Reflecting across Borders

Palestinian and US Early Childhood Educators Engage in Collaborative Science Inquiry

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Given the widening disparities in science achievement in many countries as children move into the elementary school years and beyond, it is imperative that early childhood educators understand how to promote inquiry-based science learning for the 21st century (Bradley 2016) that builds on children's natural sense of curiosity and discovery (Engel 2011). There is growing evidence that despite potential challenges, the need for teachers to integrate meaningful, inquiry-based science experiences in the curriculum is essential. Important recent work has examined children's understanding of nature (Meier & Sisk-Hilton 2013; Parnell, Downs, & Cullen 2017), critical links between content knowledge and the development of abstract reasoning (Metz 2008), and connections between science learning and multilingual development (Evans & Avila 2016).

By providing young children with both unstructured and structured science experiences, teachers support them in building an understanding of the natural world that allows children to engage in increasingly complex investigations and knowledge building over time (Gelman & Brenneman 2004). Further, at a time when access to science and inquiry experiences is increasingly lacking in children's lives outside of school, making time and space for science activities as part of the school program has become critical (White 2006). Finally, early experiences with science and nature contribute to children's future interest in the sciences (Maltese & Tai 2010).

One of the most promising avenues for improving the quality of early childhood teaching is the use of inquiry and reflective practice to promote teachers' professional growth (Castle 2012; Stremmel 2012). The systematic use of reflection and inquiry at the preservice and in-service levels can improve teachers' observational skills, instructional strategies, and capacity for self-reflection, and can promote professional dialogue and collaboration.

Internationally, the most influential source of professional growth opportunities via inquiry and reflection—as inspiration, philosophy, and curriculum—is the Reggio Emilia early childhood educators in Italy (Edwards, Gandini, & Forman 2012). Reggio has garnered international interest in its approach to a cohesive social and intellectual philosophy of teacher learning and development through inquiry, documentation, and collaboration. Documentation—the systematic collection and analysis of children's ideas, language, and theories through various tools—lies at the heart of Reggio teachers' inquiry and reflective practices.

The early childhood field at the global level, though, is in need of other international examples and approaches that educators can adapt to support teachers, children, and families in their specific local contexts. In this article, we four authors describe and reflect on a cross-cultural and international exchange of data about inquiry-based teaching and learning between preschool-age children's science engagement in the West Bank and in San Francisco. The project participants included a teacher educator working with several preservice and in-service preschool teachers in the West Bank/Palestine and a teacher educator working with two veteran preschool teachers in San Francisco.

Thoughts On the Article | Ben Mardell, *Voices* Executive Editor

Emerging technologies are making international communication, and thus international collaborations, increasingly feasible. Still, barriers of language, culture, and time zones complicate such projects. By sharing the experiences of Palestinian and US early childhood educators involved in a joint project aimed at promoting meaningful early science teaching and learning, this article provides the rationale for undertaking such work and strategies for making such projects fruitful.

"Reflecting across Borders" will be of interest to educators not in a position to currently undertake an international collaboration, as well. From a professional development perspective, it is important to note how the levels of reflection of those involved in this project—individual teachers, local groups, and the entire research team—amplified the learning power of the work. Such reflection can be replicated between two schools (or even two classrooms).

From a teacher advocacy perspective, the power of teacher research to make visible (or audible) teachers' voices and expertise is clear. And from a teacher researcher perspective, "Reflecting across Borders" is an exemplary piece of work, one that should be included on the syllabuses of every teacher research course.

Beginning our international project on science learning

The project began with four goals. First, all four authors sought new ways for the US teachers to serve as inquiry and curriculum mentors for the Palestinian teachers. Second, we wanted to develop new ideas and strategies for promoting inquiry-based science learning in varied educational, social, and cultural contexts. Third, we were interested in understanding how an international project on science learning might open new windows onto children's social and cognitive development in cross-cultural contexts. Fourth, we hoped to begin filling a gap in existing research: while there is scant research on early childhood teacher inquiry at the whole-school level in the United States and internationally (Edwards, Gandini, & Forman 2012; Kroll & Meier 2017), there is even less information in the field of teacher inquiry about collaborative international projects. We framed this as an international project

founded on teacher inquiry goals and strategies for closely observing children, documenting key moments and examples of science teaching and learning, and engaging in interpretation of data with colleagues (File et al. 2016).

Systematic use of reflection and inquiry can improve teachers' instructional strategies.

Methodology

Given that this was the first collaborative international project for both teams, and that the US team could communicate only in English, both teams were unsure of how to frame the most fruitful initial research questions. The Palestinian team was interested in learning about child-centered, inquiry-based science teaching from the US preschool teachers, who in turn were interested in serving as mentors for the Palestinian teachers on teacher inquiry goals and tools. We four authors crafted broad initial questions that left enough curricular and inquiry space for us and the eight Palestinian teachers to proceed while maintaining the integrity of local teaching practices and of our respective cross-cultural interests:

- How can teacher inquiry help us understand new forms of effective science education for young children in two contrasting international contexts?
- How do both groups of international educators perceive and approach high-quality science education for young children?
- To what extent can an inquiry-based, cross-cultural exchange of classroom data influence teachers' understanding of high-quality science education and the roles of teacher-directed and child-centered instruction?

The Palestinian team included one teacher educator (Khales, the second author), who teaches at a university in the West Bank and who has implemented innovative, inquiry-based teaching practices with preservice and in-service teachers. She worked with one preservice teacher and seven in-service preschool teachers from the Jerusalem (East) area, whose teaching experience ranged from 4 to 22 years. The teachers worked at a mix of public and private preschools, teaching classes of 20 to 30 children, ages 3 to 5, with Arabic as the primary language of instruction; they followed the centralized Palestinian Ministry of Education curriculum.

The San Francisco team consisted of one teacher educator (Meier, the third author) with extensive experience working with early childhood inquiry groups; one preschool teacher/director (Melgoza, the fourth author) with 25 years of experience, currently teaching in a private, play-based preschool for 3- to 5-year-olds; and one preschool teacher (Escamilla, the first author) with 20 years of experience, currently teaching in a Spanish-English public preschool with a project-based curriculum. All are experienced teacher inquirers.

The project took place over one academic year, with monthly exchanges of data and reflections by the US and Palestinian teams. Both teams designed science activities and projects at their sites. Using note taking, audiotaping, videotaping, photographs, and written reflections, they collected data on the children's science interests and discoveries at least once a week.

The two teacher educators visited their respective sites once a month to observe the teachers' strategies and the children's science engagement; they took written notes and photographs and made brief video clips to document the most telling and instructive examples of teaching and learning. Each month, the teams uploaded selected data to the project's private website for comment and feedback from group members. The data included photographs of children's science play and work (such as a creation consisting of magnets) and written observations on the classroom science learning, in both contexts, from the four authors and the eight participating Palestinian teachers.

The two collaborative teams analyzed the project's data with four primary interests that linked to the initial teacher inquiry questions:

- Children's conversations and actions during their exploration of science activities and projects
- Teachers' curricular planning, guidance and support of children's learning, and written documentation and reflections on the teachers' instructional practices
- Changes in the degree to which the respective teaching and research teams used more teacher-directed and/or child-centered teaching strategies as the project evolved
- The kinds of data uploaded to the private website, the comments made by project participants on the posted data, and the overall efficacy of using the website for data posting and reflection

The analysis relied primarily on narrative inquiry, a methodology that privileges narrative in data design, collection, analysis, representation, and dissemination (Clandinin 2013). Narrative inquiry uses story to capture and understand telling moments, experiences, and perspectives and to help educators understand a particular educational puzzle. In reporting the project's findings (Kroll & Meier 2015), elements of narrative inquiry are evident in the Palestinian and US teachers' descriptions of key anecdotes and experiences as expressed in their own voices.

Findings and discussion

The project's major findings are presented and discussed in two sections, one analyzed from the point of view of the Palestinian team and the other from the US team's perspective. In each section, "we" is used to denote each respective team. (For more first-person notes and reflections from both teams, see the longer version of this article at NAEYC.org/resources/pubs/vop.)

Palestinian context: Fostering innovative instructional practices through inquiry and reflection

This international collaboration helped the Palestinian teachers design and implement science projects based on children's interests and make the children's learning more active and child centered.

After reading descriptions of the US children's science learning and the US teachers' reflections, we compiled our own critical questions on curriculum and teaching:

- How did the US teachers implement these play-based activities with these young learners?
- Where did they get these activities? Did they refer to a resource book or create the activities on their own?
- Did all the children engage in these activities with interest and enthusiasm?
- If not, what additional procedures did the teachers initiate?

These kinds of questions indicated an increased level of engagement with curriculum planning and

Palestinian children moving paint with magnets as part of a more child-centered approach.

instructional strategies for us as Palestinian teachers. This was of particular importance, given that Palestinian teachers are in the early stages of conceptualizing and implementing more child-centered approaches.

Our exchanges with the US teachers also prompted a realization for us that we *can* create new ideas for effective science curriculum and reflective practice to share with other educators and communities. As our data, anecdotes, and reflections reveal, the cross-national nature of the project encouraged us to take new risks, try new teaching activities and experiences, and exchange ideas and projects without feeling any inferiority or threat. In short, we were encouraged to reflect on a more enjoyable way of teaching and to develop ourselves more fully as early childhood professionals.

The regular meetings among ourselves, and the regular web postings and comments with our US colleagues, helped us

become more familiar with the concept of reflection and the use of inquiry strategies, including close classroom observations, note taking, photographs, videotaping, written reflections, and conversation and collaboration with colleagues. This new process of integrating reflection with teaching practices also encouraged us to face certain challenges and difficulties in our science teaching. For instance, after reading written observations and reflections on lessons from the US teachers, we looked for alternative ways to create more open-ended and inquiry-based teaching.

The use of videos was a particularly valuable element in our introduction to ideas and practices for inquiry and reflection. Some of us made videos of the children's science learning and then showed them to our colleagues for feedback, others made videos for self-assessment and self-improvement, and some teachers exchanged videos to get additional feedback and dialogue. Initially, several of us were reluctant to present our activities to others, hesitant to show weaknesses or seek ideas through collective reflection. The collaborative nature of our team and the supportive feedback from the US teachers helped us gain confidence and skill in presenting data and reflections.

Razan, a preservice teacher, was eager to implement science strategies that she had learned in her university classes (taught by the second author, Khales) that promoted children's discovery and curiosity. She also wanted to observe and understand the value of a playful approach to science engagement for young children, and decided on a play scenario involving a mischievous cat that she hoped would spark the children's interest in magnets and their properties. (See "Data Anecdote: Razan Playfully Scaffolds a Magnet Scenario.")

Data Anecdote: Razan Playfully Scaffolds a Magnet Scenario

Before the children arrived, I put the iron filings on the classroom floor and I painted small cat feet on paper near the filings. I also put out nails, metal pins, plastic parts, and an iron ruler. When the children entered the classroom, I told them that before they arrived, a cat had come and caused chaos with the materials (I did not call them iron filings), and we needed to clean the mess without directly using our hands. I asked the children if they knew the composition of the material on the floor. Some said "iron" and "iron filings."

I asked them how they could remove the iron filings and the metal pins without using their hands. One child said "a magnet." I then put out some materials that are attracted by magnets (metal pins and screws) and other materials not attracted by magnets (wood, plastic, and cork). I distributed magnets to the children and asked them to classify the materials by those attracted by the magnets and those that were not. The children began to eagerly test the objects with the magnets, and they discussed their discoveries with each other as they arose.

Iron filings for experimentation in Razan's classroom.

Reflection

As a preservice teacher in my fourth year as a BA student in early childhood education, I tried to provide a playful initial provocation (the cat has caused chaos with the materials) and to pose a problem for the small group of children to solve (how to clean up the materials without using their hands). I wanted to implement a hands-on, playful activity that would engage the children in problem solving and discovery.

It was valuable to teach a project like magnets that doesn't exist in our textbook. The science activities helped the children to discover knowledge on their own; they also engaged in higher stages in the educational process of learning and discovering. I saw this in their reactions, for instance, when they were experimenting with the iron filings and magnets. They made important discoveries about the properties of magnets. This project offered the students something out of the ordinary and unleashed their thinking from the more teacher-directed daily routine.

US context: Promoting reflection on science through international collaboration

The following anecdote and reflection capture one way this project deepened our understanding of inquiry and science learning through the lens of international professional collaboration. (For another reflection that captures additional lessons, read the longer version of this article, at NAEYC.org/resources/pubs/vop.)

Data Anecdote: Martha Benefits from Mirroring Others' Practices

Our shared project on magnets helped me reexamine my long-standing interest in emergent curriculum based on children's interests. The Palestinian educators thought of presenting a magnet theme in their classrooms and suggested that the US team consider introducing the topic in our classrooms as well. Magnets had not been something my students or I had on our list of interests at that particular time. Since we follow an emergent curriculum, it felt a little strange to introduce what felt like a random topic. Yet, over many weeks, I put out a range of magnets and magnetic materials for free exploration and discovery.

I provided different magnet activities for the children to explore at their own pace. There were no directions, nor a teacher or parent assigned to the space to explain the magnetic properties. At one point, I sat down to interact with the children. The metal shavings activity did not hold the children's attention for very long. The magnetic base with the circle magnets drew in a group of children and sustained their attention for 15 minutes. Some worked at stacking the circles either randomly or sorting by color. They discovered that sometimes the magnets repel and do not stack. I asked them why, and they responded:

"They are not the same color."

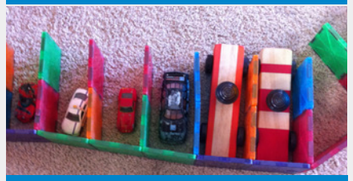
"They are hoovering" [*repelling*].

"They need to be weighed down to stay." [*The children tried many times to weight them down.*]

"They are bouncing." [*As the children tried to force the magnets together, they discovered that the magnets bounced away from one another and that some even flew off the table.*]

The group continued testing their ideas. By adding more magnetic circles to the vertical wooden stick, the children weighted down the magnets and reduced the possibility of the "hoovering" space, or the magnets repelling each other.

Magnets for outdoor experimentation in Martha's classroom.



Magna-Tiles and cars creation in Martha's classroom.

Reflection

The manner in which I participated in this activity was unusual. Normally, I am not such an active participant in conversations with young children. I usually let children explore materials for at least one day before I sit with them. When I eventually sit with them, I start by observing and discovering what they already know about the materials. This allows me to formulate questions and appropriate scaffolding and give the children more space to think about the activity.

In rereading my journal entries and reflecting on the magnet activities, I was pleased to note that the children described and named "hoovering" and "sticking" as important magnetic properties. The children asked questions and came up with possible explanations and reasons for what was occurring and shared their knowledge with one another. It sounded like everything I plan and hope for. Yet, the experience at the time felt false to me somehow. On reflection, I realized that I gave the activities less initial thought than I usually do, and the children were not following the magnets as an emergent interest. They were learning about the magnets' properties but had other reasons for their sustained focus and involvement with the activities. For instance, the children enjoyed the Magna-Tiles for the materials' building capabilities; the fact that they are magnetically held together did not seem to consciously interest the children.

If it were not for our decision to follow the Palestinian teachers' science topic suggestion, I would have dropped the exploration of magnets, considering exposure to magnets as valid in the early childhood classroom. This sharing of classroom experiences with the Palestinian educators provided me with the opportunity to take a deeper look at my practices. It allowed me to question the how and why of presenting curriculum at my school. As a site director who also works with the children as a teacher, it also helped me understand the value of more direct conversation techniques and involvement with the children's thoughts and actions, especially when presenting an activity with no planned connection to an emergent theme or focus. This experience also inspired me to engage in more professional and collaborative ventures like this to help keep my practice alive.

Implications

The project has three major implications for other early childhood teachers and teacher educators interested in transforming science education via inquiry-based collaboration.

Focusing on a single curricular area and the same topics provides a refreshing perspective on one's teaching goals and strategies.

First, for educators interested in deepening their knowledge of high-quality science education, we suggest exploring dialogue and sharing teaching beliefs and practices with early childhood educators internationally. The process of focusing on a single curricular area (such as science) and the same topics (such as magnets) provides a welcome and refreshing perspective on one's teaching goals and strategies. Such an exchange, as in our project, can provide new motivation and information for veteran teachers to question and deepen their teaching. For new teachers, the opportunity to dialogue with veteran teachers, both locally and internationally, offers a valuable stepping stone toward improving their professional practice.

Second, exchanges can be strengthened by integrating a range of inquiry-based strategies, from photographs to videos to written reflections to an electronic platform. The opportunity to choose from a wide range of inquiry tools at the outset helps teachers with varied levels of inquiry experience select tools that they feel comfortable with and provides an expanding toolbox of strategies. We also recommend further exploration of electronic platforms. For the Palestinian team, the use of a private website was a familiar and effective platform, but they had not previously used it as a tool for systematic teacher reflection. The US team was entirely new to the platform and at times found it problematic. For instance, the default translation of written text from Arabic to English was poor, and the nuances of intent and reflection in the original Arabic were lost. We now recommend the addition of other more direct forms of electronic communication (such as Skype or Google Hangout) for international dialogue.

Magnet construction in a US classroom.

Last, we recommend the inclusion of teacher educators in international inquiry-based collaboration, as in this project's Palestinian teacher educator and the US teacher educator, who were co-organizers and who helped guide the initial inquiry framework, tools, and reflections. Local teacher educators are familiar with curricular knowledge at the preservice and in-service levels and can pinpoint places in international exchanges where inquiry and reflection can work in tandem to strengthen data exchanges and interpretation. To further improve the role of the two teacher educators in this project, we now see the value of more long-term collaboration. Both teams look forward to new possibilities for improving international exchanges.

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