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From the Editor

For many of us, the pandemic has hindered our ability to collect data for research, particularly classroom data. However, virtual data-collection possibilities remain viable and have received increasing focus during this time. The fall 2021 issue of the *Journal of Montessori Research* highlights two such studies.

First, Scott and Myers explore the impact of the COVID-19 pandemic on Montessori education by providing insights into teachers' perceptions of the transition to virtual instruction. I and my colleagues Carolyn Daoust and Jan Mallett authored the second study based on data collected during the pandemic; we gathered feedback from Montessori experts on the design of the Montessori Coaching Tool Elementary Rubric for early-career Montessori educators and present our findings. The article in this issue involving more typical data collection is based on a three-year qualitative case study by Nanette (Sheri) Schonleber, which examines the potential for using Montessori's Cosmic Curriculum in a place-based indigenous science program.

I would like to acknowledge an important contributor for this issue, Sharon Damore, the guest editor for the article that I submitted with my colleagues. Because I serve as the editor for the *Journal of Montessori Research*, she stepped in as a third party to make editorial decisions regarding acceptance, revisions, and publication of the manuscript. Dr. Damore's role is important because, as a scholarly publication, the journal must maintain the integrity of the double-blind, peer-review process for all submissions under consideration, especially any submitted by the editor. I extend my sincere thanks to Dr. Damore for her time and expertise in this role.

I close with hopes for renewed opportunities for everyone to pursue in-person and classroom data collection soon.

Sincerely,

Angela K. Murray, PhD
Editor, *Journal of Montessori Research*
Director, Center for Montessori Research
Secretary/Treasurer, AERA Montessori Education SIG

Montessori Education: Teacher Perceptions of Challenges in Transitioning to Virtual Instruction

Catherine M. Scott and Brooke M. Myers, Coastal Carolina University

***Keywords**: elementary, Montessori, virtual instruction, COVID-19*

Abstract: In 2020, Montessori teachers and families across the world had to adjust as schools were closed because of the rapid onset of the COVID-19 pandemic. Those working in the Montessori classroom, which typically favors a hands-on approach and limited use of technology, had to devise new ways to engage with students in the virtual-learning environment. How do teachers perceive that the transition to online learning affected their instruction? This descriptive case study examined the ways in which a school's Lower and Upper Elementary Montessori teachers adjusted their instruction to meet student needs online, as well as the benefits and challenges that the teachers felt they and the students experienced as a result.

Montessori education is recognized for its holistic approach to education; in the Montessori environment, children are provided a sense of control as they engage with materials and progress through the curriculum. The unique features of the Montessori environment allow the child to manipulate and interact with hands-on materials, imitating the concepts taught to them by classmates and instructor until they achieve a level of mastery. Embedded within the Montessori approach are opportunities for students to engage in regulating behaviors; for example, through the Montessori work cycle, children are able to learn to develop a plan of action and enact that plan for getting work done. They are required to test their ideas and adjust their plans as needed. These carefully considered pieces of the curriculum are part of what makes Montessori instruction so different from that of the traditional classroom (American Montessori Society, n.d.).

However, what happens when the Montessori approach is interrupted because of the onset of COVID-19? In 2020, schools across the world were closed because of the rapid onset of the pandemic, causing changes for teachers, families, and students. Those working in the Montessori classroom, which typically favors a hands-on approach and limited use of technology (MacDonald, 2016), had to devise new ways to engage with students in the virtual-learning environment. As a result, we were curious: What concerns do teachers have as they navigate this transition to online instruction in a Montessori classroom? This exploratory case study examined the ways in which a school's Lower and Upper Elementary Montessori teachers adjusted their instruction to meet student needs online, as well as the benefits and challenges they felt they and the students experienced as a result.

Literature Review

Because our research focused on Montessori approaches to learning and virtual learning, we provide a literature review of each topic, examining previous research on how the Montessori approach and the ways in which the Montessori approach might change through virtual-program implementation. It was important to determine how use of virtual programs might complement or interfere with key features of the Montessori approach to learning.

Montessori Approach to Learning

The Montessori classroom provides opportunities for students to engage in a multiage learning environment. Primary classes consist of children aged 3 through 6 years, Lower Elementary serves grades 1 through 3, Upper Elementary serves grades 4 through 6, and middle school may include grades 7 through 9. Age groups are strategically designed to align with what Maria Montessori referred to as *sensitive periods*, times when children undergo developmental milestones and significant learning. These sensitive periods affect children's academic understanding and social growth, which includes learning how to work as a community and collaborate with peers (Lillard, 2016; Zimmerman & Schunk, 2014).

The aim of the Montessori Method is to support the development of the whole child while promoting independence, responsibility, and an individual who has the utmost self-respect and can rely on their own intrinsic motivation to guide them through decision-making. As Bagby and Sulak (2018) noted, "Children with well-developed executive functioning skills can inhibit negative responses, sustain attention, and use working memory resources effectively" (p. 1). These skills include students' abilities to also manage their time, organize their materials, engage in creative thinking, and focus on goal setting.

Implementing the Montessori Method within the sensitive periods of a child's development encourages educational characteristics such as independence, freedom of choice, development of self-direction, responsibility for one's own actions, and the self-confidence to blossom (Kayili & Ari, 2011; Lillard & Heise, 2006, 2016; Philips-Silver & Daza, 2018). The Montessori approach is designed to allow these opportunities by providing students choice in their work, using increasingly complex tools as students progress through the curriculum, and minimizing adult intervention in the learning process (Howell et al., 2013).

Virtual Instruction

Limited research exists that focuses solely on the use of virtual instruction in early elementary classrooms. *Virtual instruction*, in this case study, refers to the use of full-time, synchronous instruction. A 2016 study from the National Education Policy Center (NEPC) noted that more than half (51.5%) of online schools were charter schools and that an average of 305 students were in each of these schools. These demographics are similar to those of the charter school in which our study took place (NEPC, 2016). However, because of the recent onset of COVID-19, no studies are currently available that examine the shifts from in-person to virtual instruction and their effects on students. Anecdotally, some suggest there are concerns in online learning for younger students, who may be more easily distracted and thus need deeper engagement in virtual platforms (Li & Lalani, 2020).

Traditionally, the use of virtual tools, including computers, is limited in the Montessori classroom, instead emphasizing the use of hands-on, concrete objects during instruction (MacDonald, 2016). Previous research indicates that Montessori teachers may struggle to determine how to best fit technology into the Montessori approach (Jones, 2017); however, Montessori teachers also recognize that including technology in their teaching practices may also help students to further explore Montessori concepts (Cifuentes & Prozesky, 2014; Hubbell, 2003).

Research on best practices in online education (DiPietro et al., 2008) indicates that effective virtual instruction in K–12 settings encourages collaboration and interaction among students, their peers, and the teacher; further, effective virtual teachers build relationships with their students and are able to identify students in crisis or who need additional support. As with traditional, face-to-face instruction, effective virtual educators know their content, use multiple strategies to assess learning, and use instructional strategies that engage students with the content (DiPietro et al., 2008). Similarly, Cavanaugh et al.'s (2004) meta-analysis of virtual instruction in K–12 classrooms found that these factors, as well as student characteristics, had a direct impact on student success in virtual instruction. Those characteristics may include a student's self-motivation, organizational skills, and ability to work independently (Cerniglia, 2011), all areas

developed through the use of Montessori instruction.

With the onset of the pandemic, Murray et al. (2021a) administered a survey to Montessori educators to examine the ways in which the teachers developed and implemented both virtual and hands-on experiences during the pandemic. Of the 222 respondents, 75% noted that more than half of their students (60%) were in virtual instruction and that input from administration was limited in terms of support for the transitions to online teaching; only 20% of participants felt they received moderate amounts or a great deal of support from administration. The majority of teachers engaged in videoconferencing with students as a means of instruction but noted that typical Montessori strategies, such as including choice in assignments and providing access to Montessori materials, were a challenge (Murray et al., 2021a). Further research (Murray et al., 2021b) reaffirmed these difficulties for teachers; in a study of social media and webinar data, the researchers found that teachers were struggling to determine best practices and instructional strategies for a transition to online learning and that the teachers were relying on one another for support and ideas.

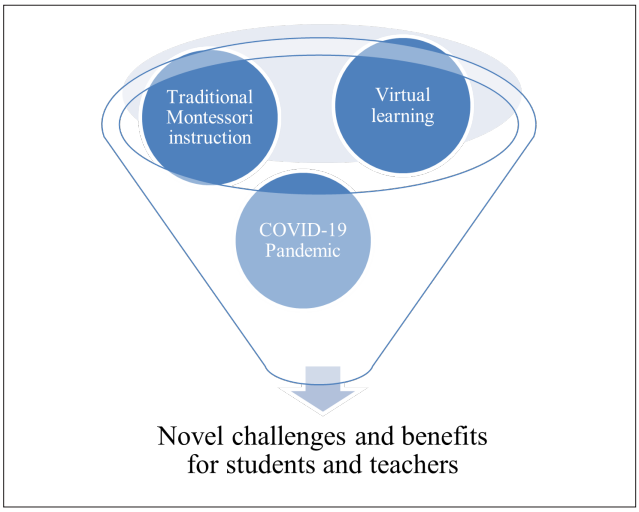
Although the American Montessori Society (AMS) has developed some suggestions for teachers on how to develop effective teaching videos to share with students, neither AMS nor Association Montessori Internationale provides teachers extensive information on how to translate the in-person Montessori learning environment to online instruction, nor are there resources to discuss how these transitions affect use of Montessori best practices. Also, limited research is available on how Montessori teachers are navigating these changes to the curriculum. Therefore, this study attempts to fill a gap in the literature by addressing two questions: What concerns do teachers have as they navigate this transition to online instruction in a Montessori classroom? What benefits and challenges do teachers perceive that students have as they transition to online learning?

Theoretical Framework

The literature on Montessori education and virtual instruction informed this study's theoretical framework. Given our understanding of Montessori practices, we recognize that the curriculum, through its hands-on materials and opportunities for self-direction, enables unique learning opportunities for students. However, these practices may be at odds with what can be accomplished through virtual instruction, particularly when there is little to no support for teachers as they navigate the transition to online instruction. Therefore, we expected to see new challenges for teachers (and students) as they negotiated issues such as student support, accountability, and developing curricular materials in unnavigated territory (see Figure 1).

These expectations guided the coding for our qualitative data analysis, which focused on describing the teachers' perceptions as they negotiated the new learning environment. Using a descriptive lens, we examined qualitative data from interviews and written correspondence to identify key themes in participant responses. A descriptive approach was used for this study as it recognizes that many variables may affect study outcomes, no variables were manipulated, and no interventions were implemented (Creswell, 2014).

Figure 1
Theoretical Framework



Methodology

Context

This case study took place in a public charter school located in the southeastern United States. The school district serves fewer than 9,000 pre-K–12 students and includes 11 elementary schools. The school is the only charter school in the district, which opened in 2012 and serves 236 students in grades 1 through 8 (ages 6–13). Because the school is a charter school, teachers are allowed autonomy in classroom structure and planning as long as they follow Montessori principles. The school is held to the same accountability standards as traditional

schools across the district. The school follows a 3-year learning cycle with its students: students remain in the same classroom for 3 years.

School Community

The school district in which the study occurred serves four small towns, but the majority of students reside in the town where the school itself is located. The area is a moderately wealthy community with just under 14,000 residents and an average household income of $55,500; the median home value is $310,000. The majority of residents are White (88.7%), and the median age is 60; only 20% of households in the area have children.

Participants

Four teachers from the school participated in the study, two from the Lower Elementary level (grades 1–3) and two from the Upper Elementary level (grades 4–6). All four teachers taught virtually during the study. Information about each participant can be found in Table 1. Institutional review board approval was obtained, and all participants consented to participation.

Data Sources

Because this is a descriptive study, we relied on information from teacher focus groups and individual teacher interviews to learn how the teachers felt online instruction was affecting the students in their classrooms.

Focus-Group Interview

A focus-group interview was conducted with three of the four participants via Zoom. The interview was recorded and transcribed. Interview questions were semistructured to allow open-ended responses from participants. Because of scheduling issues, the fourth teacher shared her responses to the interview questions via email, answering follow-up questions also by email. The interview questions are in Appendix A.

Individual Interviews

Individual interviews occurred with one Lower Elementary teacher ("Jane") and one Upper Elementary teacher ("Kate") to discuss the lessons taught, student outcomes, and their perceptions of students' abilities to self-regulate in the lessons. These interviews were not recorded; we took detailed notes through each interview.

Data Analysis

Interview data and email responses were analyzed by segmenting the responses into coding categories. These categories were developed by using common themes found across each participant's responses (Yin, 2003). Data were first coded independently by each researcher, identifying tentative codes for categories that repeatedly came up in conversation. Next, the researchers met to discuss findings and revise codes as needed. At this time, the reviewers narrowed down the coding categories to hone in on key points (see Table 2 for coding schemes). After the set of themes was agreed upon, the researchers

Table 1

Teacher Demographic Information

Teacher*	Grade level	Years at Montessori school	Total years' experience	Certifications
Jane Smith	Lower Elementary (1–3)	6	27	Elementary I Montessori; Grades PreK–3 (state); Gifted and Talented
Deb Thomas	Lower Elementary (1–3)	5	20	Elementary I Montessori; Grades PreK–3 (state)
Chelsea Jones	Upper Elementary (4–6)	10	13	Elementary II Montessori; Grades 2–6 (state); Gifted and Talented
Kate Allen	Upper Elementary (4–6)	10	31	Elementary II Montessori; Grades 2–6 (state); Gifted and Talented

* All names are pseudonyms.

Table 2

Coding Schemes for Data Analysis

Initial code	Examples to support	Final code
Building community	What do we do so kids can get to know each other? How do we create a place for families to feel supported?	Supporting students
Coping skills/dealing with stress	Harder to see the kids on screen; how do we know if they are upset? Watching for indicators of frustration while online	
Developing student–teacher relationships	Harder to get to know new students online Fortunate to have had 2/3 of the students for previous year or 2 because of learning cycle	
Parental expectations	Comparing their own schooling experience to what their children are experiencing Worrying about what their children are missing Balancing the amount of support provided (doing too much for their child versus not being involved at all)	Resiliency
COVID-19 restrictions	Concerns about local mandates for plexiglass, masks, distancing Parents and teachers worried about sick kids at school	
Following through with school responsibilities	Student response guides how we react to missing work or late assignments. Kids know they have to be responsible and get it done. Hard to deal with issues like parents taking kids out of school for other activities, so work is not done	Student accountability
Home distractions	Students can go play video games during the breaks (and sometimes not come back on time). There are distractions at home that do not exist at school.	
Family demands (work–home balance)	Parents have to work and not be home for kids. Parents struggle with knowing how to support kids with school, now that they are home all day.	Environmental influences
Student support at home	Some students have parents with them all day, and others do not. We have to know to meet them where they are at.	
Home distractions	Concern about video games, siblings, and other interruptions.	

then rewatched the focus-group interview video and reviewed its transcript, rechecking the emailed correspondence to confirm the findings.

Methods

When examining teacher responses in the focus-group interview, we saw that four major themes emerged, each of which is described in greater detail below: student support, resiliency, student accountability, and environmental influences.

Student Support

All four teachers noted that their goals were to establish relationships with the students and support them in their virtual classrooms. This occurred through a variety of formats; one teacher held a Wednesday lunch with her students so that they could log on and eat lunch together. The other three teachers noted that they also provided support at nonacademic times so that students could log on, ask questions, and spend time together. As Kate shared, "Once a week we have our students come together as a cluster of kids where they can share their cats and show their gardens. Whatever they feel they need to do" (K. Allen, personal communication, March 8, 2021)[1]. These actions aligned with findings from Murray et al. (2021a, 2021b); teachers in that study shared that they had engaged in lunches, book groups, and virtual social times with students to provide opportunities for collaboration and social engagement.

When asked if they felt that their approaches were effective, the teachers agreed that, for the most part, they seemed to help students build a sense of community in a virtual setting. One teacher commented that students sometimes lingered online after class to talk with her and that they sometimes shared information they never would have shared in person. However, there were some concerns, particularly with dealing with students who would become frustrated by content difficulties or technology issues. Although the teachers appreciated how they were able to allow a student to log off to gather himself or herself and rejoin the group when ready, they also recognized that students might be showing signs of frustration (e.g., watering eyes) that they may miss when looking at 24 faces on a computer screen. One teacher shared that she tried to watch body language with two students whom she knew had difficulties with executive functioning. She explained that her goal was to provide those students with other moments, such as free time to log in and just talk, to help them feel more comfortable sharing their frustration in class, allowing everyone to work through it together.

Resiliency

A major concern and topic of conversation among many adults is how the COVID generation of children will bounce back after their extended absence from an in-person classroom setting. (Bauerlein, 2021; Richards, 2020). How will students rebound after they miss so many opportunities for growth and development in school? While it may be surprising, a commonality among all four teachers was that the majority of children in their classes seemed unharmed. As "Chelsea" explained,

> *For me as the adult, I know how much we're missing because we're virtual. Because I know I've been missing that [the building of student–teacher relationships] a lot. But in the students' minds we still have a close relationship. We are still making the impact socially and emotionally; it's just not the one teachers are used to. The students are content with the friendships and relationships they have developed. (C. Jones, personal communication, March 8, 2021)*

The other party that typically has concerns regarding resiliency is the parents and families of students. Because most families had been through the traditional education system, they were likely comparing the experiences they had had in school to the virtual experience their children were having. When imagining the educational needs of their children before the pandemic, families likely pictured the typical general education classroom. The reality of the situation was that, regardless of whether the children were in school or learning virtually, their education was different than in pre-COVID times. Jane said, "Unfortunately, in-person is far from 'normal' right now, so they're not really missing what they think they might be missing" (J. Smith, personal communication, March 8, 2021). Students attending in-person school were wearing masks and socially distanced, in a scenario unlike that of prior school years. Following district guidelines, group work was extremely limited, and students sat within plexiglass barriers and were not

[1] All teacher names are pseudonyms.

allowed to mingle with other grade-level classes. Because of these restrictions, Jane argued that

> *the needs of students with existing social and emotional regulation skills might be better met in the "in-person" option, but maybe not. Is it better to be in a tiny box on a screen or in a tiny plastic box in the classroom? I really don't know. (C. Smith, personal communication, March 8, 2021)*

Both Jane and Kate shared examples of the lessons that their students were completing at home and that allowed opportunities for movement, STEM (e.g., building a robot from recycled goods and writing about what the robot did), and hands-on mathematics, which could not be completed in the school building because of COVID-based safety restrictions. Thus, while children were missing some of the typical in-person educational opportunities that their families had experienced, their virtual environment was perhaps less restrictive than the in-person options available.

Student Accountability

Working with students on developing personal accountability was a common concern for participants. Similar to the teachers in Murray et al.'s study (2021b), our teachers worked on ways to encourage self-discipline and independent work among their students. Chelsea said, "We have kids who are relying on us to give them skills to be self-reliant" (C. Jones, personal communication, March 8, 2021). The teachers shared that many times student frustration came not from the content but from students not turning in their work or from choosing activities such as playing video games during class break times (when they should be completing independent assignments). Chelsea further explained:

> *Once the excuses go, the students we are meeting with are the ones who decided to play video games during the school day and didn't come to class. Then what we are combating . . . are things that the students have messed up for themselves. (C. Jones, personal communication, March 8, 2021)*

For both Chelsea and Kate, student accountability appeared to be a greater issue, perhaps because these teachers were working with students in Upper Elementary grades.

All of the teachers indicated that it was generally evident when students had support at home to aid them in personal accountability and when they did not. Differences in student responses (e.g., "I didn't do the work because my mom was working and could not help me" versus "I didn't do the work because I was playing video games") were easier for the teacher to detect through how students responded when asked about absences or missing assignments. Across both age bands, student concerns about missing work were exacerbated by parental decisions to have the students miss school, as when booking a doctor's appointment in the middle of the day. These situations appeared to upset students more than the times when their absences were their own fault (as when playing video games) because these absences were beyond students' control. However, regardless of age group, the teachers agreed that students recognized the need to be accountable for their own actions.

Environmental Influences

When discussing frustrations associated with the virtual-learning platform, all four teachers mentioned one specific idea: influences in a student's home environment affect the way they develop, and these influences become much more prevalent in the virtual environment. As educators in an online education system, the teachers can only interpret what is seen on camera. Chelsea explained, "There's no way to control what's happening at home. There are ways to help and assist, but ultimately everyone runs their homes the way they think is best" (C. Jones, personal communication, March 8, 2021). Because students' home lives and school days had merged, their rules and ideas about education had as well. Families were having to balance work, family life, and their child's education at the same time. For some, this meant that the child was unsupervised at home during the school day, while others had the resources to be home with their kids. The teachers noted that they tried to stay aware of these circumstances so that they could determine the best means to reach the students.

On the other hand, some children appeared to be thriving because of their new environmental influences. As "Deb," a Lower Elementary teacher, stated,

> *The kids who are not getting the support at all are being impacted. The kids who are getting the support at home are being impacted, but in a positive way. It really depends on what happens when the students click "end*

meeting." (D. Thomas, personal communication, March 8, 2021)

Similar to Murray et al., (2021a), our teachers found that parents could serve as a great source of support for the children in their classrooms, so they wanted to further opportunities to help parents engage with their children. They found themselves providing more educational resources to help families build their child's emotional and organizational skills through virtual learning, rather than having to focus on content alone. For example, one teacher provided articles and tutorials to explain to families that "this is what it looks like to talk to an upset child, this is what it looks like to talk to a frustrated child, these are things you can do to help your child practice independence" (D. Thomas, personal communication, March 8, 2021). Jane also shared examples of the work that she assigned students; rather than assign only projects that they had to complete on their own, the students in her class were encouraged to work with a sibling or family member to complete tasks, such as making the longest paper chain using one sheet of paper. She noted that the kids were excited to involve others in their activities and that she was fine with family participation if it helped keep the students engaged and involved (J. Smith, personal communication, March 8, 2021). When families were provided the resources to engage in and support their child's social and emotional development, students were able to benefit.

Discussion

While this study used a small sample size and focused on teacher perceptions in only four classrooms and therefore cannot be generalized across all learning situations, the findings highlight some key themes for Montessori teachers working in the virtual environment. In many ways, virtual learning did not seem to affect some aspects of the learning experience for students. Students were still held accountable for completing their work and accepting responsibility for their work. They also displayed resiliency in handling changes to the learning environment: although the classroom space no longer followed the traditional model, the teachers perceived that, unlike themselves, the students were largely unaffected by the changes. It should be noted that some of the students' ease with the change in the learning environment may be because the older students already had a sense of community in the classroom, having known the teacher and been in in-person instruction with them for a year or more before the school closures.

The teachers shared that there were issues and concerns with aiding students that would be handled differently in an in-person setting. One concern for teachers was the difficulty in recognizing signs of frustration for all students in the virtual setting; it could be difficult to see on the screen when students were getting upset. Also, the types of distractions that students dealt with at home (e.g., video games on break time) presented new challenges for teachers to handle as they tried to engage students in their work. Finally, more time was needed to support parents as they helped their children navigate academic, social, and emotional challenges than was normally required in an in-class setting, where teachers would be spending time with the students to work on these issues.

Each of these issues brings new implications for those working in the virtual-learning environment as they work with students. It will be important, moving forward, for teachers to continue to foster social and emotional regulation skills in students. Teachers should not only continue to provide the supports they developed in their virtual classroom, but they also should consider ways to ensure accessibility for all students. For example, it may be necessary to provide opportunities for students to make up classroom time that may have been lost because of environmental factors. Creating time-management plans for students who may be easily deterred from their school work or sending out weekly check-in surveys to gauge how students are feeling may help teachers gain more insights into students' emotional well-being than having to guess through a screen.

For teachers returning to the classroom after virtual instruction, it is important to consider how the teachers will support students and their families as everyone readjusts to in-class instruction. Teachers may find that more time is needed to provide students emotional support or skills for dealing with frustration that may not have been visible on screen. There may also be challenges as students transition from what they perceive as more freedom working at home to a more structured classroom environment, requiring additional scaffolding support from the teacher.

Finally, although children need all of these supports, it is important to keep in mind how much families influence their child's education. Teachers may need to

provide opportunities for families to become more involved in their students' learning, especially in the virtual environment. Given that Montessori virtual learning is a new experience for all, parents may need additional supports in learning how their child develops and how to support this learning at home, for both those with children in virtual instruction and those transitioning to face-to-face instruction.

Most importantly, further research must be done on the use of virtual instruction in elementary education environments, particularly Montessori environments, given the dearth of research in this area. Such research may aid teachers in learning best practices for their work and may also aid those working in teacher education as they help teachers and students navigate this new terrain.

Author Information

Catherine M. Scott is an associate professor of education at Coastal Carolina University and can be reached at cscott1@coastal.edu.
Brooke M. Myers is an early childhood education major at Coastal Carolina University and can be reached at bmmyers1@coastal.edu.

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Appendix A

1. What strategies if any have you implemented to help your students deal with frustrations from home?
2. Do you see signs that your students are becoming overwhelmed often due to the online platform?
    a. How frequent are these signs?
    b. What do they look like?
    c. Have you seen a difference in the amount from the start of online learning to now?
3. Do you feel your students are able to self-regulate their emotions through the online platform?
4. How do you feel like the online platform has impacted students with delays in social and emotional regulation skills?
5. How are you promoting the development of social and emotional skills in your classroom?
6. Is your approach different online versus in class?

Using the Cosmic Curriculum of Dr. Montessori Toward the Development of a Place-Based Indigenous Science Program

Nanette S. Schonleber, Department of Early Childhood Studies, Sonoma State University

***Keywords**: Montessori, Cosmic Curriculum, Hawaiian language immersion, Indigenous epistemology; culture-based science curricula; Anschauung educators*

Abstract: Indigenous educators desire to use culturally restorative and decolonized pedagogies reflective of their own cultural values and beliefs in their science programs but have lacked models for how to start. They also often lack confidence in their ability to teach the sciences. This three-year qualitative case study used grounded theory methodology to discover (a) how Hawaiian language immersion (HLC) K–6 educators used Maria Montessori's Cosmic Curriculum for the creation of a science program based on Hawaiian epistemology and cultural values and (b) why the Cosmic Curriculum appealed to the HLC educators. Five key themes emerged: (a) the notion of creation as interconnected and relational, (b) an epistemological similarity regarding how people learn, (c) using timelines as organizing cognitive structures, (d) a focus on the natural sciences, and (e) the use of storytelling and key lessons to engage students. Participants stated that they felt successful in creating science curriculum and teaching the sciences as they adapted the above aspects of Dr. Montessori's Cosmic Curriculum. Future research should be conducted to discover if her Cosmic Curriculum can be adapted for use in other types of non-Montessori program and whether this kind of science program could encourage students to choose the sciences as a career choice.

In this paper, I describe how K–6 Hawaiian language immersion and culture-based (HLC) educators used Maria Montessori's Cosmic Curriculum (Montessori, 1948/1991) as a scaffold to create and implement a culturally restorative and decolonized science program. The science program integrated Hawaiian cultural values with Western views of science. The HLC educators wanted their students to be able to pass state-mandated science evaluations while also becoming grounded in their own language and culture (Kelling & Schonleber, 2011). The teachers also wanted to inspire their students to want to become scientists and leaders who could approach the future through the lens of their own Indigenous cultural perspective, epistemology, and experiences.

While there is a dearth of Indigenous scientists in the United States (Bang et al., 2018; Bernard & Cooperdock, 2018; National Research Council, 2014), preschool through college (P–16) science programs in the United

States are still not inspiring enough students from Indigenous cultures to become scientists (Kahn et al., 2020; Nelson & Madesen, 2018). According to Morgan et al., (2016), this race- and class-based inequity is detectable before kindergarten entry. It results from lack of access to a science curriculum utilizing the informal funds of knowledge and identity students bring with them from home and community (Esteban-Guitart & Moll, 2014; Rice, 2020). In addition to the lack of a motivating science, technology, engineering, and mathematics (STEM) curriculum to which their students can relate, preschool through sixth-grade (P–6) teachers often lack adequate basic content knowledge and confidence to teach the sciences at all, no matter what curriculum they are using (Aslan et al., 2016; Blank, 2013; Mullis et al., 2020)

Teaching the sciences may be even more difficult for teachers wishing to teach an Indigenous perspective on the sciences. In addition to needing to know the science content for two knowledge systems, Indigenous educators also need to be able to function as cultural brokers for their students (Schonleber & Kelling, 2018). Aikenhead (2001) stated that Indigenous students may feel disinterest because of a discrepancy between the values and mores of Western science traditions and the traditions and beliefs of Indigenous peoples. In Indigenous cultures, scientific knowledge is implicit within the activities of the culture. In Western cultures, scientific knowledge is a set of abstract principles and concepts devoid of context (Varghese & Crawford, 2021).

Some HLC educators also have asserted the need for a curriculum to function as "a bridge between the past and the future." (Schonleber, 2011, p. 7) They view the Montessori approach as providing that bridge because of perceived overlaps in teaching strategies, values and beliefs, and a shared world view regarding the nature of the universe (Schonleber, 2011). Non-HLC Indigenous educators also have adapted the Montessori approach (Montessori, 1912/1964) for those same reasons (Holmes, 2018; Romero-Little, 2010). Unlike traditional schooling models with their one-size-fits-all curriculum, the Montessori approach emphasizes the need for education to be adapted to the time and place of the families and children in their own communities. Learning and teaching are holistic, grounded in both reality and relatedness, and focused on supporting the development of the whole person to be able to achieve their greatest potential (Montessori, 1912/1964).

Purpose

There were two purposes for this qualitative case study. One was to discover how a group of HLC kindergarten through sixth-grade (K–6) educators used Dr. Montessori's Cosmic Curriculum to create a science curriculum based on Hawaiian epistemology and cultural values. The other purpose was to discover why the HLC educators chose her Cosmic Curriculum. The connection between the Montessori approach and Indigenous education is known. However previous research has not explored a specific connection between the Cosmic Curriculum and the creation of an Indigenous science curriculum designed for students to be able to "walk in both worlds." (I. K. Kelling, personal communication, February 10, 2020)

Theoretical Framework

The study utilized sociocultural learning theory (John-Steiner & Mahn, 1996; Vygotsky, 1978), which posits that learning is situated in a cultural context bounded by time and history. Learning occurs because of interplay between the environment and the individual, most often with the assistance of a more knowledgeable other. According to this theoretical perspective, the learning process is understandable only from the perspective of the child's social world (Vygotsky, 1978).

The Montessori Approach

The Montessori approach, with its well-operationalized and replicable pedagogy (Cossentino, 2005), has existed for more than 100 years (Chattin-McNichols, 1991). and there are over 20,000 public Montessori programs around the world (Center for Montessori in the Public Sector, 2019).

From Medical Doctor to Peace Educator

Dr. Montessori began her career as a medical doctor who focused on pediatric neurology (Lee, 2020). In this role, she made medical rounds in a local asylum where her young patients with neurological and cognitive disabilities lived. She had the insight that her patients were starved for stimulation and decided to find ways to help (Kramer, 1988). Dr. Montessori's research and discoveries inspired the formulation of a method of teaching and approach to learning she termed the *Montessori Method* (Montessori, 1912/1964). Dr. Montessori's Method began with an emphasis on sensory learning, access to

the natural world, exercises of practical living, and an ordered and sequential set of didactic materials designed to spark children's interest and support optimal growth and development (Montessori, 1912/1964; 1914/1965). The Method evolved into a holistic view of education and hope for a more peaceful world (Montessori, 1949/1992).

An Anschauung Educator

Dr. Montessori was influenced by a group of Anschauung philosophers and educators dating back to Johann Heinrich Pestalozzi (1756–1827), Joseph Priestley (1733–1804), and Johann Friedrich Herbart (1776–1841). *Anschauung* educators believed that the spiritual and scientific worlds work together as one; they thought that theories of education should be based on observed facts, sensory knowledge, innate patterns of growth and development, and intuition (Takaya, 2003; Trudeau, 1984). From this perspective, how we know something is based on empirical information gained through all our senses. Our brain actively organizes and classifies sensory information according to perceived importance. Once classified, information becomes transformed into an internal mental model of the world. What we notice or pay attention to depends on our cultural, relational, developmental, and survival needs. From her clinical observations of children, Dr. Montessori believed this transformation occurred through close, sustained attention to whatever was of interest (Montessori, 1949/1994).

From Anschauung Educator to the Cosmic Curriculum and Peace Education

In 1939, the Theosophical Society invited Dr. Montessori to Adyar, India, to give a training program on the grounds of its compound. When Italy entered World War II on the side of the Germans, the Allied forces required Dr. Montessori to be interned in Kodaikanal, India, along with other enemy aliens from around the world (Trudeau, 1984). Parents asked Dr. Montessori to begin a school for the children within the compound, so she started a school for about 100 international students of all ages. Dr. Montessori held lessons outdoors in a large, open-air pavilion with the natural world surrounding them (Kahn, 1998; Trudeau, 1984). She finally had the luxury of time to reflect on her experiences and observations about children and life, and it was here in Kodaikanal that she more fully developed her Cosmic Curriculum. Lena Wicknamaratne, the Montessori teacher at Kodaikanal during that time, described the experience in an interview with Sister Christina Marie Trudeau in 1983 (Trudeau, 1984):

> *For the first time, [Dr. Montessori] . . . began to see all of her basic cosmic background come true. The whole of the spiritual foundation of humankind, the spiritual unity of man, she could see that was true. For here were all these vastly different people . . . all this was combined in one melting pot with [Dr. Montessori's methods]. And [Dr.] Montessori saw the cosmic value of what she was saying because, despite the disparate backgrounds, all the children reacted basically the same way . . . and the trainees too. Putting education in a cosmic setting came there, in India, because of all these international and multi-aged children.* (p. 119).

Montessori's Cosmic Curriculum

Dr. Montessori described her Cosmic Curriculum most thoroughly in her book, *To Educate the Human Potential* (1948/1991). As an integrated and place-based curriculum, the Cosmic Curriculum utilizes pedagogy capitalizing on developmental qualities found in 6-to-12-year-olds. The curriculum provides a conceptual overview of the history of the universe, including Earth and all its living and nonliving components. The curriculum also provides a framework for learning the history of the universe through a series of five or six stories, complete with props and timelines to tie the stories together. The *Great Lessons*, as the stories with their props connected via timelines are sometimes called, are typically taught at the beginning of each year in Montessori Elementary classrooms. According to Duffy and Duffy (2002), the stories of the Great Lessons provide a way for students and teachers to emotionally connect to the material. Research on the power of healing and the use of stories in learning and teaching suggests that Dr. Montessori hit upon a powerful truth (Rosenthal, 2003; Weaver, 1994). Gulino and Shears (2018) state that he cognitive and perceptual processes used when people listen to a story make for richer connections and create a coherent narrative of life and situations. According to Boris (2017), telling stories is one of the most effective means of teaching, as the cognitive framework created by the stories helps us know how to respond emotionally to different situations. Stories also help us separate substantial amounts of information into manageable pieces so we can remember them

Table 1
The Great Stories and Their Relationships to Western Sciences

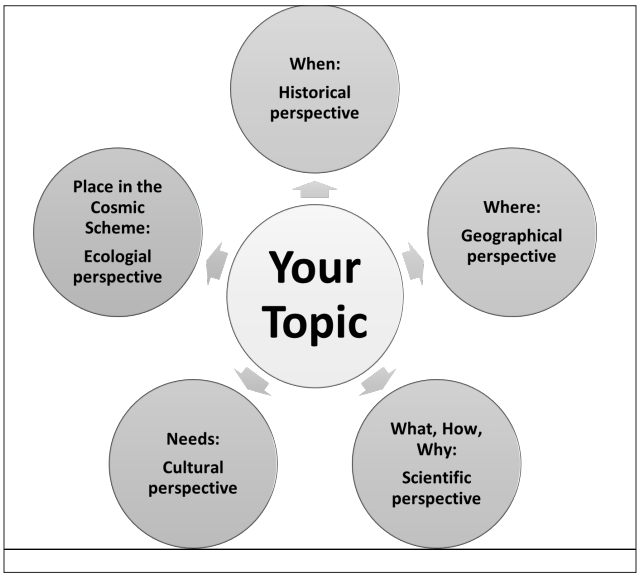
Great Story	Western science
The Creation of the Universe	cosmology, astronomy, physics, chemistry
The Coming Into Being of Earth	geography, geology
The Coming of Life	biology, ecology
The Coming of Human Beings	anthropology, sociology, archeology
The Story of Communication in Signs	linguistics
The Story of Numbers	mathematics

Note. From *Montessori Today: A Comprehensive Approach to Education From Birth to Adulthood*, by P. P. Lillard, 1996, Schocken Books.

long enough to create long-term neural pathways (Gulino & Shears, 2018). In a brilliant example of Miller's *magical number seven* (Miller, 1956), each of the Great Lessons connects to one or more of the sciences or a content area of the classroom, or both. The telling of the stories follows the sequence shown in Table 1.

The Cosmic Curriculum also provides a conceptual map, or framework for researching and learning any topic of interest through the sciences (see Figure 1). Students can independently or collaboratively study and learn about topics of personal interest while meeting state-mandated science standards. Teachers can immediately see where there are gaps in what students have chosen to research as well as in state standards. For example, if students are interested in learning about the complex system of life found within Hawaiian fishponds, they can organize their questions around the five perspectives in the conceptual map shown in Figure 1. The five perspectives include a historical view, a geographical view, a cultural view, a "parts-to-the-whole" view and an integrated or ecological view. (Schonleber & Kelling, 2018). With this framework, teachers who previously felt powerless to teach the sciences feel both empowered and excited to work with students to investigate topics within the sciences that are of interest to them (Kelling & Schonleber, 2011). These cognitive frameworks work in multiple cultural contexts and with multiple knowledge systems. The stories change, according to culture and time, but the framework is consistent.

Figure 1
The Anticipatory Web Template



Note. Starting with the historical perspective and going clockwise, each bubble is for questions of (a) when, (b) where, (c) what, why, and how, (d) needs and relationships to humans, and (e) the role of the topic in the ecosystem.

Hawaiian Language Immersion and Culture-Based Education

Before the arrival of Europeans in the late 1700s, Hawaiians had a well-organized system of both informal and formal learning (Chun, 2006; Osorio, 2002). When they were first exposed to the technology of the written word, they immediately recognized the value of the alphabet. By 1846, according to Wilson and Kamanā (2006), over 90% of the Hawaiian population was literate; by the time of the overthrow of the Hawaiian Kingdom in 1893, however, the Hawaiian system of education had changed drastically. The Americans who overthrew the Hawaiian monarchy institutionalized assimilationist policies similar to those imposed on Native Americans and other Indigenous peoples (Osorio, 2002; Reyhner, 2017); in 1896, those same Americans banned the Hawaiian language. By the 1990s, only 4% of Hawaiian people considered themselves to be fluent speakers of the Hawaiian language (Wilson & Kamanā, 2001).

In the 1970s, a movement to revitalize the Hawaiian language and culture included the creation of HLC schools. The core mission of HLC schools is to save the Hawaiian language from extinction and to support Hawaiian children in experiencing a sense of pride and belonging in their own culture. Beginning with the *ʻAha Pūnana Leo* (language nest) program, the movement

expanded in 1987 to include *Ka Papahana Kaiapuni*, a public-school, Hawaiian language immersion program (Wilson & Kamanā, 2001). Today, there are 22 *Papa Kaiapuni* programs and nine public charter schools that focus on the Hawaiian culture or the Hawaiian language and culture (Hawai`i State Department of Education, 2021). Scores from statewide tests of math, English, and science indicate student outcomes in these programs are equal to or better than those of their peers in conventional schooling systems (Wilson & Kamanā, 2006).

Montessori and Hawaiian Language Immersion Education

Access to Montessori teacher education is not readily available outside private training institutions or within separate, stand-alone programs in a community college or university. This means that Montessori education is not well-known in other types of educational systems. In Hawai`i between 1993 and 2003, a group of HLC educators completed between 225 and 600 hours of Montessori coursework as an integral part of their early childhood master's degree program. HLC educators immediately noticed similarities between their ancestors' perspectives on teaching and learning and Dr. Montessori's perspectives on teaching and learning. They often commented on the similarities.

Method

Study Design

Grounded theory methodology (Denzin & Lincoln, 2011; Strauss & Corbin, 1994) guided the overall design strategy of this qualitative case study. *Grounded theory methodology* is an analytic approach using a case perspective whereby theory derives from both inductive reasoning and deductive analysis. Grounded theory methodology is also an appropriate research methodology when conducting research with Indigenous peoples (Elers, 2016; Wilson & Baker, 2012).

Participants

The study took place at a kindergarten through grade 12 HLC school in Hawai`i. Hawaiian activist parents and scholars founded the school with the goal of revitalizing the language and cultural values of the Hawaiian people. Like schools in other parts of the country that emphasize the culture and language of Indigenous peoples (Lipka & Ilutsik, 1995), this school makes use of the cultural strengths of the Hawaiian culture and community. Here, children learn their cultural differences can be an asset (Meyer, 2003; Yamauchi, 2003). As one of the founders of the HLC movement said, there was "a need, an urgent need, to help to revitalize the language and the culture for all of Hawai`i's people. Especially for the Hawaiian people, but not just for the Hawaiian people" (K. Kamanā, personal communication, May 5, 2005)

Participants included seven K–6 educators, and 60 K–6 students. All seven educators who worked at the HLC program had their bachelor's degrees in Hawaiian studies or Hawaiian language. At the time of the study, four also had their master's degrees. The *Kumu Alaka`i* (teacher, guide [Pukui & Elbert, 1986]) had a doctorate in educational administration. The experience of the school educators at the time of the study was just under 10 years, and the average educator age was 33. The students' ages ranged from 5 to 12 years, and 92% were Hawaiian or part Hawaiian.

At the time the study began, the *Kumu Alaka`i* and I had known one another for 12 years. We worked collaboratively on this project, first informally and then formally, for

Table 2
Demographic Information for Teachers and Kumu Alakai

Pseudonym	Age	No. of years with school	No. of years teaching	Ethnicity	Role
Koalani	32	7	14	Not Hawaiian	Kumu Alakai
Anuenue	34	0	2	Hawaiian	K teacher
Ululani	36	6	13	Part Hawaiian	G1–2 teacher
Kanani	30	5	8	Part Hawaiian	G1–2 teacher
Mahina	31	1	5	Part Hawaiian	G3–4 teacher
Kanoe	36	0	6	Hawaiian	G5–6 teacher
Kalea	49	0	18	Hawaiian	K–G3–4 teacher

Note. All teachers were female, and all spoke Hawaiian. K = kindergarten; G1–2 = combined first and second grades; G3–4 = combined second and third grades; G5–6 = combined fourth and fifth grades.

5 years. Three of the teachers had participated in an earlier study with me. See Table 2 for a summary of the demographic information for the teachers and the *Kumu Alaka`i.*

Procedure

Procedures during our first year included the following steps:

- two 90-minute semistructured focus groups;
- two 6-hour workshops;
- two 4-hour teacher visits to schools and classrooms using approaches the teachers were interested in learning more about;
- three 90-to-120-minute individual classroom observations with coaching and consultation for each HLC teacher;
- twice-monthly in-service professional development meetings;
- the implementation of a pilot inquiry project by one of the HLC teachers.

Procedures during our second year started with the development and implementation of a 45-hour specialized summer course focused on introducing educators to the Montessori Cosmic Curriculum and framework and on building their confidence in their knowledge of traditional Hawaiian science concepts. After the semester commenced, there were five 90-to-120-minute classroom observations combined with individual coaching and consultations for each HLC teacher. There were twice-monthly in-service meetings as we implemented the inquiry projects in all the classrooms. At the end of the project, there was a final 30-minute teacher focus group, a final 30-minute conversation with the students of each classroom, and parent feedback.

Ethics

I obtained informed consent from all participants included in the study. To ensure participants' confidentiality and anonymity, I removed all identifying information from the transcripts, and I referred to participants according to identification codes. Teachers chose their own pseudonyms. This study received approval from the Institutional Review Board for the Rights of Human Subjects at my home institution, and I secured all data as required by the ethical recommendations of the American Psychological Association. No other permissions were required.

Data Analysis

I used the constant comparison method described by Strauss and Corbin (1994) for the qualitative data analysis. This qualitative method of analyzing data is the "data-analytic process whereby each interpretation and finding is compared with existing findings as it emerges from the data analysis" (Lewis-Beck et al., 2004. p. 2). I first coded data as received; these data were coded at the level of individual keywords or open codes using a line-by-line process, and later, as patterns emerged, as themes. The first open codes informed our future in-service sessions and interview questions and led to further readings of the literature to better understand the emerging categories. Through this iterative process, 15 initial categories emerged. Axial coding (Ezzy, 2002) led to five emergent themes and finally, from those five, one grounded theory emerged. This theme best connected and explained the other four themes, their elements, and their relationships with one another. The process concluded with member checks.

Findings

Five themes explained how learning about Dr. Montessori's Cosmic Curriculum supported the HLC educators in achieving an important goal. HLC educators wanted to be able to create a culturally restorative and decolonized science program that privileged and integrated deeply held Hawaiian cultural values while also accounting for the state-mandated science evaluations of their third-grade students' knowledge of Western science (Kelling & Schonleber, 2011). They achieved that goal.

The first two themes answered the question of why the Montessori approach appealed to the HLC educators. They described (a) a holistic and relational world view shared by the two types of educators and (b) an empirical epistemology based on the beliefs that the spiritual and scientific worlds work together as one and that knowledge should be based on observed facts, sensory knowledge, innate patterns of growth and development, and intuition. What we notice or pay attention to depends on our cultural, relational, developmental, and survival needs. (Takaya, 2003; Trudeau, 1984).

The other three themes answered the question of how Dr. Montessori's Cosmic Curriculum supported the HLC educators in creating their culturally restorative and decolonizing science program. The three themes were (a)

the use of a culturally important timeline as an organizing cognitive structure, (b) an emphasis on the natural world, and (c) the use of Dr. Montessori's Great Lessons to anchor the science curriculum.

The Interconnectedness of All Creation: A Grounded Theory

The grounded theory that best explained the other four themes was a similar world view about the interconnected and relational nature of the universe and our role in the cosmos. This theme best explicated the narrative and described a worldview that is shared by many Indigenous educators. It was also a worldview that Dr. Montessori subscribed to. Here, for example, is what she wrote about her *Cosmic Plan.*

> *All [things] are linked and have their place in the universe . . . the stars, earth, stones, life of all kinds form a whole in relation to one another, and so close is this relation that we cannot understand a stone without some understanding of the great sun! No matter what we touch, an atom, or a cell, we cannot explain it without knowledge of the wide universe! What am I? What is the task of [people] in this wonderful universe? Do we live merely for ourselves, is there something more for us to do?* (Montessori, 1948/1991, p. 10)

Like other Indigenous educators, the HLC educators viewed everything in the universe as connected in a system of dynamic and reciprocal relationships (Cajete, 2000), and the idea of an integrated curriculum emphasizing the interconnectedness of everything made sense to them. An educator who had taken part in a previous study about the general connection between what Dr. Montessori wrote and believed and what HLC educators believed said:

> *What got [us], was that concept of the interconnectedness of all creation . . . what [Dr.] Montessori called the Cosmic Plan. It [the Cosmic Plan] has Montessori's name to it, but the concepts are universal . . . . The beliefs and concepts that [Dr.] Montessori wrote down . . . are what Indigenous people [like] our* kūpuna *[grandparents, (Pukui & Elbert, 1986)] believe. This is what we felt was a match.*

During the reflection after the class, another teacher said,

> *I was unconsciously integrating an integrated cultural perspective [all along] when I took the* keiki *[child, children (Pukui & Elbert, 1986)] to a friend's nursery. We learned a chant to asking for water, learned about the water cycle, where the rain comes from, and went through each plant in the* Kumulipo *[origin, genesis, name of the Hawaiian creation poem consisting of 16 sections and over 2000 lines (Pukui & Elbert, 1986)] from there [the Kumulipo] explained why there is a connection between plant and fish, why there are different variations of* kalo *[taro, an edible tuber and considered a staple of Hawaiian traditional foods (Pukui & Elbert, 1986) with different fish names, and so forth. When the keiki learned the chant, they realized that words have power. [I] feel like I gained (and the keiki gained) perspective to make connections*.

These two observations show the remarkable similarity of world view between the two educators, including the notion that everything is related and connected.

The Montessori Approach Is so Tangible and Sensorial: A Shared Epistemology

The second theme is an empirical epistemological perspective shared by both approaches. As described earlier, this perspective is based on the beliefs that both the spiritual and the scientific world work together as one and that knowledge should be based on observed facts, sensory knowledge, innate patterns of growth and development, and intuition. The connection to sensorial learning specifically relates to the element in knowledge involving sense awareness and to the need for patience and keeping observation as a necessary prerequisite for learning. Pestalozzi described this sense awareness as the foundation of all knowledge (Downs, 1975), and a hallmark of any early childhood Montessori classroom is the sensory education area of the prepared environment. Dr. Montessori's focus on sensorial learning never wavered in all the years she worked with children. In one of her last books, she wrote:

> *Our sensorial material provides a kind of guide to observation, for it classifies the impressions that each sense can receive: the colours, notes, noises, forms and sizes, touch-sensations, odors, and tastes. This undoubtedly is also a form of culture, for it leads*

> *us to pay attention both to ourselves and to our surroundings . . . . The senses, being explorers of the world, open the way to knowledge.* (Montessori, 1949/1994, p. 183)

What resonated most for the K–4 math specialist was the fact that Montessori education emphasizes sensorial knowledge based on empirical facts.

> *[The Montessori approach] is so tangible and . . . sensorial. And as Hawaiians . . . that's what we can sit in the room and agree on . . . . Tangible things like, "This is how you do poi [the Hawaiian staff of life, made from cooked taro (Pukui & Elbert, 1986)]." We might have a two-hour discussion on how you show aloha, but "This is poi. This is fish. This is how you clean [fish]." The tangibles. That's what we related to. Learning by reality.*)

I Now Have a Logical Sequence to Follow: A Teaching Strategy Grounded in the Hawaiian Creation Story

The third theme helps us understand how Dr. Montessori's Cosmic Curriculum was useful to the HLC educators in terms of pedagogical practices. The first strategy was the variety of timelines incorporated into the Cosmic Curriculum didactic materials. These timelines help organize students' understanding of the universe and their own place in the universe. For example, a timeline described in "The Long Black Strip" compares the length of time Earth has existed with the length of time humans have existed (Baker, 2011). These timelines are direct and active, so students find it easy and interesting to learn about the different eras with their corresponding plants and animals. Dr. Montessori used Western science as the basis of her timeline, but when the HLC teachers saw this didactic material, they at once made a connection to the *Kumulipo*, a Hawaiian creation chant consisting of 16 sections and more than 2,000 lines (Beckwith, 1951). Anuenue, the kindergarten teacher, said, about having a framework for her teaching,

> *As a result of [learning about using the Kumulipo as a curriculum timeline], I have a guide for my lessons for the entire school year. I never had this much guidance with my curriculum. With my unit plan, I will be more consistent and hopefully create smoother transitions between units as I now have a logical sequence to follow.*

And at the end of the project, Mahina, the grades 3–4 teacher, said what was typical of responses by other educators: "I'm excited . . . because I know this is what I've been lacking all these years teaching. Worried because I want to, and need to, make sure I've planned well enough for my students."

"Learning About Sea Knowledge, For Example": A Focus on the Natural World

This was the second of the three themes focused on pedagogical strategies. Both Dr. Montessori and the HLC educators advocate for teaching with an emphasis on caring for and understanding the natural world. Dr. Montessori was adamant about the necessity of connecting children with nature and of the caretaking role of humanity with regard to Earth (Montessori, 1948/1994). Her writings constantly referred to connecting children with the natural world. In *The Discovery of the Child* (Montessori, 1948/1967), for example, Dr. Montessori wrote a whole chapter on the need for children to be connected with the natural world. In her book, *From Childhood to Adolescence* (Montessori, 1948/1994), she wrote,

> *There is no description, no image in any book that is capable of replacing the sight of real trees, and all the life to be found around them, in a real forest. Something emanates from those trees which speaks to the soul, something no book, no museum is capable of giving.* (p. 19)

This resonated deeply with the HLC educators. A regular part of their curriculum was to take the children to work at the 800-year-old human-designed fishpond or the *loʻi kalo* (taro patch [Pukui & Elbert, 1986]) to garden. One educator said in an interview for an earlier project,

> *The relationship between us as humans and nature, and what [Dr.] Montessori talked about: How there's that relationship [with nature] and how having that garden is important. We try to cultivate that, and build sustainability, especially in the Hawaiian immersion charter schools where [the children and teachers] go to visit the loʻi kalo [taro field (Pukui & Elbert, 1986)] and learn about farming and being able to take care of themselves.*

The embedded nature of humans and the natural world within the Cosmic Curriculum at once captured her interest. Another teacher agreed:

> *The learning environment is not only in the classrooms, but outside too. Emphasizing physical activity and learning about sea knowledge, for example. Fruit bearing knowledge. You go down to the ocean, learn about your life skills down at the ocean, and connect with trying to bring back the Hawaiian literature.*

"From Those Stories and Those Concepts You Can Get Everything" Teaching by Telling Stories

This was the third of three themes that related to shared pedagogical strategies, and it involves the power of storytelling. Dr. Montessori advocated the use of stories for the 6- to-12-year-old child, saying there was a need to teach this age through the use of imagination and the judicious use of stories and tales. She described,

> *To interest the students in the universe, we must not begin by giving them elementary facts about it, to merely make them understand its mechanisms, but start with far loftier notions of a philosophical manner . . . . Here we may usefully call to aid some myths or fairy tales, but they must be such as symbolize truths of nature, not wholly fantastic . . . . Life is one of the creative forces of the world . . . and has the power to acquire and retain impressions.* (Montessori, 1948/1991, pp. 28–29).

Indigenous peoples, including the Native Hawaiians, have always used stories to teach, to inform, and to instruct (Datta, 2017), so the anchoring of Dr. Montessori's Cosmic Curriculum to stories was a natural match. A kindergarten through fourth-grade math specialist described how the teachers used the content of the Kumulipo to integrate their science curriculum. This teacher also had previously worked with the grade 5–6 teacher.

> *From those stories and from those concepts you can get everything. From the science to the politics, everything can come out of that . . . the Kumulipo says it all. For example, when you learn at this* wā *[era, epoch, genesis (Pukui & Elbert, 1986)] or this age of the Kumulipo, talking about certain plants and animals, well, that is where [the] science learning comes in. And when you reach the* kanaka *[human being (Pukui & Elbert, 1986)] stage, that's where the politics side could come in, so we could have tied in a lot more academics. You could even get in math in there.*

One of the other teachers spoke of what she saw as the important practice of teaching students by starting with the stories of their own place and then extending from the stories to more abstract concepts related to the different content areas such as history, science and language arts. She and the others then showed me children's books that one of the high school students created. It was all stories about the area: the plants, the animals, the reasons for the names of particular places. The teacher went on:

> *You know [the] Kumulipo project? The teacher worked with the third graders for research, and she . . . used the Montessori research approach where they had to identify "Where does [the thing being studied] live, what's its name, characteristics, the interesting facts about it, what it eats." You know, some of the basic research questions that Montessori [education] already does with the cards and charts of the animal kingdom. Since we had translated the [cards and charts of the animal kingdom] already, [the children] would do the research, and it wasn't actually that they had to read everything—they just had to look at the main points. And then later on they would put the main points into sentences, in their own grammar. And then the teacher would help with the grammar. So we had science, history, and language arts.*

Using the three pedagogical strategies described above, in combination with a relational and connected worldview and congruent epistemology, provided the HLC educators with the tools to create what they needed: a decolonized science curriculum grounded in Hawaiian epistemology and a relational and interconnected perspective. Using the Cosmic Curriculum as inspiration also supported the HLC educators in this study to successfully incorporate Western science as part of the curriculum without dominating the curriculum. At the conclusion of this project, both teachers and students experienced a surge in confidence in their ability to do science in a culturally restorative and decolonizing manner, while also learning the science content needed so that students could do well on state-mandated exams.

Discussion

This study aimed to explore how and why HLC educators used Dr. Montessori's Cosmic Curriculum in their K–6 HLC classrooms to support their students in learn-

ing how to think like scientists; how to use the culture and knowledge systems of their ancestors in building their understandings of STEM; and how to support their *keiki* in wanting to become scientists. To feel excited about the prospects of becoming scientists, a rich, direct, culturally restorative curriculum and decolonizing pedagogy needs to be employed by teachers who feel confident in their ability to teach from an Indigenous perspective what the Western world calls *the sciences* (Cajete, 2000; Cartier, 2019). These same teachers need to know that mainstream scientists will respect rather than exploit them for their cultural scientific knowledge (Green, 2021; Greenburg, 2020; James, 2001; Morris, 2020).

The results revealed that the HLC teachers related to Dr. Montessori's Cosmic Curriculum because of a congruence in epistemology (Meyer, 2001; Montessori, 1948/1991) and a shared philosophical cosmology in which the universe functions as a relational and interconnected whole. The HLC educators primarily used three teaching strategies of the Cosmic Curriculum as an inspiration for building their own HLC science curriculum. These three strategies were: (a) the use of timelines to understand the natural world, (b) the use of stories and storytelling, and (c) a focus on the natural world. Through the use of these three strategies they were able to use their own cultural experiences and understandings to create a science program that was culturally restorative and included content that the students needed so they could pass state-mandated science tests.

Limitations

This study was bounded by time and circumstance and cannot be generalized. In addition, I had worked with the *Kumu Alaka`i* and three of the teachers in the past; the teachers and the *Kumu Alaka`i* may have felt intimidated or unwilling to share their true feelings. I attempted to mitigate this limitation by triangulating the data with samples of student work and student interviews and conducting a confidential member check at the end of the study.

Conclusion

The HLC educators felt successful using Dr. Montessori's Cosmic Curriculum as a scaffold to create their own culturally based science curriculum. Further research on the efficacy of using the Cosmic Curriculum as a scaffolding device with non-Montessori educators would help answer questions about whether it is possible to use the Cosmic Curriculum with educators who do not share the epistemology and cosmology philosophy of Dr. Montessori. Longitudinal studies of student change in attitudes about careers in the sciences and a sense of stewardship toward Earth would also be useful in discovering whether and how the use of the Cosmic Curriculum outside the Montessori ecosystem would work to increase interest in the sciences by Indigenous students.

Author Information

Nanette (Sheri) Schonleber is an associate professor in the Department of Early Childhood Studies at Sonoma State University. Address correspondence concerning this article to Nanette S. Schonleber, Department of Early Childhood Studies, Sonoma State University, 1801 E. Cotati Rd., Rohnert Park, CA 94928.
Email: schonleb@sonoma.edu

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Designing the Montessori Coaching Tool Elementary Rubric for Early-Career Professional Development

Angela K. Murray, University of Kansas
Carolyn J. Daoust, University of Kansas
Jan Mallett, Southern Methodist University

Sharon Damore, Guest Editor

***Keywords**: Montessori; rubric; teacher coaching; elementary education; teacher preparation; rubric development; reflective practice*

Abstract: Becoming a competent Montessori Elementary guide is a complex process, so we are developing the Montessori Coaching Tool Elementary (MCT-EL) rubric to describe teaching-practice expectations for self-reflection and formative feedback during the critical early period in a teacher's development. The purpose of this article is to share results from a small-scale, online survey collecting both qualitative and quantitative feedback on the rubric from experienced Montessori Elementary teacher educators. The rubric's content was based on Maria Montessori's writings and well-documented Montessori practices, which we translated to specific teacher behaviors and developmental progressions. We wanted to gauge the MCT-EL rubric's usefulness and appropriateness from the perspective of experts who have significant depth of experience mentoring new teachers. The rubric was not developed to be used for performance evaluation, promotion, or retention but rather for early-career Montessori teachers' self-reflection. It provides a framework for coaching conversations between the early-career Montessori teacher and a Montessori mentor. Results from the study identified overall support for use of the MCT-EL rubric with developing teachers, along with specific recommendations for revisions, additions, and deletions. Using a thorough review of the data, we developed a refined MCT-EL rubric, which is provided in Appendix B and is available for use by interested practitioners in the field.

Becoming a competent Montessori Elementary guide requires the development of specific skills and competencies that represent quality practice. What proficiencies make up this skill set, and how might these develop over time? We are developing the Montessori Coaching Tool Elementary (MCT-EL) rubric to describe teaching-practice expectations for self-reflection and formative feedback during the critical early period in an Elementary teacher's development.

The content of the MCT-EL rubric was based on Maria Montessori's writings and well-documented Montessori practices (see Tables 1 and 2).

Acknowledging the diversity of Montessori training experiences and practices in the field, this rubric provides a valuable framework, rooted in a sound research base, for supporting the development of high-quality Montessori Elementary teachers. We envisioned coaching sessions based on the MCT-EL rubric framework over time that would trace a teacher's growth trajectory and encourage reflection on and refinement of their practice. The rubric maps the progression of teacher growth from an initial lack of awareness of Montessori best practices to a beginning level of proficiency to developing, maturing, and integrating their implementation of these skills over time. The MCT-EL rubric was not developed with the intention for use in performance evaluation, promotion, or retention, and no scores are attached to any section of the rubric. Instead, the rubric was designed to be used by early-career Montessori teachers for self-reflection and as a basis for coaching conversations between early-career Montessori teachers and their mentors. The purpose of this article is to discuss the results of a research study investigating the utility of this rubric using feedback from experienced Montessori Elementary teacher educators.

Literature Review

A discussion of the literature provides important context for the development of the rubric and the design of this study. We start with an introduction to teacher coaching and the development and use of rubrics in educational settings in general. Next, we provide an overview of professional-development efforts using rubrics with Montessori educators and make the case for why a Montessori-specific teacher coaching rubric is necessary.

Coaching Outside of Montessori Settings

The MCT-EL rubric is intended to provide preservice and early-career Montessori teachers a structured opportunity for self-reflection, leading to collaborative conversations with instructional coaches to improve their teaching practice. Therefore, it is valuable to first examine the use of similar rubrics outside the field of Montessori education. When carefully constructed, thoughtfully implemented, and piloted, coaching sessions are opportunities for formative assessment. Specifically, supportive protocols that are inquiry based can serve as valuable resources for these sessions. Multiple researchers have found evidence that coaching experiences produce positive impacts in both teacher confidence and demonstrated teaching effectiveness (Bartolome, 2017; Elish-Piper & L'Allier, 2011; Kraft & Blazar, 2017; Vernon-Feagans et al., 2013). A recent meta-analysis examined the empirical literature on teacher coaching to gauge the effect of coaching programs on instructional practices and student achievement (Kraft et al., 2018). Across 60 studies with causal research designs, the authors found that the impact of teacher coaching as a tool for professional development is favorable; however, they also identified that scaling up such programs is a significant challenge (Kraft et al., 2018).

Rubric Use Outside of Montessori Settings

Rubrics are commonly used as a tool to facilitate the coaching process (Gulikers et al., 2021; Tchekmedyian et al., 2017; Zugelder et al., 2019). According to Brookhart (2013), "a rubric is a coherent set of criteria for students' work that includes descriptions of levels of performance quality on the criteria" (p. 4). Rubrics are designed to support unbiased observation through providing a structure that shifts the focus from judging performance to simply describing performance, facilitating constructive feedback. Despite empirical evidence that supports the effectiveness of rubrics in enhancing student learning and performance, rubrics have faced criticism for potentially being harmful when poorly designed or implemented. Panadero and Jonsson's (2020) critical review of rubrics argued that this problem largely stems from narrow conceptualizations of rubrics or anecdotal personal experience rather than rigorous research. Instead, they asserted the evidence points to the value of rubrics when implemented effectively for their intended purpose. They further suggested that scientific, empirical research is necessary to optimize the design and use of rubrics.

Assessing Validity in Rubric Development

Any tool used for either formative or summative assessment, including a rubric, requires validity evidence that it is appropriate for its intended application (American Educational Research Association [AERA] et al., 2014). Authors typically engage in a multistep process to make the case for the validity of rubrics they develop (Allen & Knight, 2009; Timmerman et al., 2010). Timmerman et al. (2010) provided evidence of the appropriateness of a rubric's content to assess college students' scientific reasoning skills using four sources:

(a) rubrics in the literature, (b) alignment with criteria used by professional referees for their reviews, (c) input of pedagogical experts, and (d) recursive feedback rounds from stakeholders who were also content experts. Recursive feedback from experts is frequently used to support validity arguments for situations that are not well defined or well researched (Feldon, 2007; Linstone & Turoff, 1975; Miller et al., 2020).

Montessori Elementary Education

Montessori classrooms across age levels require certified Montessori teachers and include 3-year, mixed-age groupings and long blocks of uninterrupted time for children to choose their work from specially designed materials (Culclasure et al., 2019). Dr. Montessori (1971) conceptualized human development in planes, each corresponding to 6 years of growth. She proposed that children experience these phases or planes with each "having its own particular needs" (Montessori, 1971, p. 1). The focus for the present study is Montessori teachers working with children in the 6-to-12-year-old age group. According to the needs Dr. Montessori identified in what Montessorians call the *second plane of development*, or the Elementary years (ages 6 to 12), Montessori Elementary education has several unique characteristics that include reliance on interactive, small-group lessons within a curriculum that is integrated across subject areas, extensive storytelling, significant freedom and responsibility, and activities designed to optimally challenge each student (Culclasure et al., 2019).

Professional Development, Rubrics, and Coaching for Montessori Educators

Interest in a coaching orientation is growing within the Montessori community. The National Center for Montessori in the Public Sector (NCMPS) reports having "trained and supported more than 500 Montessori Coaches" in their coaches' training program, which provides preparation for working with Montessori educators in the field (NCMPS, 2021, "Support for Coaches" section). Public Montessori in Action is another organization that offers professional development for coaches, with a focus on "providing systems for reflective, child-centered practice that supports the growth and development of adults" (Public Montessori in Action, n.d.).

A variety of rubrics, instruments, and inventories have been developed to support high-quality Montessori implementation. For example, NCMPS has published the *Montessori Assessment Playbook* that outlines a Reflective Practice Inventory to allow teachers to rate themselves on 22 items using a 5-point Likert scale (NCMPS, 2019). The *Playbook* also includes a rubric for assessing the attainment of program-level standards and the Teacher Appraisal Instrument, which is a summative assessment of teaching practice (NCMPS, 2019). NCMPS also developed the Developmental Environmental Rating Scale, which is an iPad-based classroom observation rubric for supporting continual improvement by measuring child and adult behaviors as well as environmental attributes associated with executive function, linguistic and cultural fluency, and social fluency and emotional flexibility (NCMPS, 2019). Further, Canzoneri-Golden and King (2020) developed the Culturally Responsive Practice Anti-Bias Anti-Racism Rubric (CRP-ABAR) for Montessori teachers.

Empirical research on professional development for Montessori educators is limited, but two recent studies have examined its impact. Damore and Rieckhoff (2021) created a coaching protocol designed around the development of leadership competencies for Montessori school leaders. The coaching protocol was implemented as a form of professional development, and research on the protocol demonstrated that school leaders believed guided reflection yielded practice improvement both for themselves as school leaders and for the teachers in their schools. Specifically, they found that modeling and encouraging reflective practice should be a priority among leaders' complex administrative roles. The case study conducted by Saylor et al. (2018) examined a program for cocreated professional-development communities for Montessori teachers. Saylor et al. found that a multidimensional professional-development program addressing mindfulness, reflective practice, and teacher-centered mentorship had the potential to improve teachers' perceptions of the effectiveness of their practices.

Need for a Montessori-Specific Coaching Rubric

The preceding paragraphs illustrate that, although Montessori professional development, rubrics, and coaching initiatives exist, no comprehensive rubric is available for formative assessment that includes specific expectations of Montessori teacher practice that includes descriptions of levels of performance. In addition, because classroom practices and expectations

for Montessori teachers are quite different from those for conventional teachers, examining research outside of Montessori education is instructive but insufficient (Lillard & McHugh, 2019a, 2019b). Coaching as an approach to professional development translates to Montessori environments, but the content of that coaching differs because early-career Montessori teachers require guidance on mastering the unique role of teachers in Montessori classrooms (Damore & Rieckhoff, 2021; Saylor et al., 2018). Edwards et al. (2020) faced a similar task with respect to the development of a rubric for reflective practices in preservice and in-service teachers inspired by the Reggio Emilia approach to documentation. They developed a rubric based on Reggio's pedagogical documentation dimensions as an approach to engage preservice and in-service teachers, who tended to be more accustomed to following standardized curricula, in reflective practices that were not adequately addressed within the conventional educational literature.

The MCT-EL rubric was developed to fill the gap that exists between the literature on teacher coaching and rubric use in conventional settings and the currently available resources for supporting preservice and early-career Montessori teachers. The MCT-EL rubric includes a coherent set of criteria needed for Montessori Elementary teachers to be successful in the classroom, along with specific descriptions of levels of performance quality for each of the criteria. The purpose of this study is to gauge the usefulness and appropriateness of the MCT-EL rubric by obtaining input from a diverse group of experienced Montessori teacher educators. Therefore, three research questions guided the present study:

1. Do Montessori Elementary teacher experts view a coaching or mentoring rubric as valuable?
2. What are the strengths and weaknesses of the rubric that was developed?
3. What improvements to specific elements are necessary to optimize the value of the rubric?

Methods

To address our research questions, we designed a mixed-methods research study to obtain input from expert Montessori Elementary teacher educators through an anonymous online survey. As is often the case in mixed-methods research, we employed pragmatism as our philosophical foundation because our focus was on the consequences of our research in a real-world application (Creswell & Plano Clark, 2018). Our survey collected both qualitative and quantitative data using a "questionnaire variant" form of a convergent mixed-methods research design (Creswell & Plano Clark, 2018, p. 73). In this design, qualitative data are considered an add-on to the survey instrument, which enriches the quantitative-survey findings. This use of qualitative data to supplement quantitative-survey findings contrasts with the approach of a fully qualitative survey as defined by Braun et al. (2020), which relies primarily on the survey as a rich source of contextualized qualitative data.

Our approach to gathering feedback from experts in the field as an initial validation process parallels the procedures followed by Alsina et al. (2017), Van Ginkel et al. (2017), and Furze et al. (2015). Although we did not follow a strict Delphi technique (i.e., multiple interactive rounds of feedback until consensus is reached), we did incorporate an iterative process of gathering input on the MCT-EL rubric (Linstone & Turoff, 1975). Details of the development of the MCT-EL rubric are discussed in the next section, followed by a description of the research methods employed.

MCT-EL Rubric Development

An author of the present study initially developed the MCT-EL rubric to facilitate the self-evaluation of practicum students using Montessori and expert writings, research on Montessori implementation, and author experience that included 20 years supervising Montessori preservice teachers and 7 years teaching Upper Elementary. Daoust, one of the authors of this article, conducted a 1-year pilot in an American Montessori Society (AMS, n.d.) teacher education program (TEP) involved student teachers and their supervising teachers to jointly assess progress at the midpoint and end of the student teaching year. Consultants from the TEP used a similar form to evaluate student teachers after a 2-hour observation. Student feedback on the pilot suggested that the form had promise as an effective rubric.

The success of the TEP observation-tool pilot led us to embark on the present study. We reexamined texts with which we were already familiar so we could critically evaluate the content of the observation tool to ascertain its comprehensiveness in terms of key practices that comprise effective Montessori teaching at the Elementary level. Tables 1 and 2 list the specific Montessori and expert writings and other key resources we consulted for

Table 1

Resources Consulted for Rubric Development (Organizational Criteria and Maria Montessori's Writings)

Source	Author or publisher	Year
Organizational criteria		
AMS accreditation standards	AMS	2018
AMI/USA Montessori school standards	AMI/USA	2009
AMI Elementary classes: Detailed description	AMI Canada	n.d.
Montessori National Curriculum	Montessori Australia Foundation Limited	2012
Montessori assessment playbook	NCMPS	2019
The authentic American Montessori school: A guide to the self-study, evaluation, and accreditation of American schools committed to Montessori education	Rambusch & Stoops (AMS & the Commission on Elementary Schools of the Middle States Association)	1992
Maria Montessori's writings		
Education for a new world	M. Montessori	1963
Spontaneous Montessori activity in education: The advanced Montessori method	M. Montessori	1965
The child in the family	M. Montessori	1970
Education and peace	M. Montessori	1949/1972
To educate the human potential	M. Montessori	1973
From childhood to adolescence	M. Montessori	1976
The discovery of the child	M. Montessori	1948/1988
The absorbent mind	M. Montessori	1949/1989
The child, society, and the world: Unpublished speeches and writings	M. Montessori	2008
The Montessori Method	M. Montessori	1912/1964
Basic ideas of Montessori's educational theory: Extracts from Maria Montessori's writings and teachings	M. Montessori	1997a
The California lectures of Maria Montessori	M. Montessori	1997b
Education for human development	M. M. Montessori, Jr.	1976

Note. AMS = American Montessori Society; AMI = American Montessori Internationale; NCMPS = National Center for Montessori in the Public Sector.

Table 2

Resources Consulted for Rubric Development (Leading Authors, Articles and Other Publications)

Source	Author or publisher	Year
Leading Montessori authors		
Annette Haines: Spokesperson for Montessori values, scholarship, and research	AMI/NAMTA	2017–2018
Cosmic education: A collection of talks	Baker et al.	2008
The Montessori controversy	Chattin-McNichols	1992
An observer's notebook: Learning from children with the observation C.O.R.E.	Epstein	2012
What is Montessori Elementary?	Kahn	1995
Montessori: The science behind the genius	A. Lillard	2017
Montessori today	P. Lillard	1996
Elementary classroom management: How to implement cosmic education	Pottish-Lewis	2011
Maria Montessori: Her life and work	Standing	1957/1984
Articles and publications		
Designing a logic model to inform Montessori research	Culclasure et al.	2019
Montessori magnets and charters: Similarities and differences in implementation. [Poster]	Daoust & Suzuki	2013
Public Montessori Elementary: Three models of implementation. [Poster]	Daoust & Suzuki	2014
Authentic Montessori: The Dottoressa's view at the end of her life (Parts 1 & 2)	Lillard & McHugh	2019
Developing instruments to measure Montessori instructional practices	Murray et al.	2019
The role of the disciplines for cosmic education	Grazzini	2010
What we've learned, and what we're learning	Huneke Stone	2019
Becoming a scientific observer	MacDonald	2016
Montessori voices: Guided by nature	NAMTA	2013
What is Montessori? A basic guide to the principles, practices, and benefits of a Montessori education	Pendersen & Pendersen	2008
Montessori in action: Building resilient Montessori schools	Slade	2021
Making some changes in teacher training	Wyld	2019

Note. AMI = American Montessori Internationale; NAMTA = North American Montessori Teachers' Association.

creating and revising the rubric. The in-depth analysis of the resources resulted in iterative drafts of key items to be included in the MCT-EL rubric. In addition, this analysis resulted in a cycle of drafting and revising the descriptions of the various levels of performance on each of the items.

In the next phase of development, we collected informal feedback on a preliminary version of the MCT-EL rubric from participants at gatherings of teacher educators affiliated with the Montessori Accreditation Council for Teacher Education (MACTE) and AMS. Multiple rounds of revisions to the rubric emerged from these informal feedback sessions, resulting in the version of the MCT-EL rubric presented to participants in this study.

Participants

Our goal was to gather input from experienced Montessori Elementary teacher trainers because they had the extensive knowledge of Montessori practices necessary to provide in-depth feedback on the coaching rubric. The first step in identifying participants was to visit the websites for Association Montessori Internationale (AMI), AMS, and MACTE Elementary TEPs in the United States to examine the qualifications of the Elementary program directors and key Elementary instructors. Required criteria for inclusion in the study included at least five years of Montessori classroom teaching and administrative experience, a history of professional speaking engagements related to Montessori pedagogy, and service in leadership roles within a regional, national, or international Montessori organization. To ensure a wide range of experiences, we also considered potential participants' record of publishing academic articles or professional books, advanced degrees, professional recognition, and experience in public schools. We collected a list of 32 Elementary trainers with appropriate credentials and substantial experience. Next, we collected email addresses from publicly available websites and professional connections to contact these experts, to introduce

Table 3
Profile of Study Participants

Multiple responses allowed for credentials and training	*N*	%
Credentials held (multiple allowed)		
Early Childhood	12	75
Elementary	16	100
Adolescent	2	13
Administrator	4	25
Elementary training received from		
American Montessori Internationale	4	25
American Montessori Society	9	56
International Montessori Council	1	6
Montessori Educational Programs International	1	6
Pan American Montessori Society	1	6
Independent	1	6
Currently training for (multiple allowed)		
American Montessori Internationale	4	25
American Montessori Society	10	63
International Montessori Council	1	6
Montessori Educational Programs International	1	6
Independent	1	6
Years of classroom teaching		
> 25	3	19
21–25	2	13
16–20	2	13
11–15	6	38
6–10	3	19
Years as trainer		
> 25	9	56
21–25	4	25
16–20	1	6
11–15	1	6
6–10	1	6

the study, and to invite participation. Participants acknowledged an information statement before completing the survey, and our procedures were approved by the institutional review board (IRB) at the University of Kansas.

A total of 18 participants responded to the online survey, an excellent response rate of 56% relative to the range of 20% to 30% reported as typical by Qualtrics (n.d.), which hosted the survey. Table 3 profiles the 16 participants who provided background information in the survey. Although two individuals chose not to provide background information, the reported results indicated that participants held the required credentials and had extensive professional experience. All participants had Montessori Elementary training, with half receiving training from AMS and the next-largest group receiving training from AMI. The majority of participants reported they were serving as Montessori training providers for AMS at the time of the survey. Considering the size of AMS in the United States relative to AMI, this is not a surprising distribution. All participants had spent at least six years as Montessori classroom teachers, and half had been serving as trainers for more than 25 years. We did not ask for gender, race, or ethnicity in the survey because the vast majority of experienced teacher educators are White females, leaving little doubt that our sample reflected that demographic.

Instrument

The 32 identified participants received an email approved in our IRB protocol, which included a link to an anonymous online survey on the Qualtrics platform. The survey began with an information statement as stipulated by the IRB, required about 30 minutes to complete, and included no honorarium or incentive. Participants could withdraw at any time by choosing not to participate in the online study. Because the survey link was anonymous, no unique identifying information or personal data were collected.

The MCT-EL rubric itself is lengthy and detailed, so the survey was programmed so that each participant provided feedback on only a portion of the components. The rubric itself was broken down into three blocks, and the survey software randomly assigned one of these blocks to each participant. Before being shown the randomly selected component of the rubric, participants were presented with an overview image to give them a general understanding of the complete rubric. The stimuli presented to participants are provided in Appendix A. As a consequence of the random rotation of the stimuli, the number of reviewers for each block was not equal and varied from four to seven.

After each of the four images in the assigned block was presented to a participant, the participant was asked to rate three statements on a 7-point Likert scale, with responses that included *strongly disagree*, *somewhat disagree*, *slightly disagree*, *neither agree nor disagree*, *slightly agree*, *somewhat agree*, and *strongly agree*. The three statements were (a) "Consistent with Montessori pedagogy," (b) "Terminology is clear," and (c) "Reasonable progression of expectations for each practice." After the ratings, participants were prompted with an opportunity to provide open-ended comments: "Please explain your ratings above to help us improve the component of the rubric."

After participants completed the series of questions for each of the four elements they were randomly assigned to review, an image of the overall coaching rubric was provided, along with an opportunity for them to provide feedback on the entire framework. They were asked to use the same Likert scale to rate the degree to which the rubric covered the most important practices and the extent to which it would be useful for developing teachers. Four final, open-ended questions concluded the evaluation of the rubric, related to (a) an explanation of ratings, (b) the biggest strength of the rubric, (c) anything missing from the rubric, and (d) any final suggestions for improvement. Finally, the survey collected information about participants' professional background.

Analysis Procedures

Given the small sample size for this study, quantitative analysis was conducted in Microsoft Excel. The Likert items were analyzed descriptively in terms of the frequency of rating values assigned, which allowed us to gauge the relative strength and weakness of each subsection. This approach was recommended by Sullivan and Artino (2013) as the best way to analyze and interpret Likert-scale data.

Microsoft Excel was also employed in the analysis of the qualitative data, which allowed for the sorting of comments by topic and emerging themes. The qualitative data were examined using the process of thematic analysis as outlined by Braun and Clarke (2012). Specifically, we followed the process they described as "systematically identifying, organizing, and offering insight into patterns

of meaning (themes) across a data set" (p. 57). They further clarified that the valuable patterns of meaning are those that are important relative to the specific research question at hand.

We chose to follow the integration approach for a convergent mixed-methods design described by Creswell and Plano Clark (2018), involving organization of the results by major topic. These topics were related to the study's research questions and allowed quantitative analysis for each topic to be followed by an analysis of qualitative responses for themes and opportunities to improve individual items.

Results

Presentation of results is organized around our three research questions and includes both quantitative and qualitative findings.

Research Question 1: Is the rubric valuable?

When asked to rate their agreement level regarding the rubric being useful for developing teachers, 75% of experts indicated they strongly agreed it would be valuable, 19% responded that they somewhat agreed, and 6% indicated they somewhat disagreed. Many experts were positive in their open-ended comments about the overall value of the rubric:

- "This is an outstanding rubric that will be useful to all Elementary Montessori programs! It provides concrete components of practice for coaching teachers."
- "Overall, I think this is an excellent rubric."
- "This is a tremendous undertaking that is very well done. The suggestions I have made today should in no way be taken to be a criticism of the work done to date! I offer them in the spirit of wanting to address the most common problems I see with new teachers in my work with the TEP. Please accept my thanks and admiration for this work!"

One participant felt the rubric had merit but needed more work: "I think that the overall components have validity, but the rubrics are not ready for implementation yet." Another participant summed up the challenge of creating a valuable rubric: "The truest success of the Elementary Montessori guide is when the children trust them and collaborate with them. How do we measure that?"

Reliability is an important consideration when evaluating the usefulness of a rubric. While we did not have pilot data to calculate interrater reliability of the rubric in use, we were able to ascertain a measure of reliability for participants' ratings of the rubric items. Consistency within these ratings gives us confidence that the reactions to the items reflected common understanding and criteria for assessing their usefulness. We calculated James et al.'s (1984) interrater agreement (IRA) r_{wg} for single items, indicating the proportion of variance caused by agreement according to the formula in Equation 1:

$$r_{wg} = 1 - (S^2_x/\sigma^2_{eu}), \quad (1)$$

where we used the common practice of employing the uniform distribution to obtain σ^2_{eu}, where A is the number of discrete Likert response alternatives. In this case, it was seven for a σ^2_{eu} value of 4, representing the variance of completely random responses (Mood et al., 1974), as shown in Equation 2:

$$\sigma^2_{eu} = (A^2 - 1)/12 \quad (2)$$

Across the 70 items, the range of r_{wg} was .52 to 1.00, with an average of .84. In interpreting IRA, values of 1 represent complete agreement and values of 0 indicate completely random responses, so values closer to 1 reflect more substantial agreement. A common rule of thumb for interpreting r_{wg} is based on a practical standard of a cutoff of .70 (O'Neill, 2017). With an average r_{wg} of .84 and only seven of the 70 items evaluated in this small sample falling below this threshold, our results suggest reasonable agreement in ratings among our experts.

Research Question 2: What are the rubric's strengths and weaknesses?

Strengths

When asked what they believed was the biggest strength of this coaching rubric, participants commented on the structure, content, and potential impact of the rubric. Many of them viewed the structure of the rubric as a strength, indicating they appreciated the rubric's organization, simplicity, breadth, and developmental nature. In terms of structure, one commented on the organization: "The specificity of the criteria, as well as the structure of the rubric, where one could see what improvement would look like, is a real strength." Another comment identified a strength: "The thoughtful, professional, well-informed development of this rubric is a strength, and its ease of use and simplicity / objectivity

of its language." Several comments addressed the breadth of the rubric, believing it was "comprehensive" and provided "specifics." Two comments highlighted feelings about the coverage of the rubric:

- "The rubric has clear and concise language and is progressive in the ratings. I feel you have covered the majority of areas that need to be considered in a coaching rubric."
- "The breadth of areas viewed gives ample opportunities for improvement but also for the teacher to see what [they are] doing well."

Other comments demonstrated that the developmental aspects of the structure were also appealing.

- "I like that it can be used to document change over time."
- "Clearly identifies components of the teacher's role and shows progressive steps for improvement with the rubric. It's a rubric for reflection."
- "I think a strength is that mentors can understand the student teaching is a developmental process, and expectations and guidance should recognize that. We need to look at Developing [one of the performance levels described in the rubric presented to participants] for goals in the initial weeks of a placement."
- "The specificity of the criteria, as well as the structure of the rubric, where one could see what improvement would look like, is a real strength."
- "Clarity of expectations and how to grow to next level."
- "The rubric has clear and concise language and is progressive in the ratings."

Participants also valued that the rubric was grounded in Montessori pedagogy and philosophy and was therefore appropriate for use in a Montessori Elementary classroom. Many comments reflected this perspective.

- "It covers the basics of what it means to implement Montessori philosophy and best practices for a novice teacher."
- "I think a strength is having a rubric founded on Montessori pedagogy and philosophy."
- "Components are logical, and this is a very good rubric of reference."
- "The overall components included are valid points and touch important aspects of working with children in a Montessori setting."
- "It is thorough, comprehensive, and grounded in Montessori philosophy. It values what we [Montessori professionals] value."

Finally, the reviewers recognized a key strength in the potential impact of the rubric on early-career teachers:

- "The sections are well divided. The rubric has sub-categories to support growth and development gradually."
- "[It helps] young and experienced teachers take stock and become more conscious."
- "It provides a (somewhat) objective rubric for measuring one's practice. I think that it could provide both the coach and the new teacher a fair experience."

Weaknesses

Although participants identified many strengths of the rubric, we were particularly interested in where they saw weaknesses. We will discuss specific items that participants identified that were missing from the rubric in the next section, but here we outline larger issues that they viewed as lacking. Several participants needed more information about how, specifically, to use the rubric:

- "I don't see information on how the coach and the 'coachee' would be matched for their work. Is it purely a job performance experience, or more of a mentoring / relationship experience? In either case, the match-up and the reason for providing coaching would be critical. I realize that is all outside of this rubric, however."
- "[Need an] explanation of how it should be used, how often, who should be using it, a section for 'goals' to be established based on the rating given, and strategies for reaching the goals."

Questions and suggestions also emerged about next steps in the rubric's development and implementation:

- "I am assuming that there is a 'minimum' that is suggested for field consultants. Will this be a digital rubric that allows [field consultants] to make additional notes to verify their rating?"
- "I hope you are piloting the rubric in a wide range

of classrooms to include public, private, [classrooms that are] inclusive of special education students, and classrooms that are diverse."
- "When [the rubric] is implemented, there might be a suggestion for observers to assess only some areas on a particular visit and other areas on another visit.
- "I also think it might be really interesting to have the person being coached complete the matrix (self-assessment) so that the debrief can focus on those areas where the mentor and the mentee see things quite differently or on areas where both agree there is room for growth. This could be quite powerful!"
- "How do you expect a teacher to reach the expected goals toward perfection?"

Research Question 3: What improvements are necessary for specific elements of the rubric?

Participants evaluated components of the rubric in blocks, as described previously. For each block, they rated consistency with Montessori pedagogy, clarity of terminology, and reasonableness of the expectation progression. They also provided open-ended comments to elaborate on their ratings. The feedback on specific elements of the rubric is broken down between quantitative results and qualitative results.

Ratings

We summarized participants' ratings for various elements of the rubric in Figure 1. In terms of consistency with Montessori pedagogy, participants provided the highest proportion of ratings of 7 on the 7-point scale for the items related to Delivery (86%) and Organization (71%) of presentations, Observation (75%), Redirection (71%), and teacher Demeanor (75%). The element about teacher Conduct received the fewest ratings of 7 on the 7-point scale for consistency with Montessori pedagogy (25%). Terminology elements that received the highest number of ratings of 7 on the 7-point scale were Organization (86%) and Delivery (86%) of lessons with teacher Conduct close behind (75%). Terminology for Choice and Independence received no ratings of 7 on the 7-point scale. The progression elements related to lesson Delivery (71%) received the most 7 ratings on the 7-point scale. No other progression elements came close, and Choice and Independence both received no ratings of 7 on the 7-point scale.

Qualitative Results

Likert ratings, particularly for the Demeanor and Conduct elements, indicated that improvements were needed in progressions, along with clearer terminology. Examining participants' suggestions for refining the existing items provided insights into necessary refinements. The paragraphs that follow explore comments organized into the areas of consistency with Montessori pedagogy, clarity of terminology, and appropriateness of progressions. This section concludes with a discussion of recommended additional items for the rubric.

Consistency With Montessori Pedagogy. Although ratings for consistency with Montessori pedagogy were fairly positive, some participants made comments related to their professional experience and perspectives on Montessori philosophy.

- "New teachers sometimes think that the best lesson is the one that is rolled out verbatim from the album . . . . Rather than memorize lessons and deliver them AT the children like a prerecorded message, we encourage them to tell THEIR story based on the version of the story in the album . . . ."
- "I placed less emphasis on analyzed movements and limited language than did my Primary trainer colleagues . . . . The Elementary Montessori teacher has to appeal to the older child's imagination. Our stories do still need to be limited—we sow the seeds, we present the keys, we're not just entertaining them—but they must not be dry or too brief."

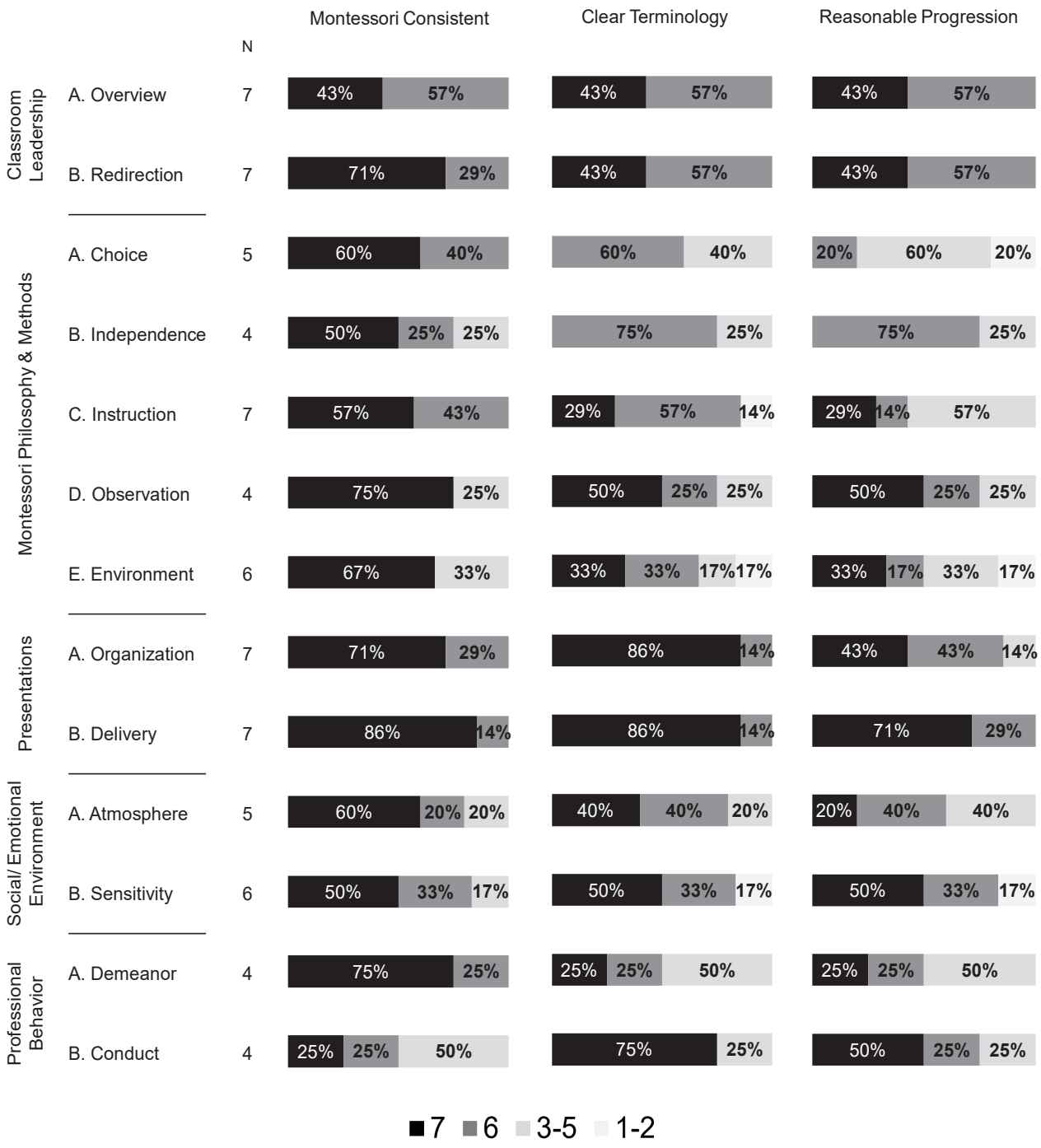
One participant identified a specific point of disagreement:

- "Overall, it works with one striking point of disagreement—Classroom Leadership issue. Teaching with your back to the wall is one extreme, the other being giving your whole self to the child to encourage currents of mental energy with full focus on the child and his lesson. The assistant can keep things calm. Scanning all the time is not modeling concentration."

Clarity of Terminology. A significant amount of feedback revolved around clarifying terminology:

Figure 1

Relative Ratings for Each Rubric Component



Note. The range of the 7-Point Likert scale was *strongly disagree* (1), *somewhat disagree* (2), *slightly disagree* (3), *neither agree nor disagree* (4), *slightly agree* (5), *somewhat agree* (6), and *strongly agree* (7).

- "Under Classroom Leadership—is there another word that you can use for 'Redirection'? Redirection has a negative connotation. What about using 'Guidance'?"
- "I do not use the terms 'on-task' or 'off-task' in my Montessori work. The work of the children is self-construction. How can they be 'off-task' then? The lessons, activities, materials, experiences are all invitations to inspire and structure and guide that self-construction. But in my experience, what gets deemed 'off-task' is often a child manifesting some other aspect of the self-constructive work."
- "The only thing I 'bumped on' here was the word 'reinforced,' which sounds a bit harsh—I prefer 'upheld' or 'supported' (Integrating / item 1)."
- "'Permits,' 'Allows,' and similar language make the adult the keeper of knowledge; in Montessori, we know the children learn through their own actions."

Appropriateness of Progressions. The largest number of comments related to specific concerns with the rubric's progressions. Many participants identified particular items where progressions did not seem to be continual scales:

- "I think that the scales do not show accurate 'progressions' of skill in implementation . . . . They don't reflect a true progression."
- "Like all rubrics, there are a few places where it would be tricky to use simply because the 5 descriptions within a given element are neither mutually exclusive nor cumulative."
- "These rubrics don't always base their progression on the same points of observation, introducing a variety of goals that are sometimes like comparing apples and oranges."
- "The progression from Developing to Maturing to Integrating does not seem consistent—there appear to be different criteria introduced at each of those levels rather than deepening or expanding the criteria from the previous levels."
- "I feel that some of the explanations for categories above are arbitrarily assigned a space in the linear scale."

Other concerns related to the number of points that the items used:

- "I am feeling that maybe you are trying to get too many categories on the rating scale."
- "A rubric with so many components can be very useful with less of a progression (three instead of five) since you are covering so many areas."

Finally, some participants noted that the language in the progressions had a negative tone as mentioned in these quotes:

- "The first level, 'unaware,' seems very negative."
- "Rework all of the rubrics to be less negative (for the first column)."
- "Consider language that puts children at the center rather than the adult: 'helps children maintain journals; children understand reasons why this is important.'"
- "Phrase positives, e.g., able to be objective rather than inferring in observation: The girl cries rather than the girl is sad."

Suggestions for Additions. Although 94% of participants agreed either strongly (50%) or somewhat (44%) that the MCT-EL rubric covers the most important practices, they also provided valuable suggestions for additions for the rubric. Qualitative feedback mentioned the importance of addressing practices related to diversity, equity, and inclusion in the rubric.

- "One of the biggest challenges for new and experienced Montessori teachers is differentiating instruction for students with learning differences and disabilities and collaborating with special education faculty. Inclusivity is a major focus in education today."
- "I'd suggest inclusion of something referencing the teacher's sensitivity to their school's culture and community—and responsiveness to equity, diversity, and inclusion goals."

Given today's challenges with the COVID-19 pandemic, one participant pointed out the importance of self-care for teachers: "I wonder if there should be an element under Professionalism to address self-care. Montessorians are really bad at self-care in a normal year; the pandemic . . . has exacerbated this issue." Finally, another participant suggested including the relationship with a classroom

assistant through "directing/guiding" as an important leadership skill to be developed. Other suggestions for potential topics to be added to the rubric included curriculum planning, technology, reflective practice, assisting children, assessment, and sections for each subject area.

Discussion

Overall, the results from these experts suggest that the MCT-EL rubric is comprehensive and valuable. They especially appreciated its objectivity and the design that clearly articulates professional progression. Participants rated the rubric as highly consistent with Montessori pedagogy, but opportunities for improvement exist in the clarity of the terminology and some aspects of the progressions in performance-quality level. Specifically, participants rated consistency with Montessori pedagogy more favorably than clarity of terminology and reasonableness of the progressions. Participants were similarly positive about the rubric covering the most important Elementary practices but suggested additions did emerge from the qualitative analysis, particularly in the area of diversity, equity, and inclusion. Qualitative data also supported the quantitative results that found opportunities for improvement in terminology and the progression descriptions of performance-quality level. In fact, the largest number of comments related to the progressions across levels of performance quality; many were related to the possibility that some language was negative in tone or some of the scales did not seem to truly be a continuum. Qualitative results related to terminology largely revolved around concerns with specific words (e.g., "redirect," "off-task," "reinforced," and "permits") that seemed inconsistent with Montessori philosophy.

When we examined the results across dimensions, the most positive ratings were evident in the four elements comprising the Classroom Leadership and Presentations components of the rubric (i.e., Overview, Redirection, Organization, and Delivery). Almost all respondents reviewing these dimensions indicated they either strongly or somewhat agreed that the criteria and indicators provided were consistent with Montessori pedagogy, they used clear terminology, and they listed a reasonable progression. No disagreement or neutrality was expressed for these dimensions. These elements also generated few comments in the qualitative data. The ratings for Instruction, Observation, and Environment in the Montessori Philosophy and Methods dimension fell in the middle of all elements—with more ratings of slightly agree, disagree, or neither agree nor disagree—although no ratings reflected a level of strong or moderate degree of disagreement. These results were similar to those for Atmosphere and Conduct, although Conduct had the lowest ratings for being aligned with Montessori pedagogy. The elements with the least positive ratings were Choice, Demeanor, Independence, and Sensitivity.

Limitations

While this study generated a great deal of valuable insight into refining the MCT-EL rubric, a number of limitations existed. First, the study included a small sample size, and the number of ratings for each component of the rubric was even smaller, to make the task manageable for participants. We also acknowledge that the sample had very little diversity, which is unfortunately consistent with the population of Montessori teacher trainers. Finally, as this study focused on the content of the rubric components with a very small sample, we did not address reliability issues. To remedy these problems, we intend to conduct future research to examine the MCT-EL rubric through a diversity, equity, and inclusion lens and to pilot the revised rubric with a larger sample of preservice and early-career teachers to allow more-sophisticated quantitative analysis.

Future Directions: Revisions for the MCT-EL Rubric

The results of this study led to revisions of the MCT-EL rubric to enhance its usability in the field. This section outlines how we incorporated the results from this study into a revised version of the rubric. We first organized the data by strength and frequency to better understand consistent themes and the areas in most need of revision. Modifications were made, one element at a time, by systematically addressing each practice individually. After carefully reviewing the extensive feedback from the expert Montessori teacher educators, we revised the rubric. Continuing our iterative process, we asked a small group of experienced Montessori teacher educators to informally review the changes we made, which resulted in additional revisions we incorporated into a new version of the MCT-EL rubric, provided in Appendix B. A number of areas were revised according to specific suggestions for how items could be changed, while others required refinement according to general feedback. Examples

of how these changes were reflected in revisions to the elements and dimensions, specific practices, and indicators are discussed in the paragraphs that follow.

To ensure that no section was overwhelmingly large and unwieldy and to enhance the intuitive logic of the framework, the first modification was a reorganization of the elements. We divided the Montessori Philosophy and Methods dimension into two subsections: Montessori Philosophy (with the Choice, Independence, and Observation elements), and Montessori Methods (with the Instruction and Environment elements). In addition, three element titles were changed. Under Classroom Leadership, we changed Overview to Awareness and Redirection to Guidance. Within Professional Behavior, we changed Conduct to Development and redistributed practices to align better with the change in the title. Additional changes were made in both the practices themselves and the indicators of progression levels.

Practices

The number of practices was expanded from 70 to 81 to incorporate areas that were deemed lacking; additions included:

- Collaborates with the classroom assistant (for lead teachers).
- Integrates technology.
- Provides educational differentiation.
- Supports quiet and active pursuits.
- Fosters home and school partnerships.
- Addresses implicit bias.
- Supports social justice goals.
- Practices self-care.
- Connects with each child.

Additional changes were made for clarity and consistency with Montessori theory:

- Wording added or changed (e.g., "Lessons are well-prepared" became "Prepares lessons in advance").
- Structure altered so each statement begins with a verb (providing consistency across practices); for example, "Materials appropriately placed" becomes "Places materials appropriately."

One item, Implements Routines, was removed because all the indicators for this practice should be exhibited by a beginning teacher.

Indicators

Many of the indicators in the individual progressions were edited for clarity, accuracy, and completeness, as suggested by participants. The most significant changes were made in the progression of indicators from Beginning to Maturing. Our goal was to ensure the Beginning column listed all basic indicators, the Developing column represented somewhat more-complex skills, and the Maturing column included practices that were even more advanced. In addition, indicators originally listed in the Integrating column were combined with the practices they described, and all indicators in the Unaware column were reworded in positive terms.

Although the feedback from participants was extensive, we recognize that the relatively small number of participants is a limitation for any statistical analysis. However, the rich qualitative data provided sufficient insight for development of major improvements to the rubric. Out of respect for participants' time, we asked each person to provide detailed feedback on only about one-third of the complete rubric. We believe this was necessary to ensure that the task was manageable and that participants did not abandon the online survey before completion; however, this segmented presentation of the complete rubric limited participants' ability to envision how the fully implemented rubric might function in practice. We hope to address these limitations by continuing to collect feedback as early-career teachers and their mentors use the rubric in real classrooms in the field.

Conclusion and Future Directions

Extensive background research provided the foundation for the development of the MCT-EL rubric that was presented to Montessori teacher-education experts. These participants provided thorough, thoughtful, and detailed feedback on the value of the rubric and specific opportunities for refinement. We meticulously incorporated this valuable input into a revised version of the rubric, which is provided in Appendix B. A downloadable version of the MCT-EL rubric is available in the Supplementary Materials for this article. In conducting this research study, we learned a great deal, not only about the goals we set out to achieve, but also about how to design a process for rigorously examining the validity of this type of coaching rubric. Our approach and the acknowledgments of its limitations can serve as lessons for

future researchers as interest in designing instruments and rubrics grows in the field of Montessori education.

The revised MCT-EL rubric has the potential to contribute to the field of Montessori education by enhancing the development of early-career educators as they grow in their proficiency with Montessori pedagogy. The rubric provides a solid foundation for additional coaching and mentoring tools to facilitate the development of highly qualified teachers. Our hope is that teacher educators and school administrators will find opportunities to explore this rubric with early-career teachers as they refine their craft. If readers apply the rubric in their work, we encourage them to contact us to describe their experiences.

Author Information

Angela K. Murray is an assistant research professor at the University of Kansas, director of the KU Center for Montessori Research in the Achievement and Assessment Institute, and editor of the *Journal of Montessori Research.*
http://orcid.org/0000-0001-6310-8842

Carolyn J. Daoust is a research associate at the KU Center for Montessori Research in the Achievement and Assessment Institute. She can be reached at cjdaoust@ku.edu.
https://orcid.org/0000-0002-4853-4496

Jan Mallett is a research assistant professor at Southern Methodist University.
https://orcid.org/0000-0002-7755-1252

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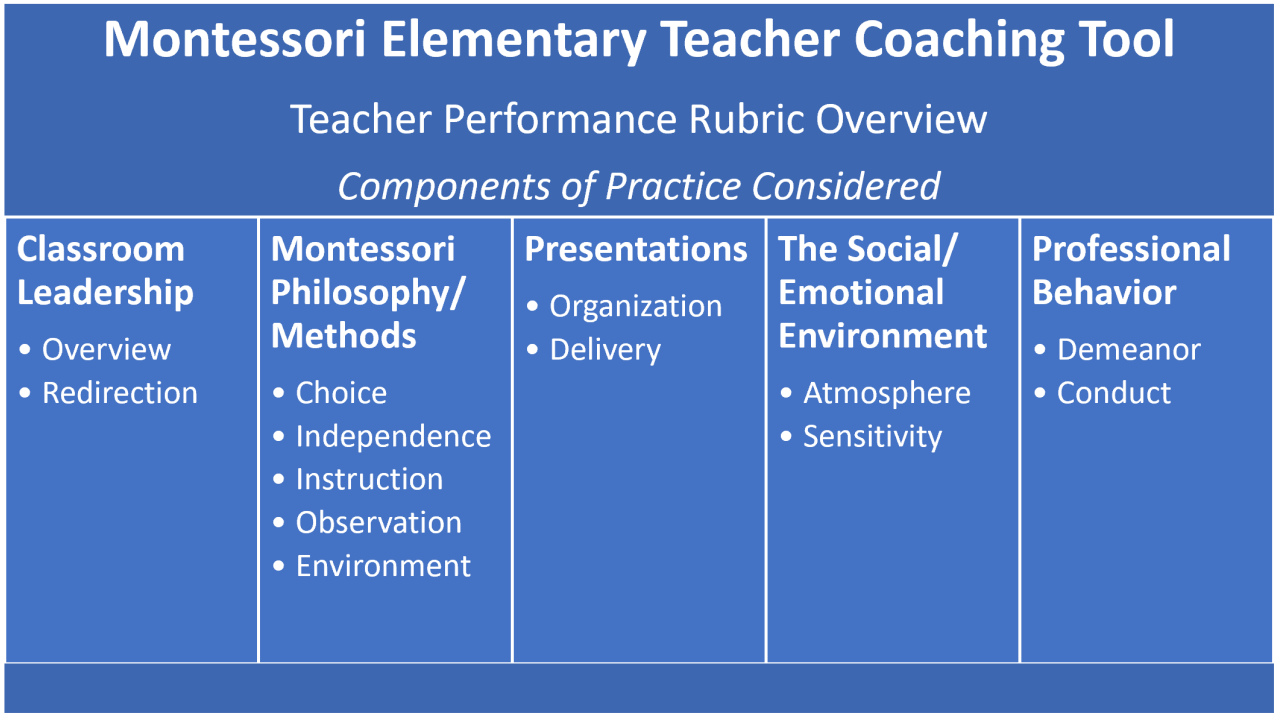
Appendix A: Survey Stimuli

First, participants were presented with an overview image to provide a general understanding of the complete rubric. For the questions participants responded to, the survey software randomly chose which of the three alternative blocks was presented to any given participant. Each of the blocks contained four individual images. This appendix includes the overview image as well as the three possible blocks presented. Instructions from the survey read:

> *The Montessori Coaching Tool Elementary (MCT-EL) rubric is a detailed rubric that contains specific items representing five components of Montessori Elementary practice. Out of respect for your time, we will not be asking you to provide feedback on the entire rubric. Instead, we are asking different people to review different sections assigned randomly. To provide context, this image illustrates all five components covered in the rubric. On the next series of screens you will be asked to respond to questions related to specific items within a subset of the five components.*

Overview Presented to All Participants



Alternative Block 1 (four images)

I. Classroom Leadership					
A. Overview	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Positions with back to a wall	Does not position with his/ her back to a wall.	Usually avoids facing a wall or shelf during lessons.	Back is toward a wall while observing and during most lessons.	Consistently positions with back to a wall, near room edges.	Positions for maximum overview during lessons and otherwise.
2. Scans the room	Does not look around the classroom.	Occasionally scans the room.	More consistently looks up and around during lessons.	Incorporates room scans into and between lessons.	Scans often to maintain awareness of the classroom.
3. Listens	Does not seem aware of sounds in the environment.	Occasionally turns toward a loud sound.	More consistently turns toward unusual sounds.	Reacts to sounds suggesting off-task behavior.	Listens to monitor activity in the classroom.
4. Balances adults in the room	Does not spatially balance other adults in the classroom.	Is becoming aware when other adults are teaching or have left the room.	Begins to position away from other adults.	Repositions to balance other adults, checks in with them verbally or non-verbally.	Works as a team with other adults to maximize overview.
5. Prioritizes assistance	Does not prioritize when assisting children.	Notices assistance is needed by nearby children and approaches.	Monitors children within 15 feet; moves from one group to the next.	Begins to scan the room before determining where to approach.	Assistance is based on whole class awareness.
6. Manages whole group activities	Does not successfully lead whole group activities.	Maintains the group's attention briefly while reading a story, singing, etc.	Attains attention prior to a group activity and can hold attention for 10 min.	Leads the whole group for 15 min. regaining attention as needed.	Appropriately selected whole group activities are well run, short and enjoyable.

I. Classroom Leadership					
B. Redirection	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Implements rules and procedures	Does not implement rules and procedures.	Begins to convey and reinforce classroom rules and procedures.	More reliably responds to rule and procedure noncompliance.	Consistently addresses rule and procedure noncompliance.	Rules and procedures are clearly communicated and reinforced.
2. Enables self-correction	Does not enable children to self-correct behavior.	States what to do and avoids negative directives e.g. "walk" instead of "don't run".	Begins to redirect nonverbally and with questions while avoiding "you need to".	Does not nag, and points things out in a matter of fact way, e.g. "I notice…".	Avoids power struggles by emphasizing prompts and problem solving.
3. Is non-judgmental	Does not use factual information to draw conclusions.	Begins to avoid snap judgments of behavior.	More consistently avoids assumptions and preconceived notions.	Obtains information before drawing conclusions and responding.	Understands children who misbehave have needs that are not being met.
4. Monitors redirection	Does not monitor redirection.	Is starting to observe a child's response after redirection.	More consistently notices if redirection has been effective.	Usually monitors re-direction encouraging compliance when needed.	Dependably and productively monitors redirection.

III. Presentations					
A. Organization	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Appropriate lessons	Does not choose appropriate lessons for children.	Uses album ages to guide lesson selection.	Introduces lessons based on observed interest.	Uses observation, record keeping and discussions to select interesting lessons.	Lessons are appropriate for children's ages, interest, experience and ability.
2. Lessons are well-prepared	Does not prepare lessons ahead of time.	Albums are consulted and notes taken prior to giving lessons.	Refers to notes briefly and unobtrusively during lessons.	Lessons usually flow and are consistent with album descriptions.	Lessons flow, and are clear, complete and concise.
3. Needed materials available	Does not gather required materials prior to lessons.	Most materials needed are on hand when lessons begin.	Materials remain available to children after lessons.	Appropriate follow up materials are made available.	All materials needed are available during and following lessons.
4. Materials appropriately placed	Does not place materials appropriately during lessons.	Materials are orderly placed during most lessons.	Materials are placed directly in front of children during most lessons.	Material placements are consistent with album descriptions.	Materials are placed accurately and in easy reach of children during each lesson.

III. Presentations					
B. Delivery	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. **Uses accurate, limited language**	Does not use accurate, limited language.	Begins to use accurate language during lessons.	Precise language is used with few embellishments.	Adapts language to children's responses.	Language flows, and is clear, accurate, appropriately adjusted, and limited.
2. **Uses accurate, precise movements**	Does not use accurate, precise movements.	Begins to move materials slowly and accurately during lessons.	Uses clear, exact movements without bouncing the hand.	Carefully and accurately manipulates materials during most lessons.	Materials are precisely and correctly manipulated throughout each lesson.
3. **Lessons are interactive**	Does not give interactive lessons.	Involves children at some point during lessons.	Involves children early on during lessons.	Engages each child often in each lesson.	Engages children in highly interactive lessons.
4. **Lessons stay on topic**	Does not give short, focused lessons.	Refocuses lessons that have veered off course.	Remains on topic during most lessons.	The majority of lessons are 15 minutes or less.	Lessons stay on topic and are short in duration.
5. **Modifies lesson pacing**	Does not modify lesson pacing based on children's responses.	Begins to notice when a lesson's pace is too fast or slow.	Modifies a lessons pace according to children's responses.	Reviews prior learning and gives a prior or subsequent lesson if needed.	Gives well-paced lessons that aren't too hard or too easy.
6. **Connects with children**	Does not connect with children during lessons.	Begins to use facial expressions to connect with children.	Acknowledges children's reactions during most lessons.	Responds to children with warmth and empathy.	Maintains a connection with each child throughout each lesson.
7. **Checks for under-standing**	Does not check for understanding during lessons.	Observes children's material use during lessons.	Observes during and after lessons to assess ability to use materials.	Uses 3 period lessons and questions to determine understanding.	Integrates observation, 3 period lessons and questions to assess understanding.
8. **Supports struggling children**	Does not support struggling children.	Recognizes when children are struggling with an activity.	Notices and begins to assess why children have difficulty with an activity.	Tries different strategies to help children challenged by an activity.	Implements appropriate solutions when children struggle with an activity.
9. **Offers follow-up suggestions**	Does not offer follow-up suggestions.	Avoids assigning follow-up activities.	Begins to provide suitable ideas for follow-up activities.	Provides follow-up how-to instruction when needed.	Offers appealing follow-up suggestions aligned with children's interests and ability.

Alternative Block 2 (five images)

II. Montessori Philosophy/Methods					
A. Choice	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Facilitates choice with lessons	Does not facilitate activity choice by giving lessons.	Invites participation in lessons and avoids telling children what work to do.	Refrains from assigning work discussing work options instead.	Introduces interesting activities to encourage self-selection.	Gives many well-timed lessons facilitating choice and concentrated activity.
2. Promotes co-activity	Does not promote co-activity.	Permits children to work together and instruct one another.	Allows children to choose with whom they work.	Structures activities so children work together successfully.	Facilitates productive coactivity, collaboration and peer instruction.
3. Supports productive work choice	Does not help children choose appropriate activities.	Is becoming aware of children unable to choose activities.	Alternately selects work and offers choice for a child unable to choose.	Avoids inhibiting choice with praise, rewards, deadlines, etc.	Develops the choice making ability of each child.
4. Fosters choice through procedures	Does not enact procedures supporting children's choice making.	Involves children in making classroom rules.	Children decide where to sit, how long to use an activity, and when to have snack.	Facilitates choice with a 3-hr uninterrupted work period.	Enacts procedures that provide decision-making opportunities.
5. Promotes choice with material availability	Does not provide children with a full range of elementary Montessori materials.	Makes age-appropriate manipulative materials available.	Makes timelines and charts available.	Makes experiment and large timeline making materials available.	Supports productive choice with a full range of elementary Montessori materials.

II. Montessori Philosophy/Methods					
B. Independence	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Emphasizes careful handling of materials	Does not emphasize careful handling of materials.	Begins to notice when materials aren't used, carried or returned properly.	Models appropriate handling of materials.	Reviews the proper handling of materials when needed.	Supports careful material retrieval, use and replacement.
2. Respects student work spaces	Does not respect children's work areas.	Avoids touching children's work without permission.	Helps children straighten a dis-organized workspace.	Introduces methods for maintaining an organized workspace.	Respects each child's work space.
3. Supports self-reliance	Does not support children's self-reliance.	Avoids completing children's activities or stating what to do.	Asks problem solving questions when children face difficulties.	Monitors activity discreetly, assists briefly and checks back in as needed.	Recognizes when children need help or can do activities themselves.
4. Facilitates productive use of time	Does not facilitate productive use of time.	Helps children maintain work journals and explains reasons for doing so.	Meets regularly 1-on-1 with children to review journals and plan activities.	Monitors agreed-on goals and mutually creates solutions when plans fall short.	Monitors and supports each child's work goals and effective use of time.
5. Clarifies work expectations	Does not clarify work expectations.	Begins to define freedoms offered and work responsibilities.	Provides children with access to public school requirements.	Establishes and clearly communicates classroom work expectations.	Helps each child balance freedom and responsibility in the classroom.
6. Monitors activity outside of lessons	Does not monitor learning outside of lessons.	Begins to distinguish between useful and unproductive activity.	Begins to find the reasons behind unproductive activity.	Confers with children to refocus unproductive activity.	Implements agreed upon solutions to help prevent unproductive activity.

II. Montessori Philosophy/Methods					
D. Observation	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Records observations	Does not observe and record observations.	Records observations several times a week.	Records observations everyday.	Regularly uses a record keeping system.	Records observations daily and uses an efficient record keeping system.
2. Utilizes recorded observations	Does not refer to recorded observations.	Begins to review notes for lesson planning purposes.	Uses notes to plan lessons and adjust the environment.	Uses recorded observations to create student reports.	Uses observation to plan lessons, modify the classroom, and generate reports.
3. Observes objectively	Does not describe children's behavior objectively.	Begins to describe behavior factually, e.g. *The boy throws the hat.*	Avoids evaluation, e.g. *The girl is rude.*	Avoids attributing cause or inferring, e.g. *The girl cries*, not *The girl is sad.*	Avoids reaction based on past experiences, beliefs, opinion and/or biases.
4. Records objectively	Does not record student's activities objectively.	While note taking avoids labels and absolutes, e.g. never, always, every.	Can record what is said and done in a play-by-play manner.	Begins to recognize behavior patterns in notes.	Records impartially and draws factually based conclusions.

V. Professional Behavior					
A. Demeanor	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Appropriate dress	Does not dress appropriately.	Avoids low necklines, flip flops, displaying the mid-drift, etc.	Clothing is neat and in good repair.	Accessories are limited and appropriate; effort is made to look attractive.	Appearance is appealing and professional.
2. Positive attitude	Does not project a positive attitude.	Limits frowning and negative facial expressions.	Maintains a relaxed posture; seems to be having fun.	Is pleasant to be around, and facial expression and stance are welcoming.	Smiles often, is warm, and maintains a positive, relaxed attitude.
3. Professional commitment	Does not demonstrate professional commitment.	Is eager to give lessons and assist children.	Willingly assumes increased classroom responsibility.	Participates in whole school activities.	Is a committed member of the school community.
4. Wants to improve professionally	Does not show openness to improving professionally.	Avoids defensiveness.	Responds favorably to constructive suggestions.	Seeks advice and help when needed.	Wants to improve and do his/her best professionally.

V. Professional Behavior					
B. Conduct	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Moves calmly	Does not move calmly through the classroom.	Usually minimizes quick movements in the classroom.	Movement is unhurried and limited.	Approaches children quietly and unperturbed.	Moves calmly with purpose and composure.
2. Listens carefully	Does not listen attentively to children.	Communicates with children at eye level.	Looks at children while listening with interest.	Listens to children with undivided attention.	Talks with children at eye level and listens attentively.
3. Touches respectfully	Does not touch children respectfully.	Refrains from touching children excessively or giving unsolicited hugs.	Avoids pulling children; offers a hand if appropriate.	Touches children only in ways with which each is comfortable.	Respects children's physical boundaries.
4. Provides appropriate feedback	Does not provide children with appropriate feedback.	Uses humor properly while avoiding sarcasm and statements that dampen enthusiasm.	Notes accomplishments with encouragement, e.g. "Wow, you figured it out!"	Avoids taking children's negative statements personally.	Responds to children in a sensitive and conscientious manner.

Alternative Block 3 (four images)

II. Montessori Philosophy/Methods					
C. Instruction	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Lessons given across curriculum	Does not give at least 3 Montessori lessons each week.	3-5 classic Montessori lessons are given each week.	At least 2 lessons in different curriculum areas are given each day.	At least 3 lessons in a variety of curriculum areas are given each day.	On average 3-6 daily lessons across curriculum areas are given each week.
2. Small and flexible lesson grouping	Does not give small group lessons with flexible grouping.	Most lessons given with 2-6 children.	Lessons aren't repeated with multiple groups on the same day.	Initiates flexible grouping and invites an interested child to join.	Uses small, non-static lesson groupings diverse across ages, genders, and abilities.
3. Instructs with enthusiasm	Does not instruct with enthusiasm.	Is curious and eager to learn with children.	Suggests and presents activities with enthusiasm.	Shares children's excitement in discovery and learning.	Instructs with enthusiasm and a sense of wonder.
4. Excites interest	Does not introduce Montessori practices that excite interest.	Uses storytelling and fondness for the extra-ordinary to foster interest.	Facilitates 'big work' and 'going-out'.	Facilitates food preparation and community service.	Arouses interest with practices geared to 2nd plane characteristics.
5. Facilitates research	Does not facilitate independent investigations.	Limits provided information to encourage child inquiry.	Facilitates self-initiated projects with how-to lessons.	Uses questioning to spur further investigation.	Provides time, motivation, and resources essential for in-depth research.
6. Adapts public school requirements	Does not appropriately adapt public school requirements.	Math lessons incorporate public school terminology.	Public school lessons are short, hands-on and collaborative.	Adapts public school curriculum to children's needs, interests and abilities.	Required public school lessons resemble Montessori presentations.
7. Honors self-correction	Does not enable children to correct their own work.	Has a friendly attitude toward mistakes.	Allows children to correct their own work.	Assures that activities have a build-in control of error.	Treats mistakes and self-correction as essential to learning.

II. Montessori Philosophy/Methods					
E. Environment	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Maintains the classroom	Does not help maintain the environment.	Models care of the classroom.	Reinforces procedures for classroom maintenance.	Regularly monitors children's care of the environment.	Supports children in ongoing classroom maintenance.
2. **Maintains materials**	Does not adequately maintain classroom materials.	Begins to monitor materials for completeness .	Makes sure materials are in good repair.	Mends and returns broken or incomplete materials in a timely manner.	Assures materials are complete and in good working order.
3. Prepares the environment	Does not participate in classroom preparation and modification.	Helps set up the classroom each day.	Notices when a classroom change could meet children's needs.	Regularly adjusts the environment to meet children's needs.	Participates in ongoing classroom preparation and modification.
4. Promotes safety	Does not consistently assure a safe environment.	Knows classroom and school safety and emergency procedures.	Models safe handling of matches, dangerous substances, etc.	Addresses potential classroom and 'going out' safety hazards.	Maintains safety in and out of the classroom.
5. Promotes health	Does not maintain a healthy environment.	Models cleanliness and safe food handling.	Administers basic first aid and helps children maintain clean animal cages.	Implements health promotion strategies and assists children with personal hygiene.	Appropriately reinforces classroom health and disease prevention procedures.
6. Implements routines	Does not implement classroom routines.	Warmly welcomes children and is familiar with classroom routines.	Supervises classroom clean-up, bathroom use and self-serve snack.	Facilitates calm, quiet and orderly transitions.	Appropriately implements classroom routines.
7. Organizes the classroom	Does not maintain a well-organized classroom.	Avoids over-crowded shelves and adding extraneous materials.	Maintains logical material groupings and easy access to materials.	De-clutters and rotates cultural materials as appropriate.	Maintains an orderly, uncluttered environment.
8. Attends to aesthetics	Does not help sustain an aesthetically pleasing classroom.	Avoids commercial enhancement s and over-decorating.	Beautifies the classroom with simple decorations and items from nature.	Regularly exhibits and rotates children's displays and art work.	Maintains an aesthetically pleasing environment.

IV. The Social/Emotional Environment					
A. Atmosphere	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Maintains acceptable noise level	Does not maintain an acceptable noise level.	Begins to use a low voice and allows conversation.	Avoids using "shhh" and reprimanding children who converse loudly.	Avoids whole class quieting, uses targeted problem solving instead.	Addresses noise issues through modeling and problem solving.
2. Supports conflict resolution	Does not support children's conflict resolution.	Helps children negotiate simple disagreements.	Avoids involvement or taking sides in children's conflicts.	Comforts each child in a dispute under- standing both are upset.	Provides time and support for conflict resolution based on best practice.
3. Builds community	Does not build community in the classroom.	Helps children organize and run class meetings.	Supports whole group activities (art exhibits class newsletter, etc.).	Supports special events and productions (plays, musical/dance performances, etc.)	Develops community through well-managed collaborative activities.
4. Nurtures creative expression	Does not nurture creative expression.	Encourages children to decorate their work.	Begins to provide multicultural creative arts instruction.	Infuses academics with opportunities for handwork and creative expression.	Cultivates creativity and an arts-rich classroom.
5. Provides experiences with nature	Does not provide experiences with nature.	Offers real specimen for exploration and discovery.	Facilitates plant and animal care.	Arranges outdoor observation and sample collection for classification.	Offers frequent and varied experiences with nature.
6. Provides a foundation for cosmic education	Does not provide a foundation for cosmic education.	Assures children are given the Creation of the Universe story.	Assures the Great Lessons/ Stories are presented.	Assures fundamental needs and interdependencies are examined.	Emphasizes meaningful contribution and the interconnected-ness of all things.

IV. The Social/Emotional Environment					
B. Sensitivity	**Unaware**	**Beginning**	**Developing**	**Maturing**	**Integrating**
1. Sensitive to feelings	Does not consistently show sensitivity to children's feeling.	Notices when feelings have been hurt or a child is out of sorts.	Shows concern toward an upset child and acknowledges his/her feelings.	Remains calm when strong emotions are expressed.	Helps each child feel safe and supported especially during emotionally intense situations.
2. Avoids embarrass-ing children	Does not avoid embarrassing children.	Avoids talking about a child near the child or others.	Approaches a child prior to having a conversation.	Discusses issues with a child calmly and away from others.	Is discreet and unagitated when talking with and about children.
3. Adapts activities of interest	Does not adapt activities of interest to a child's ability level.	Avoids telling a child he/she isn't ready for an activity of interest.	Suggests alternatives for work a child is interested in but not yet ready for.	Able to adapt an activity of interest to a child's level.	Recognizes and capitalizes on teachable moments.

Final Overall Image (all participants)

Montessori Elementary Teacher Coaching Tool

Components of Practice Considered

Classroom Leadership

Overview
- Positions with back to a wall
- Scans the room
- Listens
- Balances adults in the room
- Prioritizes assistance
- Manages whole group activities

Redirection
- Implements rules and procedures
- Enables self-correction
- Is nonjudgmental
- Monitors redirection

Professional Behavior

Demeanor
- Appropriate dress
- Positive attitude
- Professional commitment
- Wants to improve professionally

Conduct
- Moves calmly
- Listens carefully
- Touches respectfully
- Provides appropriate feedback

Montessori Philosophy/ Methods

Choice
- Facilitates choice with lessons
- Promotes co-activity
- Supports productive work choice
- Fosters choice through procedures
- Promotes choice with material availability

Independence
- Handles materials carefully
- Respects student work spaces
- Supports self-reliance
- Supports productive use of time
- Clarifies work expectations
- Monitors activity outside of lessons

Instruction
- Lessons given across curriculum
- Small and flexible lesson grouping
- Instructs with enthusiasm
- Excites interest
- Facilitates research
- Adapts public school requirements
- Honors self-correction

Observation
- Records observations
- Utilizes recorded observations
- Observes objectively
- Records objectively

Environment
- Maintains the classroom
- Maintains materials
- Prepares the environment
- Promotes safety
- Promotes health
- Implements routines
- Organizes the classroom
- Attends to aesthetics

Presentations

Organization
- Appropriate lessons
- Lessons are well-prepared
- Needed materials available
- Materials appropriately placed

Delivery
- Uses accurate, limited language
- Uses accurate, precise movements
- Lessons are interactive
- Lessons stay on topic
- Modifies lesson pacing
- Connects with children
- Checks for understanding
- Supports struggling children
- Offers follow-up suggestions

The Social/Emotional Environment

Atmosphere
- Maintains acceptable noise level
- Supports conflict resolution
- Builds community
- Nurtures creative expression
- Provides experiences with nature
- Provides a foundation for cosmic education

Sensitivity
- Sensitive to feelings
- Avoids embarrassing children
- Adapts activities of interest

Appendix B: Refined MCT-EL Rubric

Montessori Coaching Tool Elementary Rubric

Successful Montessori teaching requires the development of specific skills and competencies that reflect quality practice. Designed as a self-reflection tool for early-career teachers, the Montessori Coaching Tool Elementary (MCT-EL) rubric describes the proficiencies that potentially make up this skill set at the Elementary level and outlines how these abilities may develop over time. Although the rubric was initially based on Montessori and expert writings, developer research and experience, and well-documented practices, input from a highly experienced group of Montessori teacher educators was used to substantially improve the tool. The expert feedback made it possible to identify areas of consensus and to develop the rubric into a comprehensive framework of Montessori Elementary teaching expectations. While further research is planned to validate the tool in practice, the MCT-EL rubric is made available here to support teacher self-reflection, formative feedback, and the mentoring conversations that occur between early-career Montessori Elementary teachers and Montessori coaches.

Components of Practice

Classroom Leadership

Awareness

- Positions for overview
- Scans the room
- Listens to monitor activity
- Balances other adults
- Prioritizes assistance
- Manages whole group activities

Guidance

- Promotes freedom with responsibility
- Upholds rules and procedures
- Facilitates self-correction
- Is nonjudgmental
- Monitors redirection for effectiveness
- Collaborates with classroom assistant

Presentations

Organization

- Selects suitable lessons
- Prepares lessons in advance
- Makes needed materials available
- Places materials appropriately
- Engages in curriculum planning
- Supports quiet and active pursuits

Delivery

- Uses accurate, limited language
- Uses accurate movements
- Lessons are interactive
- Lessons stay on topic
- Modifies lesson pacing
- Connects with children
- Checks for understanding
- Supports children who are challenged
- Encourages follow-up activity

Montessori Philosophy

Choice

- Fosters choice with lessons
- Supports productive work choice
- Facilitates choice through procedures
- Promotes choice with material availability

Independence

- Supports self-reliance
- Promotes accountability
- Maintains high work expectations
- Facilitates productive activity
- Emphasizes careful material handling

Observation

- Records observations
- Uses recorded observations
- Observes objectively
- Records and analyzes objectively

Social/Emotional Environment

Atmosphere

- Presents the Great Stories
- Encourages coactivity
- Supports group work
- Supports conflict resolution
- Builds community
- Nurtures creative expression
- Provides experiences with nature
- Maintains an acceptable noise level

Sensitivity

- Is responsive to feelings
- Handles embarrassment constructively
- Adapts activities of interest
- Values children's work spaces
- Addresses implicit bias
- Supports social justice goals

Montessori Methods

Instruction

- Gives lessons across the curriculum
- Uses small & flexible groupings
- Instructs with enthusiasm
- Excites interest
- Facilitates research
- Honors self-correction
- Adapts public school requirements
- Integrates technology

Environment

- Maintains the classroom
- Maintains materials
- Prepares the environment
- Organizes the classroom
- Attends to aesthetics
- Promotes safety
- Promotes health
- Provides educational differentiation

Professional Behavior

Demeanor

- Listens carefully
- Dresses professionally
- Maintains a positive attitude
- Respects children's personal space
- Provides appropriate feedback
- Connects with each child
- Fosters home and school partnerships

Development

- Shows professional commitment
- Wants to improve professionally
- Practices self-care
- Engages in professional development

Montessori Coaching Tool—Elementary Rubric

I. Classroom Leadership

A. Awareness	Unaware	Beginning	Developing	Maturing
1. **Positions for overview** Facilitates overview by positioning with the back toward a wall.	At times positioning enables overview of half the classroom or less.	Usually avoids facing a wall or shelf during lessons.	Back is toward a wall while observing and during most lessons.	Consistently positions with the back to a wall, near room edges.
2. **Scans the room** Scans as needed to maintain classroom awareness.	Only occasionally looks up or around the classroom.	Begins to scan the room between lessons.	More consistently looks up and around during lessons.	Incorporates room scans into and between lessons as needed for overview.
3. **Listens to monitor activity** Listens to discreetly monitor children's activity.	Remains occupied after loud or unusual sounds are made.	Turns toward loud sounds.	Turns toward unusual sounds.	Notices and responds to sounds suggesting unsafe or disruptive behavior.
4. **Balances other adults** Works together with other adults to safeguard the classroom.	Has limited overview when other adults teach/leave the room.	Is becoming aware when other adults are teaching or have left the room.	Begins to position away from other adults and for 'one up, one down.'	Repositions to balance other adults, and checks in with them verbally or non-verbally.
5. **Prioritizes assistance** Bases assistance on whole class awareness.	Approaches to assist before observing or looking around.	Notices assistance is needed by nearby children and approaches.	Monitors children within 15 feet; moves from one group to the next.	Usually scans the room before determining where to assist.
6. **Manages whole group activities** Carefully selected whole group activities are well run, short, and enjoyable.	Continues a whole group activity despite children's diverted attention.	Maintains the group's attention while reading a story, singing, etc.	Attains attention before a group activity and holds attention for at least 10 minutes.	Can lead the whole group for at least 15 minutes regaining attention as needed.
B. Guidance	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Promotes freedom with responsibility** Helps each child balance freedom with responsibility.	At times is overly permissive or more restrictive than necessary.	With children, clearly defines freedoms, and responsibilities.	Expands freedoms offered with demonstrated responsibility.	Assesses if expectations for each child are too restrictive or permissive.
2. **Upholds rules and procedures** Rules and procedures are effectively and impartially communicated and supported.	Inconsistently supports rule and procedure compliance.	Gives grace and courtesy lessons and begins to uphold rules and procedures.	Refers to established limits when addressing unfavorable actions.	Responds to unfavorable actions promptly, fairly, and consistently.
3. **Facilitates self-correction** Enables self-correction with prompts and problem solving while avoiding power struggles.	Occasionally nags or motivates nonconstructively, e.g., "No…," "That's wrong," "Shhh," "You need to…".	States what to do rather than negative directives, e.g., "walk" instead of "don't run."	Questions and points things out in a matter of fact way, e.g., "Is that your pencil?" "I notice…"	Redirects non-verbally with facial expressions and gestures.
4. **Is nonjudgmental** Draws non-judgmental conclusions based on factual information.	Some conclusions about behavior are made as snap judgments or assumptions.	Uses observation to help ground conclusions in fact.	Uses open-ended questions to draw factual conclusions, e.g., "Tell me about…"	Checks in and problem solves with children to jointly form accurate conclusions.
5. **Monitors redirection for effectiveness** Dependably and productively monitors redirection.	Provides redirection then focuses attention elsewhere.	Begins to observe a child's response after redirection.	More consistently assesses if redirection has been effective.	Impartially monitors redirection encouraging compliance when needed.
6. **Collaborates with classroom assistant** Builds a trusting, collaborative relationship with the classroom assistant.	Is inconsistent in support or direction provided to the assistant.	Clarifies the assistant's responsibilities and reasons behind classroom practices.	Begins to provide the assistant with ongoing communication and constructive guidance.	Consults with the assistant to share, plan, and address issues.

II. Montessori Philosophy

A. Choice	Unaware	Beginning	Developing	Maturing
1. **Fosters choice with lessons** Offers many optional, small group lessons to facilitate choice.	Lessons tend to be required or given to individuals.	Invites children to participate in lessons.	Gives many small group lessons that pique children's interests.	Helps children develop work plans with lessons inspiring productive work.
2. **Supports productive work choice** Establishes systems to help children select suitable activities.	Occasionally motivates activity choice with an incentive or disincentive.	Alternately selects work and offers choice for a child unable to choose.	Models weighing pros and cons of choices; increases options as ability to choose develops.	Strategically groups and pairs children to help stimulate activity selection.
3. **Facilitates choice through procedures** Enacts procedures supporting every-day decision-making opportunities.	Decisions are sometimes made that children could have made themselves.	Children choose their seating, work partners, snack time, etc.	Children organize their time during a 3-hr uninterrupted work period.	Children engage in community decision-making and problem solving.
4. **Promotes choice with material availability** Supports productive choice with a full range of Montessori Elementary materials.	Montessori materials are limited or misaligned with children's ability and needs.	Makes age-appropriate manipulative and timeline/chart materials available.	Makes experiment, follow-up, and large timeline making materials available.	Regularly rotates materials, books, and resources to meet children's interests and needs.
B. Independence	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Supports self-reliance** Recognizes when children need help or can do activities themselves.	Occasionally completes work, helps, or tells what to do when not needed.	Observes before offering assistance.	Asks problem solving questions when children face difficulties.	Monitors activity discreetly, assists briefly, and checks back in as needed.
2. **Promotes accountability** Supports each child's activity-goals with work journals and conferences.	Has yet to use work journals and conferences to support accountability.	Helps children maintain work journals and understand why doing so is important.	Meets regularly 1-on-1 with children to review journals and plan activities.	Monitors agreed-on goals and mutually creates solutions when plans fall short.
3. **Maintains high work expectations** Holds the expectation that meaningful work will be done by all.	At times praises and recognizes children for simple tasks.	Conveys the expectation that productive work must be done.	Uses challenging but achievable activities to uphold high expectations.	Uses self-reflection to assess if expectations are held without bias or prejudice.
4. **Facilitates productive activity** Establishes systems to help assure productive use of time.	Tends to allow unproductive activity to continue.	Begins to recognize when time is not being used constructively.	Observes, identifies, and begins to address reasons behind unproductive activity.	Confers with children and strategizes together to address unproductive use of time.
5. **Emphasizes careful material handling** Supports careful material retrieval, use, and replacement.	Misses when 2 materials are carried or are used in an unsafe or damaging way.	Models appropriate handling of materials.	Reviews how to carry materials when needed.	Consistently addresses when materials aren't used, carried, or returned properly.
C. Observation	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Records observations** Records observations daily using an efficient record keeping system.	Primarily keeps a mental record of lessons given and children's activities.	Records observations at least several times a week.	Records observations everyday and begins to use a record keeping system.	Records lessons right after they're given using an efficient record-keeping system.
2. **Uses recorded observations** Utilizes observations to plan, set goals, modify the classroom, and create reports.	Uses recollection to plan lessons and modify the classroom.	Begins to review notes for lesson planning purposes.	Uses recorded observations to plan lessons and adjust the environment.	Uses notes for student goal setting and to generate reports.
3. **Observes objectively** Observes and describes behavior objectively without evaluation or attribute.	Perceives some behavior subjectively by evaluating or attributing cause.	Begins to describe behavior factually, e.g., *The boy throws the hat quickly*.	Describes behavior with-out evaluation, e.g., *The girl talks loudly,* rather than *The girl is rude.*	Describes behavior without attributing cause, e.g., *The girl cries,* rather than *The girl is sad.*
4. **Records and analyzes objectively** Records impartially and draws factually based conclusions grounded in theory.	Periodically draws behavioral conclusions based on past experiences.	While note taking avoids labels and absolutes, e.g., needy, gifted; never, always, every.	Can record what is said and done in a play-by-play manner.	Begins to use developmental theory to interpret recorded behavior patterns.

III. Montessori Methods

A. Instruction	Unaware	Beginning	Developing	Maturing
1. **Gives lessons across the curriculum** Each week, 5-8 daily lessons are given across curriculum areas.	1 or 2 lessons are given each day.	At least 12 Montessori lessons are given each week.	At least 3 lessons in different curriculum areas are given each day.	At least 5 lessons in a variety of curriculum areas are given each day.
2. **Uses small and flexible groupings** Uses small, non-static lesson groupings diverse across ages, genders, and abilities.	Regularly gives lessons to 7 or more children.	Most lessons given with 2 to 6 children.	Lessons aren't repeated with multiple groups on the same day.	Initiates flexible grouping and invites an interested child to join.
3. **Instructs with enthusiasm** Teaches with enthusiasm, enjoyment, and a sense of wonder.	Sometimes appears indifferent or uncomfortable during lessons.	Is curious and eager to learn with children.	Suggests and presents activities with enthusiasm.	Shares children's excitement in discovery and learning.
4. **Excites interest** Arouses interest with practices geared to 2nd plane characteristics.	Lessons consist primarily of material use instruction or directional statements.	Uses storytelling and fondness for heroes and the extraordinary to foster interest.	Facilitates 'big work,' and the study of etymology and calligraphy.	Facilitates 'going out' and service learning.
5. **Facilitates research** Provides time, motivation, instruction, and resources essential for in-depth research.	Classroom activity focuses on materials and basic follow-up exercises.	Limits the amount of information given to encourage child inquiry.	Facilitates self-initiated projects with sufficient time and how-to lessons.	Uses questioning and resource availability to spur further investigation.
6. **Honors self-correction** Uses control of error and reflection to foster learning from mistakes.	Inspects or corrects each child's finished work.	Assures activities have a control of error; has a respectful attitude toward mistakes.	Guides children in seeing, reflecting on, and correcting errors themselves.	Helps children provide one another with constructive feedback.
7. **Adapts public school requirements** Adapts auxiliary public school content to children's needs, interests, and abilities.	Presents public school content in a public school manner.	Posts the public school curriculum, and lessons incorporate public school terminology.	Public school lessons are short, hands-on, and collaborative.	Required additional public school lessons resemble Montessori presentations.
8. **Integrates technology** Integrates technologies that complement the curriculum and develop digital fluency.	Is reluctant or has yet to incorporate technologies in the classroom.	Sets technology use guidelines, and teaches basic skills, e.g., key- boarding.	Introduces productivity tools for completing projects, e.g., word processing, graphs.	Introduces digital tools to foster exploration, discovery, collaboration, and creativity.
B. Environment	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Maintains the classroom** Supports children's ownership of classroom maintenance.	Establishes room care procedures with little or no input from children.	Helps children devise and implement a room care system.	Models and monitors care of the environment.	Helps children maintain order during large, messy projects.
2. **Maintains materials** Assures materials are clean, complete, and in good working order.	Some classroom materials are poorly functioning, incomplete, damaged, or dirty.	Begins to monitor materials for cleanliness and completeness.	Makes sure materials are in good repair.	Mends and returns damaged or incomplete materials in a timely manner.
3. **Prepares the environment** Prepares and modifies the classroom based on children's needs.	Maintains the classroom as it is, rarely making a change.	Assures the classroom is appropriately set up each day.	Begins to implement classroom changes to meet children's needs.	Regularly adds/removes materials or resources to support children's progress.
4. **Organizes the classroom** Maintains an orderly, uncluttered environment.	Some materials have been placed haphazardly on shelves.	Avoids overcrowded shelves and adding extraneous materials.	Maintains easy access to materials and logical material groupings.	Accommodates evolving activities and projects; declutters as needed.
5. **Attends to aesthetics** Maintains an aesthetically pleasing environment.	Some areas are heavily decorated, or commercial décor is prominent.	Beautifies the classroom with simple decorations and items from nature.	Regularly exhibits and rotates children's displays and artwork.	Consciously uses color, textures, plants, etc. to invoke warmth and beautify.
6. **Promotes safety** Encourages safety in and out of the classroom.	One or more safety issue is evident, e.g., trip hazard, unlocked chemicals.	Introduces classroom and school safety and emergency procedures.	Models and supports children in the safe use of matches, dangerous substances, etc.	Preemptively addresses potential classroom, school and 'going out' safety hazards.
7. **Promotes health** Consistently reinforces classroom health and disease prevention procedures.	One or more health issue is evident, e.g., no first-aid kit, lax hand washing.	Models and teaches cleanliness and safe food handling.	Administers basic first aid and helps children maintain clean animal enclosures.	Implements health promotion strategies and assists children with personal hygiene.
8. **Provides educational differentiation** Differentiates education to support children of all abilities.	Classroom practices are geared toward typically developing children.	Partners with parents and SPED faculty to provide needed services.	Adjusts the environment and lessons to support children who learn/think differently.	Uses strengths to target areas of need; provides useful technologies.

IV. Presentations

A. Organization	Unaware	Beginning	Developing	Maturing
1. **Selects suitable lessons** Lessons are appropriate for each child's interest, experience, and ability.	Lesson selection is based on grade level or age.	Uses albums and work plans to guide lesson selection.	Planned and spontaneous lessons are based on observed interest and prior activity.	Uses notes, discussions, and curriculum planning to select interesting lessons.
2. **Prepares lessons in advance** Lessons flow, and are clear, complete, and concise.	Gives spontaneous lessons with minimal prior preparation.	Albums are consulted and notes taken before giving lessons.	Refers to notes briefly and unobtrusively during lessons.	Lessons usually flow and are consistent with album descriptions.
3. **Makes needed materials available** All materials needed are available during and after lessons.	Materials are periodically retrieved as needed during lessons.	Materials needed are on hand when lessons begin.	Materials remain available to children after lessons.	Appropriate follow-up materials are made available.
4. **Places materials appropriately** Materials are accurately placed and in easy reach of children during and after lessons.	At times places materials haphazardly or in front of themselves rather than the children.	Materials are placed in an orderly layout during most lessons.	Materials are placed directly in front of children during most lessons.	Material placements enable successful use during and once the presentation is over.
5. **Engages in curriculum planning** Engages in short and long term curriculum planning for each child.	Lesson planning ideas have yet to be written out.	Prepares daily lesson plans with room for spontaneous presentations.	Prepares weekly lesson plans with flexibility.	Engages in monthly/ semester planning for each child.
6. **Supports quiet and active pursuits** Supports quiet/lively activity preferences with workspace options and resources.	Supports either quiet or lively activities, but not both at the same time.	Provides classroom space for both quiet and more spirited activities.	Offers equipment to facilitate quiet, focused activity, e.g., head- phones.	Creates and implements procedures for work in areas adjacent to the classroom, e.g., hallway.
B. Delivery	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Uses accurate, limited language** Language flows, and is clear, accurate, and limited.	On occasion embellishes or uses imprecise or incorrect language.	Speaks clearly during lessons.	Precise, accurate language is used with few embellishments.	Language flows and is succinctly adapted to children's responses.
2. **Uses accurate movements** Materials are precisely and correctly manipulated throughout each lesson.	Some movements are rushed or inaccurate.	Begins to move materials slowly and accurately during lessons.	Uses clear, exact movements without bouncing the hand.	Carefully and accurately manipulates materials during lessons.
3. **Lessons are interactive** Engages children in highly interactive lessons.	Children primarily listen and observe during lessons.	Involves children at some point during lessons.	Involves children early on during lessons.	Engages each child often in each lesson.
4. **Lessons stay on topic** Lessons stay on topic and are short in duration.	Sometimes lessons are overly long or unfocused.	Refocuses lessons that have veered off course.	Remains on topic during most lessons.	The majority of lessons are 15 minutes or less.
5. **Modifies lesson pacing** Gives well-paced lessons that aren't too hard or too easy.	Continues with a lesson despite indications it is too basic or difficult.	Begins to notice when a lesson's pace is too fast or slow.	Modifies a lesson's pace according to children's responses.	Reviews prior learning and gives a prior or subsequent lesson if needed.
6. **Connects with children** Maintains a connection with each child throughout each lesson.	Focuses on the lesson rather than the participating children.	Begins to use facial expressions to connect with children.	Acknowledges children's reactions during most lessons.	Responds to children with warmth and empathy.
7. **Checks for understanding** Observes and questions to assess understanding during and after lessons.	Periodically gives a lesson without observing, questioning, or discussing.	Asks simple questions and observes material use during lessons.	Observes during and after lessons to assess ability to use materials.	Checks for understanding with clarifying questions and discussion.
8. **Supports children who are challenged** Differentiates instruction when children struggle with an activity.	At times is unaware or only repeats a lesson when a child exhibits difficultly.	Recognizes when children are struggling to understand an activity.	Begins to assess why children are having difficulty with an activity.	Helps children challenged by an activity by isolating the difficulty.
9. **Encourages follow-up activity** Encourages child-designed follow-up aligned with their interests and ability.	Tends to assign follow- up activities or limits what can be done.	Offers follow-up options based on album suggestions.	Provides clear follow-up instruction modeling what is expected.	With children, develops follow-up options based on their ideas and preferences.

V. Social/Emotional Environment				
A. Atmosphere	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Presents the Great Stories** Uses the Great Stories to unify instruction, inspire awe, and motivate child led research.	Gives key lessons before presenting the Creation Story.	Presents the Universe Creation story; begins to tell other Great Stories.	Assures children are told all the Great Stories.	Aligns key lessons with the Great Stories and emphasizes inter-connections.
2. **Encourages coactivity** Facilitates productive coactivity, collaboration, and peer instruction.	Instruction and procedures encourage individual activity.	Table/floor arrangements accommodate pairs and different sized groups.	Teaches coactivity skills so children collaborate productively.	Fosters a spirit of cooperation where children willingly help or instruct one another.
3. **Supports group work** Establishes productive, harmonious group activity as the classroom norm.	Recognizes sitting together but working separately as group work.	Provides instruction favorable to collaborative work.	Helps children organize and share group work responsibilities.	Helps children refocus unproductive group activity.
4. **Supports conflict resolution** Teaches and entrusts children to resolve their own disputes.	Misses escalating conflict, takes sides, resolves the conflict, etc.	Assists children in negotiating simple disagreements.	Teaches age-appropriate conflict resolution skills.	Provides time, neutrality, and procedures for child lead conflict resolution.
5. **Builds community** Develops community through well-managed collaborative activities.	Classroom activity focuses exclusively on small group and individual exercises.	Supports whole group activities, e.g., class newsletter, art exhibits.	Helps children organize and run class meetings.	Supports special events and productions, e.g., plays, dance performances.
6. **Nurtures creative expression** Cultivates creativity and an arts-rich classroom.	Prioritizes academics with minimal emphasis on arts education.	Encourages children to decorate their work.	Begins to provide multicultural creative-arts instruction.	Infuses academics with opportunities for handwork and creative expression.
7. **Provides experiences with nature** Offers frequent and varied experiences with nature.	Emphasizes instruction about nature rather than hands-on experiences.	Facilitates plant and animal care.	Offers real specimen for exploration and discovery.	Arranges outdoor adventuring and sample collection/ observation for classification.
8. **Maintains an acceptable noise level** Addresses noise issues through modeling and problem solving.	Quiets the class with a raised voice, limiting talk, reprimanding or using "shhh."	Uses a low voice and allows conversation and a hum of activity.	Uses targeted problem solving when the classroom is too loud.	Develops solutions with children for maintaining an acceptable noise level.
B. Sensitivity	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Is responsive to feelings** Helps children feel heard and supported when emotionally distressed.	At times misses when feelings are hurt, a child is out of sorts, etc.	Acknowledges and helps an upset child identify and verbalize their feelings.	Handles strong emotions calmly, not taking what is said or done personally.	Teaches children how to cope with uncomfortable feelings.
2. **Handles embarrassment constructively** Helps each child feel safe from judgment and embarrassment.	On occasion teases, dwells on mistakes, praises in front of others, downplays an embarrassment, etc.	Approaches children quietly and unperturbed; discusses issues privately.	Models handling embarrassment productively.	Helps an embarrassed child reflect and gain perspective without minimizing his/her/their feelings.
3. **Adapts activities of interest** Recognizes and capitalizes on teachable moments.	Occasionally tells a child they aren't ready for an activity of interest.	Responds to children's expressed interest in a topic, activity, or material.	Suggests alternatives for work a child is interested in but not yet ready for.	Adapts an activity of interest to a child's ability level.
4. **Values children's work spaces** Respects and cultivates respect for each child's workspace.	Moves children's work to a new location without obtaining agreement first.	Asks permission before touching or writing on children's work.	Helps children respect one another's workspace.	Introduces methods for organizing and maintaining an orderly work area.
5. **Addresses implicit bias** Counters implicit bias to provide every child with an equitable experience.	Believes he/she/they doesn't have implicit bias without examining one's internal stereotypes.	Learns about and begins to examine one's own implicit bias.	Identifies blind spots that hinder perceiving and responding to children fairly.	Uses data to assess if lessons are given equitably.
6. **Supports social justice goals** Supports social justice with cultural sensitivity and culturally responsive teaching.	Focuses solely on cultural materials to address social justice goals.	Reflects a variety of cultures, races, family makeup, etc., in materials, and the classroom.	Represents the culture of each child when possible in lessons, materials, and the environment.	Teaches about social justice issues and engages children in related activities.

VI. Professional Behavior

A. Demeanor	Unaware	Beginning	Developing	Maturing
1. **Listens carefully** Talks with children at eye level and listens attentively.	Periodically focuses somewhere else while conversing with a child.	Communicates with children at eye level.	Looks at children while listening with interest.	Listens to children with undivided attention in and outside of lessons.
2. **Dresses professionally** Appearance is appealing and professional.	Some clothing is best worn elsewhere, e.g., flip-flops, low necklines, showing the midriff.	Clothing is neat, clean, and in good repair.	Accessories are limited, non-encumbering, and culturally appropriate.	Effort is made to look attractive and professional.
3. **Maintains a positive attitude** Smiles often, is warm, and maintains a positive, relaxed attitude.	At times conveys irritation, impatience, dislike, etc., toward a child.	Smiles frequently, and uses a constructive, upbeat tone of voice.	Maintains a relaxed posture; seems to be having fun.	Movements convey patience, respect, warmth, and sensitivity.
4. **Respects children's personal space** Assures respect for each child's contact and proximity preferences.	Sometimes pulls, touches, or hugs a child without prior consent.	Talks at a distance that appears comfortable to children (they don't lean away).	Helps children maintain one another's personal space.	Learns and respects the personal space preferences of each child.
5. **Provides appropriate feedback** Responds to children in a sensitive and conscientious manner.	Sometimes uses sarcasm, off color jokes, statements that dampen enthusiasm, etc.	Uses encouragement and appropriate humor, e.g., funny stories, puns, wordplay.	Provides feedback that is specific, descriptive, and constructive, e.g., "Wow, you counted then you…"	Feedback is given equitably and reflects children's cultural norms.
6. **Connects with each child** Builds a trusting, collaborative relationship with each child.	Occasionally views some children as slow, difficult, annoying, etc.	Begins to establish a rapport with each child.	Works to help each child feel safe, important, and cared for.	Uses reflection to understand and support children who rub us the wrong way.
7. **Fosters home and school partnerships** Fosters ongoing, constructive home/school partnerships for each child.	Interactions with families mostly occur during conferences.	Gets to know families; promptly and respectfully addresses questions and concerns.	Emphasizes children's strengths; notifies families of issues in a timely manner.	Promotes family involvement, helping each to feel connected and supported.
B. Development	**Unaware**	**Beginning**	**Developing**	**Maturing**
1. **Shows professional commitment** Is an active, committed member of the class and school community.	Sometimes seems hesitant to assume basic classroom responsibilities.	Is eager to give lessons and assist children.	Willingly assumes increased classroom responsibility, e.g., gives more complex lessons.	Readily participates in conferences, staff activities, and school events.
2. **Wants to improve professionally** Indicates desire to improve and do his/ her/their best professionally.	Tends to receive feedback reluctantly or resists initiating change.	Responds favorably to constructive suggestions.	Makes and implements a plan of action to address identified problems or issues.	Recognizes when help is needed, and seeks advice, and support.
3. **Practices self-care** Engages in ongoing self-care and rejuvenation.	At times puts the needs of others before one's own needs.	Makes time for sleep, exercise, eating well, and socializing.	Maintains outside interests, and prioritizes tasks when stressed.	Sets realistic goals, delegates and organizes to help maintain work/life balance.
4. **Engages in professional development** Engages in ongoing professional development.	Chooses not to participate in professional development activities.	Actively engages in school provided continuing education.	Participates in workshops, action research, etc., to develop professionally.	Attends conferences, seminars, etc., to support life long learning.