doi.org/10.1016/j.ssmqr.2024.100513

Dedoose. (Version 9.0) [Computer software]. (2024). SocioCultural Research Consultants, LLC. https://www.dedoose.com

Denetdale, J. N. (2006). Chairmen, presidents, and princesses: The Navajo Nation, gender, and the politics of tradition. *Wicazo Sa Review, 21*(1), 9–28. https://doi.org/10.1353/wic.2006.0004

Denham, S. A. (2006). Social-emotional competence as support for school readiness: What is it and how do we assess it? *Early Education and Development, 17*(1), 57-89. https://doi.org/10.1207/s15566935eed1701_4

Denham, S. A., Bassett, H. H., Thayer, S. K., Mincic, M. S., Sirotkin, Y. S., & Zinsser, K. (2012). Observing preschoolers' social–emotional behavior: Structure, foundations, and prediction of early school success. *The Journal of Genetic Psychology, 173*(3), 246–278. https://doi.org/10.1080/00221325.2011.597457

Domitrovich, C. E., Cortes, R. C., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool "PATHS" curriculum. *The Journal of Primary Prevention, 28*(2), 67-91. https://doi.org/10.1007/s10935-007-0081-0

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1), 405-432. https://doi.org/10.1111/j.1467-8624.2010.01564.x

Emembolu, I., Padwick, A., Shimwell, J., Sanderson, J., Davenport, C., & Strachan, R. (2020). Using action research to design and evaluate sustained and inclusive engagement to improve children's knowledge and perception of STEM careers. *International Journal of Science Education*, *42*(5), 764–782. https://doi.org/10.1080/09500693.2020.1729442

English, L. D., & King, D. T. (2015). STEM learning through engineering design: Fourth-grade students' investigations in aerospace. *International Journal of STEM Education, 2*, 14. https://doi.org/10.1186/s40594-015-0027-7

Evangelou, D., Dobbs-Oates, J., Lin, Y., Fu, C., Delacruz, S., & Davis, J. (2010). Talking about artifacts: Preschool children's explorations with sketches, stories, and tangible objects. *Early Childhood Research & Practice, 12*(2), 1-16. https://ecrp.illinois.edu/v12n2/evangelou.html

Fleer, M. (2020). Studying the relations between motives and motivation – How young children develop a motive orientation for collective engineering play. *Learning, Culture and Social Interaction*, *24*, Article 100355. https://doi.org/10.1016/j.lcsi.2019.100355

Fleer, M. (2021). A cultural-historical critique of how engineering knowledge is constructed through research in play-based settings: What counts as evidence and what is invisible? *Research in Science Education*, *52*(4), 1355–1373. https://doi.org/10.1007/s11165-021-10012-y

Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rd ed.). Teachers College Press.

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development.* Harvard University Press.

Gold, Z. S., & Elicker, J. (2020). Engineering peer play: A new perspective on science, technology, engineering, and mathematics (STEM) early childhood education. In A. Ridgway, G. Quiñones, & L. Li (Eds.), *Peer play and relationships in early childhood: International perspectives on early childhood education and development* (Vol. 30, pp. 61–75). Springer Nature. https://doi.org/10.1007/978-3-030-42331-5_5

Goldstein, L. (1998, April 17). *Taking caring seriously: The ethic of care in classroom life* [Paper presentation]. American Educational Research Association (AERA), Annual Meeting 1998, San Diego, California. http://files.eric.ed.gov/fulltext/ED419801.pdf

Google. (2024). NotebookLM [AI research tool]. https://notebooklm.google

Gresham, F. M., & Elliott, S. N. (2017). *Social Skills Improvement System Social-Emotional Learning Edition rating forms manual*. Pearson Assessments.

Herr, K., & Anderson, G. L. (2015). *The action research dissertation: A guide for students and faculty* (2nd ed.). SAGE Publications.

Jagers, R. J., Rivas-Drake, D., & Borowski, T. (2018). *Equity & social and emotional learning: A cultural analysis*. Collaborative for Academic, Social, and Emotional Learning (CASEL). https://drc.casel.org/uploads/sites/3/2019/02/Equity-Social-and-Emotional-Learning-A-Cultural-Analysis.pdf

Jones, S. M., Barnes, S. P., Bailey, R., & Doolittle, E. J. (2017). Promoting social and emotional competencies in elementary school. *The Future of Children, 27*(1), 49-72. https://doi.org/10.1353/foc.2017.0003

Jones, D. E., Greenberg, M., & Crowley, M. (2015). Early social-emotional functioning and public health: The relationship between kindergarten social competence and future wellness. American Journal of Public Health, 105(11), 2283–2290. https://doi.org/10.2105/AJPH.2015.302630

Judicial Branch of the Navajo Nation. (2004). *Navajo Peacemaking Guide: A guide to the Peacemaking Program of the Navajo Nation.* Judicial Branch of the Navajo Nation.

Kamphaus, R. W., & Reynolds, C. R. (2015). *BASC-3 Behavioral and Emotional Screening System manual*. Pearson Assessments.

Kanaʻiaupuni, S. M., & Kawaiʻaeʻa, K. (2008). E Lauhoe Mai Nā Waʻa: Toward a Hawaiian indigenous education teaching framework. *Hūlili: Multidisciplinary Research on Hawaiian Well-Being, 5*(1), 67–90. https://kamehamehapublishing.org/wp-content/uploads/sites/38/2020/09/Hulili_Vol5_3.pdf

Kawagley, A. O. (2006). *A Yupiaq worldview: A pathway to ecology and spirit* (2nd ed.). Waveland Press.

Kimmerer, R. W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge, and the teachings of plants*. Milkweed Editions.

Ladd, G. W., Kochenderfer-Ladd, B., Visconti, K. J., & Ettekal, I. (2012). Classroom peer relations and children's social and scholastic development: Risk factors and resources. In A. M. Ryan & G. W. Ladd (Eds.), *Peer relationships and adjustment at school* (pp. 189-218). Information Age Publishing.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465-491.

LeBuffe, P. A., Shapiro, V. B., & Naglieri, J. A. (2018). *The Devereux Student Strengths Assessment - Mini (DESSA-Mini) Assessment, Technical Manual, and User's Guide.*

Lee, T. S. (2006). “I came here to learn how to be a leader”: An intersection of critical pedagogy and Indigenous education. *InterActions: UCLA Journal of Education and Information Studies, 12*(1), article 3. http://repositories.cdlib.org/gseis/interactions/vol2/iss1/art3

Lee, T. S. (2015). The significance of self-determination in socially, culturally, and linguistically responsive (SCLR) education in Indigenous contexts. *Journal of American Indian Education*, *54*(1), 10–32. http://www.jstor.org/stable/10.5749/jamerindieduc.54.1.0010

Lee, O., & Campbell, D. T. (2020). What science and STEM teachers can learn from COVID-19: Harnessing data science and computer science through the convergence of multiple STEM subjects. *Journal of Science Teacher Education, 31*(8), 932-944. https://doi.org/10.1080/1046560X.2020.1814980

Lim, C. A. M., Kaveri, G., Li, J., & Choy, M. Y. (2024). Supporting parents in facilitating computational thinking for young children through loose parts construction play. *Future in Educational Research*, *2*(4), 346-358. https://doi.org/10.1002/fer3.43

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications.

Lippard, C. N., Lamm, M. H., Tank, K. M., & Choi, J. Y. (2019). Pre-engineering thinking and the engineering habits of mind in preschool classroom. *Early Childhood Education Journal, 47*(2), 187-198. https://doi.org/10.1007/s10643-018-0898-6

Lucas, B., Claxton, G., & Spencer, E. (2013). *Progression in student creativity in school: First steps towards new forms of formative assessments* (OECD Education Working Papers No. 86). https://doi.org/10.1787/5k4dp59msdwk-en

McCarty, T. L., & Lee, T. S. (2014). Critical culturally sustaining/revitalizing pedagogy and Indigenous education sovereignty. *Harvard Educational Review, 84*(1), 101–124. https://doi.org/10.17763/haer.84.1.q83746nl5pj34216

McClure, E. R., Guernsey, L., Clements, D. H., Bales, S. N., Nichols, J., Kendall-Taylor, N., & Levine, M. H. (2017). *STEM starts early: Grounding science, technology, engineering, and math education in early childhood.* The Joan Ganz Cooney Center at Sesame Workshop.

Medin, D. L., & Bang, M. (2014). *Who's Asking? Native Science, Western Science, and Science Education.* MIT Press. https://doi.org/10.7551/mitpress/9755.001.0001

Mertler, C. A. (2020). *Action research: Improving schools and empowering educators* (6th ed.). SAGE Publications.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). SAGE Publications.

Moore, T. J., & Tank, K. M. (2014). Chapter 13: Picture STEM. In C. Sneider (Ed.), *The go-to guide for engineering curricula, preK-5!* Corwin Press.

Myrtil, M. J., Lin, T.-J., Chen, J., Purtell, K. M., Justice, L., Logan, J., & Hamilton, A. (2021). Pros and (con)flict: Using head-mounted cameras to identify teachers' roles in intervening in conflict among preschool children. *Early Childhood Research Quarterly*, *55*, 230–241. https://doi.org/10.1016/j.ecresq.2020.11.011

Nathan, M. J., Wolfgram, M., Srisurichan, R., Walkington, C., & Alibali, M. W. (2017). Threading mathematics through symbols, sketches, software, silicon, and wood: Teachers produce and maintain cohesion to support STEM integration. *The Journal of Educational Research*, *110*(3), 272–293. https://doi.org/10.1080/00220671.2017.1287046

National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits.* The National Academies Press. https://doi.org/10.17226/12190

National Research Council. (2012). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. The National Academies Press. https://doi.org/10.17226/13165

National Research Council. (2013). *Next Generation Science Standards: For States, By States*. The National Academies Press. https://doi.org/10.17226/18290.

Noddings, N. (1984). *Caring: A feminine approach to ethics and moral education.* University of California Press.

Noddings, N. (2012). The caring relation in teaching. *Oxford Review of Education, 38*(6), 771-781. https://doi.org/10.1080/03054985.2012.745047

Paris, D., & Alim, H. S. (Eds.). (2017). *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world*. Teachers College Press.

Pinto, J. (2000). Peacemaking as ceremony: The mediation model of the Navajo Nation. *The International Journal of Conflict Management, 11*(3), 267–286. https://restorativejustice.org/rj-archive/peacemaking-as-ceremony-the-mediation-model-of-the-navajo-nation/

Pyle, A., DeLuca, C., Danniels, E., & Wickstrom, H. (2020). A model for assessment in play-based kindergarten education. *American Educational Research Journal, 57*(6), 2251-2292. https://doi.org/10.3102/0002831220908800

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Rogoff, B. (2014). Learning by observing and pitching in to family and community endeavors: An orientation. *Human Development, 57*(2-3), 69-81. https://doi.org/10.1159/000356757

Rubin, K. H., Bukowski, W. M., & Parker, J. G. (2006). Peer interactions, relationships, and groups. In W. Damon, R. M. Lerner (Series Eds.), & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (6th ed., pp. 571-645). Wiley.

Sabzalian, L. (2019). *Indigenous children's survivance in public schools.* Routledge. https://doi.org/10.4324/9780429427503

Saldaña, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). SAGE Publications.

San Antonio, D. M. (2018). Collaborative action research to implement social emotional learning in a rural elementary school: Helping students become "Little kids with big words." *Canadian Journal of Action Research, 19*(2), 26–47. https://doi.org/10.33524/cjar.v19i2.384

Schonert-Reichl, K. A. (2019). Advancements in the landscape of social and emotional learning and emerging topics on the horizon. *Educational Psychologist, 54*(3), 222-232. https://doi.org/10.1080/00461520.2019.1633925

Siry, C., Ziegler, G., & Max, C. (2012). "Doing science" through discourse-in-interaction: Young children's science investigations at the early childhood level. *Science Education, 96*(2), 311-326. https://doi.org/10.1002/sce.21003

Smetana, J. G., & Killen, M. (2008). Moral cognition, emotions, and neuroscience: An integrative developmental view. *European Journal of Developmental Science, 2*(3), 324–339. https://doi.org/10.3233/DEV-2008-2309

Smith, L. T. (2021). *Decolonizing methodologies: Research and Indigenous peoples* (3rd ed.). Zed Books.

Stevahn, L., Johnson, D. W., Johnson, R. T., & Schultz, R. (2000). Effects of conflict resolution training integrated into a kindergarten curriculum. *Child Development, 71*(3), 772-784. https://doi.org/10.1111/1467-8624.00184

Stringer, E. T. (2014). *Action research: A handbook for practitioners* (4th ed.). SAGE Publications.

Tan, A. L., Jamaludin, A., & Hung, D. (2021). In pursuit of learning in an informal space: a case study in the Singapore context. *International Journal of Technology and Design Education, 31*(2), 281-303. https://doi.org/10.1007/s10798-019-09553-1

Tank, K. M., Moore, T. J., Dorie, B. L., Gajdzik, E., Sanger, M. T., Rynearson, A. M. & Mann, E. F. (2018). Engineering in early elementary classrooms through the

integration of high-quality literature, design, and STEM+C content. In L. English and T. Moore, (Eds.), *Early engineering learning* (pp. 175-201). Springer.

Tank, K. M., & Moore, T. J., & Gajdzik, E., & Sanger, M. T., & Rynearson, A. M., & Dorie, B. L., & Mann, E. (2016, June). *Designing Paper Baskets: A PictureSTEM Curriculum Module (P12 Resource Exchange)*. Paper presented at 2016 ASEE Annual Conference & Exposition, New Orleans, Louisiana. https://doi.org/10.18260/p.26705

Thornberg, R. (2007). A classmate in distress: Schoolchildren as bystanders and their reasons for how they act. *Social Psychology of Education, 10*, 5–28. https://doi.org/10.1007/s11218-006-9009-4

Verdine, B. N., Golinkoff, R. M., Hirsh-Pasek, K., & Newcombe, N. S. (2017). Links between spatial and mathematical skills across the preschool years. *Monographs of the Society for Research in Child Development, 82*(1), 1-150. https://doi.org/10.1016/j.ecresq.2018.03.015

Vossoughi, S., Hooper, P. K., & Escudé, M. (2016). Making through the lens of culture and power: Toward transformative visions for educational equity. *Harvard Educational Review*, *86*(2), 206-232. https://doi.org/10.17763/0017-8055.86.2.206

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Walker, O. L., & Henderson, H. A. (2012). Temperament and social problem solving competence in preschool: Influences on academic skills in early elementary school. *Social Development, 21*, 761-779. https://doi.org/10.1111/j.1467-9507.2011.00653.x

Wendell, K. B., Connolly, K. G., Wright, C. G., Jarvin, L., Barnett, M., Rogers, C., & Marulcu, I. (2010, June). Incorporating engineering design into elementary school science curricula. [Conference presentation]. 2010 American Society for Engineering Education Annual Conference & Exposition, Louisville, Kentucky. https://peer.asee.org/16175

Whyte, K. P., Brewer, J. P., & Johnson, J. T. (2015). Weaving indigenous science, protocols, and sustainability science. *Sustainability Science, 11*(1), 25–32. https://doi.org/10.1007/s11625-015-0296-6

Wilson, S. (2008). *Research is ceremony: Indigenous research methods.* Fernwood Publishing.

Yazzie, R. (1994). Life comes from it: Navajo justice concepts. *New Mexico Law Review, 24*, 175–190. http://digitalrepository.unm.edu/nmlr/vol24/iss2/3

Yazzie-Mintz, T. (2007). From a place deep inside: Culturally appropriate curriculum as the embodiment of Navajo-ness in classroom pedagogy. *Journal of American Indian Education, 46*(3), 72–93. https://jaie.asu.edu/sites/g/files/litvpz1681/files/463_2007_6_yazzi-mintz.pdf

Zeichner, K. M. (2003). Teacher research as professional development for P–12 educators in the USA. *Educational Action Research*, *11*(2), 301–326. https://doi.org/10.1080/09650790300200211

Zinsser, K. M., Denham, S. A., Curby, T. W., & Shewark, E. A. (2015). "Practice what you preach": Teachers' social-emotional interactions and children's social-emotional competence. *Early Education and Development, 26*(7), 1–21. https://doi.org/10.1080/10409289.2015.1009320

Zion, J. W. (1998). The dynamics of Navajo peacemaking. *Journal of Contemporary Criminal Justice, 14*(1), 58-74. https://www.iirp.edu/news/the-dynamics-of-navajo-peacemaking

Zion, J. W., & Yazzie, R. (1997). Navajo restorative justice: The law of equity and harmony. In G. Bazemore & L. Walgrave (Eds.), *Restorative juvenile justice: Repairing the harm of youth crime* (pp. 123–141). Criminal Justice Press.

Appendix A: Prompts for Structured Reflections

Before Curriculum Implementation:

1. What do I currently understand about how young children experience and manage conflict, and what strategies do I typically observe them using with peers?
2. What are my goals for this curriculum, and what do I hope children will learn about conflict resolution through it?
3. Why did I decide to use the engineering design process as a framework for teaching conflict resolution, and what do I expect children's responses to be?
4. What challenges or tensions do I anticipate during implementation, and how do I plan to support children's social-emotional learning and reflect on my teaching throughout the process?
5. How do I currently understand the relationship between Navajo peacemaking values and classroom learning, and what role do I see culture playing in this curriculum?
6. What are my hopes and concerns about integrating Navajo values into engineering and conflict resolution instruction?

During Implementation:

1. What did I notice about how students responded today to the curriculum, to each other, and to me?
2. How did my teaching shift from what I originally planned? How do I feel about this?
3. What challenges emerged, and how did I respond?

4. Am I noticing the children using the engineering design process outside of my classroom?
5. Did I observe any peer conflict episodes today? If so, how did students attempt to resolve them, and which engineering design steps or Navajo values seemed evident in their responses?
6. What did I notice about how students connected cultural knowledge to the engineering process?

After Implementation:

1. How do I now understand the way young children experience and manage conflict, and what changes did I notice in their approaches over the course of the curriculum?
2. In what ways did the engineering design process influence or support children's conflict resolution strategies?
3. How did the integration of Navajo values influence both my teaching and student learning throughout this curriculum?
4. What moments during the curriculum stood out to me, and what surprised me, either in the children's responses or my own teaching?
5. How did my dual role as teacher and researcher shape my interactions with children during conflict, and what did I learn about myself as an educator?
6. What did I learn about culturally responsive pedagogy through this experience?
7. What would I revise or do differently in future implementations, and how has this experience impacted my views on teaching social-emotional learning in early childhood?

Appendix B: Structured Template for Analytic and Planning Memos

Memo Title:

Date:

Phase: ☐ Pre-lesson planning ☐ Mid-implementation adjustment ☐ Post-lesson reflection ☐ General pattern/theme memo

1. Focus of this memo
    - What specific aspect of the curriculum or teaching practice am I focusing on (e.g., a particular EDP step, a conflict moment, a cultural value, an instructional dilemma)?
2. Planning or Implementation Decisions
    - What decisions am I making or revisiting right now?
    - What data (e.g., reflections, classroom observations, consultation input) is informing these decisions?
    - Are there visible tensions or uncertainties?
3. Connection to Theoretical Framework
    - How does sociocultural theory help me understand this moment?
    - How does the feminist ethic of care shape my interpretation or next steps?
    - How does culturally relevant pedagogy influence what I'm doing or noticing?
4. Observed or Anticipated Shifts
    - What patterns or changes am I noticing across lessons?
    - What seems to be working or not working?
    - Am I seeing a shift in how children engage in engineering/problem-solving or in how they resolve conflict?

5. Cultural Considerations

- How are Navajo peacemaking values showing up in this part of the curriculum or classroom dynamic?
- What adaptations am I making to be more aligned with local cultural values?

6. Next Steps / Questions to Revisit

- What will I try next and why?
- What questions remain open that I want to reflect on later?

Appendix C: Annotated Curriculum Planning Template

Note: *This template is designed to help systematically annotate curriculum materials as part of the action research process. It will be used to document instructional decisions, highlight changes from the original PictureSTEM materials, and reflect on alignment with developmental, engineering, conflict resolution, and cultural goals.*

Lesson Title / Focus:

(Include grade level, topic, and target EDP step)

Date of Lesson:

(Insert date of implementation or planning)

Original Goal or Objective:

(Briefly describe the goal of the original lesson or unit)

Adaptations Made:

- What changes did I make from the original *PictureSTEM* lesson?
- What motivated these changes (e.g., cultural, developmental, logistical)?

Connection to Engineering Design Process (EDP):

- Which EDP step(s) does this lesson emphasize?
- How are those steps embedded in the activity?

Conflict Resolution Opportunities:

- Where in the lesson might children experience conflict?
- How does the structure support collaborative problem-solving?

Alignment with Cultural Values:

- How are Navajo peacemaking values reflected in the activity design or teacher facilitation?

- Are there any cultural considerations I am building into the lesson?

Reflection After Implementation:

- What worked well?
- What challenges or surprises emerged?
- What would I do differently next time?

Appendix D: Informal Consultation Notes Template

Note: *This template will be used to record insights from informal conversations with colleagues, such as cultural or instructional feedback. These notes help document how relational dialogue informs my curriculum decisions, ensuring responsiveness and accountability.*

Date of Conversation:

Context of the Conversation:

- What prompted the conversation? (e.g., post-lesson reflection, upcoming decision, observed issue)

Who Was Consulted: (Use role only, not names)

Key Insights or Observations Shared:

- What ideas or feedback did they offer?
- Were there any suggestions related to cultural relevance, child behavior, or teaching strategies?

How This Informs My Practice:

- What changes or considerations are you making based on this conversation?
- How does this feedback align with my research goals or frameworks?

Connection to Cultural Values or Theoretical Frameworks:

- Does this conversation touch on Navajo peacemaking values?
- How does it relate to sociocultural theory, care ethics, or culturally relevant pedagogy?

Follow-Up Actions or Reflections:

- What will I do next?

- Are there lingering questions or topics to revisit in future conversations?

Appendix E: Peer Observation Notes Template

Each observer will be asked to provide descriptive notes from at least one class session during the implementation phase. To ensure consistency, their observations will be guided by the following prompts:

1. Classroom Dynamics
    - Describe how students and the teacher interact during the lesson.
    - Note any patterns in participation, collaboration, or engagement.
2. Peer Conflict Episodes
    - Record any disagreements, tensions, or problem-solving moments you observe.
    - Include how children initiated, navigated, or resolved the conflict.
3. Evidence of Navajo Peacemaking Values
    - Note examples of *hózhó* (balance, harmony), *k'é* (respect, kinship, relationships), or *na'nitin* (learning through listening, observing, and participating).
    - Provide brief descriptions of when and how these values seemed to be expressed.

Note: *Observers should write descriptive, not evaluative, notes. The goal is to document what was seen and heard, not to judge the effectiveness of instruction or children's behavior.*

Appendix F: Rubric for Analyzing Children's Understanding of the Integrated Framework

Domain	Emerging (Limited evidence)	Developing (Partial understanding)	Proficient (Clear evidence of use)	Integrated/Advanced (Evidence of integration across domains)
EDP Steps (Define, Learn, Plan, Try, Test, Decide)	Child does not reference or enact EDP steps; relies on adult direction or trial/error without reflection.	Child shows awareness of one or two steps (e.g., defining the problem, trying a solution) but with limited sequencing or reflection.	Child uses multiple EDP steps purposefully (e.g., defines problem, plans, tests), either verbally or in action.	Child coordinates EDP steps flexibly, moving iteratively and explaining reasoning; able to apply EDP steps to both design tasks and social conflicts.
Conflict Resolution Strategies	Child does not articulate or attempt resolution; may avoid or escalate conflict.	Child engages in basic resolution strategies (e.g., sharing, compromise) when prompted by peers/teacher.	Child independently uses resolution strategies aligned with EDP steps (e.g., defining the problem, planning solutions with peers).	Child applies resolution strategies iteratively, testing and revising solutions with peers, showing awareness of fairness and relational repair.
Navajo Value: Hózhó (Harmony/Balance)	Child shows little awareness of harmony or fairness in solutions.	Child occasionally references fairness or balance but may prioritize self-interest.	Child considers balance and wellness in solutions (e.g., seeks compromise that works for all).	Child actively frames problem-solving in terms of restoring harmony for the group, linking hózhó to iterative repair.
Navajo Value: K'é (Respect/Relational Accountability)	Child demonstrates minimal acknowledgment of others' perspectives.	Child listens/responds when prompted; may show emerging respect or care.	Child demonstrates respect and relational responsibility (e.g., listening, compromise,	Child consistently prioritizes relationships and accountability in problem-solving, showing care for others in both design

			kind language).	and conflict resolution.
Navajo Value: Na'nitin (Learning through Listening, Observing, Participating)	Child does not engage in observation or listening as part of problem-solving.	Child listens when prompted; occasionally observes peers' strategies.	Child learns through observation and respectful listening, applying lessons from peers or teacher.	Child demonstrates reflective learning, articulating what was learned through listening/observing and applying it in new contexts.
Integration Across Domains	Child demonstrates understanding in only one domain (EDP, conflict resolution, or Navajo value).	Child occasionally bridges two domains (e.g., uses EDP step in conflict resolution).	Child frequently integrates an EDP step with a peacemaking value in problem-solving.	Child seamlessly weaves EDP steps, conflict resolution strategies, and Navajo peacemaking values into coherent approaches to both design challenges and peer conflicts.

Note: *This rubric was developed as an analytic tool to support consistency in identifying how children demonstrate understanding of the EDP steps, conflict resolution strategies, and Navajo peacemaking values* (hózhó, k'é, na'nitin)*. The rubric includes both a full version for detailed analysis and a shortened version for quick use during observations.*

Quick Observation Rubric: EDP, Conflict Resolution, and Navajo Peacemaking Values

Domain	Not Yet / Emerging	Developing	Proficient / Integrated
EDP Steps	No clear use of steps; relies on trial/error or adult-directed.	Uses 1–2 steps (e.g., define, try) with adult or peer support.	Uses multiple steps purposefully; may apply steps to both design and conflict resolution.
Conflict Resolution	Avoids/escalates conflict; relies on adult.	Uses basic strategies (sharing, compromi	Independently applies problem-solving steps to

		se) when prompted.	resolve conflict with peers.
Hózhó (Harmony/Balance)	Focus on self; little awareness of fairness.	Mentions or attempts fairness sometimes.	Seeks solutions that restore harmony and balance for all.
K'é (Respect/Relationality)	Limited acknowledgment of others' perspectives.	Shows respect or listening when prompted.	Consistently listens, responds respectfully, and values relationships.
Na'nitin (Learning by Listening/Observing)	Rarely listens to or observes others.	Listens or observes when reminded.	Applies learning from listening and observing.
Integration	Evidence in only one domain.	Occasional bridging across two domains.	Clear integration of EDP + conflict resolution + Navajo peacemaking values.

Timetable

August 2025

- Submit prospectus
- Begin teaching adapted curriculum
- Begin data collection and analysis

September – November 2025

- Defend prospectus
- Ongoing adaptation and teaching of curriculum
- Ongoing data collection and analysis
- Write Article 1: Theoretical

December 2025

- Finish teaching adapted curriculum
- Finish data collection and analysis
- Write Article 2: Practical

January – February 2026

- Make sure ACR is up to date
- Submit request for degree check by Jan. 30

- Write Article 3: Empirical

March 2026

- Submit report of reading copy submission & request for authority to defend by Apr. 24
- Committee members sign report of reading copy submission & request for authority to defend

April 2026

- Defend dissertation by May 1
- Submit approval for dissertation submission to SHAREOK by May 8
- Submit dissertation to SHAREOK by May 8

May 2026

- Graduate

Publishable Articles

As part of the dissertation requirements, I plan to develop three publishable articles that reflect the conceptual, practical, and empirical contributions of my study.

Article 1: Theoretical

The first article will be a theoretical manuscript that explores how sociocultural theory, the feminist ethic of care, and culturally relevant pedagogy can collectively inform an integrative framework for early childhood STEM curriculum. These three perspectives share a commitment to relational learning, context-sensitive teaching, and the affirmation of diverse ways of knowing, making them especially powerful when combined to guide curriculum design in early learning environments. The manuscript will critically examine how each theoretical lens contributes to a reimagining of engineering education as more than a technical or cognitive enterprise. Drawing on sociocultural theory, the article will frame learning as socially mediated and culturally situated, emphasizing how engineering practices can emerge through collaborative, tool-mediated interaction. The feminist ethic of care will position problem-solving and decision-making as moral and relational acts, calling attention to empathy, dialogue, and responsibility in teaching and learning. Culturally relevant pedagogy will serve as a framework for centering community knowledge, affirming children's cultural identities, and promoting equity in STEM education.

This paper will argue that engineering design in early learning settings can function not only as a structured cognitive process, but also as a relational and ethical practice—especially when aligned with community values, local knowledge systems, and children’s lived experiences. It will explore how the EDP can be reconceptualized as a

tool not only for addressing material challenges, but also for navigating interpersonal conflict, classroom relationships, and broader social concerns. By synthesizing these frameworks, the article will offer a theoretical model for curriculum that is inquiry-driven, reflective, and culturally grounded. In doing so, it will contribute to broader conversations about inclusive and culturally grounded curriculum development, particularly in the fields of early STEM education and curriculum theory. This manuscript is intended for submission to the *Journal of Curriculum Studies*, a high-tier international journal that publishes theoretical and empirical research on curriculum theory and practice across diverse contexts. The journal releases eight issues per year and is indexed in SSCI, Scopus, and ERIC.

Article 2: Practical

The second article will be a practitioner-focused piece that translates key insights from the curriculum adaptation process into actionable guidance for early childhood educators. It will outline how the EDP can be used as a scaffold for supporting peer conflict resolution in culturally responsive and developmentally appropriate ways. Grounded in a cycle of action research, the article will highlight how iterative reflection, classroom-based observation, and ongoing consultation with community members informed the adaptation process. It will also explore the theoretical foundations of curriculum adaptation, drawing from sociocultural theory, the feminist ethic of care, and culturally relevant pedagogy to emphasize the importance of relational learning and responsiveness to context.

While the curriculum described in the study was designed for Navajo early childhood classrooms, the article will present a flexible framework that can be

extrapolated to a variety of settings, particularly those serving culturally and linguistically diverse communities. By providing concrete examples, visual tools, and reflection prompts, the article will offer a strengths-based model for teachers who wish to integrate STEM and SEL in ways that are inclusive, contextually grounded, and responsive to children's cultural identities. The practical guidance shared in this piece will be useful to both Indigenous-serving programs and broader early childhood contexts where educators are seeking to foster collaborative problem-solving and affirm children's social and cultural ways of knowing. This article is intended for submission to *Young Children*, a practitioner journal published quarterly by the National Association for the Education of Young Children (NAEYC) and widely read by classroom educators and teacher educators across the United States.

Article 3: Empirical

The third article will be an empirical research study based on qualitative data collected during a 13-week cycle of action research in a culturally and linguistically diverse early childhood STEM classroom. The study investigates how a teacher-researcher adapted and implemented an engineering-integrated curriculum to support peer conflict resolution using the EDP as a developmentally appropriate scaffold. Drawing on structured reflections, annotated curriculum documents, analytic memos, and consultation notes, the article will trace the evolution of curriculum design and instructional decision-making as the teacher engaged in ongoing reflection, observation, and collaboration with community members. Particular attention will be paid to how social problem-solving, engineering thinking, and cultural values intersect to support children's collaborative learning during moments of conflict.

Data analysis will follow a three-phase coding process (descriptive, pattern, and thematic analysis) grounded in a tri-theoretical framework: sociocultural theory, culturally relevant pedagogy, and the feminist ethic of care. The article will highlight how teacher reflection served both as a lens for interpreting classroom dynamics and as a mechanism for adapting instruction in real time. By documenting this iterative process, the article contributes to teacher education research by showing how practitioner inquiry can support responsive, inclusive, and integrated curriculum development in early childhood settings. Though the study is grounded in a specific cultural context, the implications extend to educators seeking to bridge STEM and SEL in ways that honor community knowledge, relational learning, and child agency. This article is intended for submission to the *Journal of Early Childhood Teacher Education (JECTE)*, the National Association of Early Childhood Teacher Educators' (NAECTE) peer-reviewed journal that publishes empirical research on the preparation and development of early childhood educators.