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William H. Robertson

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“It Doesn’t Feel Like a Job to Learn”
Preservice Elementary Teachers’ Perceptions of Dance-Themed Mathematics Education

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ABSTRACT
A series of dance activities were introduced to preservice teachers \( n = 76 \) to help them understand how mathematics concepts could be associated with dance performance and choreography processes. A total of 468 pieces of qualitative data were collected, including 147 online discussion entries with 248 follow-up comments, and 73 individual reflection essays. The main themes for the various benefits that emerged across the preservice teachers’ reflections were: (1) improving students’ dispositions toward mathematics and creating an enjoyable learning environment for reducing mathematics anxiety; (2) allowing students to develop their creativity and allowing teachers to meet different students’ needs; and (3) developing students’ conceptual understandings of mathematics through multiple types of connections, representations, and communication. The findings support practical approaches for teacher educators who wish to employ dance in instructing mathematics teaching methods to their preservice teachers.

Educational researchers acknowledge that improvement of teacher quality is one of the strategic remedies in closing the achievement gap between minority and nonminority students (Darling-Hammond and Baratz-Snowden 2007). Unfortunately, a majority of current teacher education programs fail to prepare elementary preservice teachers with sufficient strategies for engaging students in meaningful interdisciplinary activities and designing and implementing innovative teaching strategies (Ball 1990; Fuller 1997; Singham 2003; Knoblauch and Hoy 2008). Although there are a few existing studies that investigate preservice teachers’ perceptions of cross-curriculum education (e.g., Parker, Heywood, and Jolley 2012), as well as using arts as educational resources for teaching core school subjects (e.g., An et al. 2016; Davies 2010), much remains to be understood about the pedagogical connections between mathematics and the arts. This study focuses on teachers’ perceptions as an approach to explore preservice teachers’ arts-themed mathematics teaching strategies, and specifically addresses the topic of how dance could be developed and implemented as activities for facilitating mathematics learning during mathematics lessons. In particular, this study aims to address the development and implementation of mathematics lessons within choreography and dance contexts. The specific research question guiding this study is this: How did the participating preservice teachers perceive their own experiences of investigating the mathematics within choreography- and dance-themed activities, in terms of the pedagogical effectiveness throughout?
LITERATURE REVIEW
Bodily Participation as a Catalyst for Mathematical Cognition

Empirical evidence collected across the past decade from several different studies indicated that there is a measurable positive correlation between K–12 students’ classroom-based physical activity and their academic achievement, especially in the discipline of mathematics (Sibley and Etner 2003; Tomporowski et al. 2008; Trudeau and Shephard 2008). Researchers theorized that this can be explained by the fact that physical activity affects students behaviorally, physiologically, cognitively, and emotionally during learning processes—and this in turn affects cognitive function improvements, including academic performance in mathematics, reading, writing, perceptual abilities, intelligence quotient, and developmental level (Sibley and Etner 2003; Grieco, Jowers, and Bartholomew 2009; Riley et al. 2015).

Researchers hypothesized that bodily movements might catalyze biological changes within brain-cell binding processes, and that complex physical motions found in a choreographed dance perhaps contain the stimuli needed for young minds to form connections across cell networks (Ratey 2008). More recently, empirical studies confirmed the role of “embodied cognition” while learning mathematics, with the line of research collectively concluding that mathematical cognition goes beyond being purely a brain-dominated function, and is in fact a process that is both embodied and enactive, relying on complicated interactions among (1) the brain and the body, as well as (2) the body and the environment (Gallagher and Lindgren 2015).

Enactivism mathematics educators (e.g., Hutto, Kirchhoff, and Abrahamson 2015) recognized the value of employing embodied pedagogical practices when creating formal environments for mathematics teaching and learning. Similarly, Jia Yi Chow and his colleagues (2007) proposed that teachers cannot in reality pass knowledge directly to students, but instead, effective mathematics teachers should strive to set and maintain an environment that encourages students to engage and participate in the target learning tasks through constraints-led pedagogy that is designed to avoid predetermined interactions or movements. For example, the Kinemathics project has been one of the noteworthy implementations of enactivism theory, and is prominent for employing mathematics learning tasks that were designed to support students who are learning to represent mathematical concepts, such as proportional relations, by using their hands to create motor-action schemes that result in problem solutions (Abrahamson and Trninic 2015).

Dancing as an Interdisciplinary Approach to Teaching Mathematics

Teaching mathematics via performing arts activities is identified as an effective method for (1) helping students to develop productive dispositions toward mathematics and improve mathematics performance (An and Tillman 2015; An, Tillman, Boren, et al. 2014), and (2) improving teachers’ self-efficacy for teaching mathematics and developing mathematics teaching strategies (An, Tillman, Shaheen, et al. 2014; An, Tillman, and Paez 2015). Dance activities have been developed as a mathematics learning resource for teachers, with the intention of offering meaningful inquiry opportunities for students to apply and comprehend mathematics. Benefits that have been documented as results from teaching mathematics through dancing activities include (1) motivating students to attempt more challenging mathematics tasks (Lengel and Kuczala 2010); (2) encouraging students to examine more complex mathematical relationships (Helsa and Hartono 2014); (3) creating an enjoyable learning environment and teamwork opportunities (Tremarche, Robinson, and Graham 2007); and (4) providing multiple communication channels and thereby diminishing language barriers for English-language learners (Eisner 2004).

Over the past two decades, instructional designers and teaching artists have proposed numerous techniques for crafting mathematics lessons based on dance-themed activities. For example, Helsa and Hartono (2014) examined using Indonesian traditional dances while teaching elementary mathematical concepts such as symmetry, and measured the impacts on students’ interest in learning mathematics. Likewise, Belcastro and Schaffer (2011) studied Conway’s “hop-step-jump” symmetries with seven different foot positions as contexts for teaching transformations in geometry; they also explored using Laban’s cube, a choreography framework with a three-dimensional coordinate system, to teach the concept of locations. Through collaboration between dance artists and classroom teachers, Moore and Linder (2012) developed and implemented a four-week unit on geometry, and geometrical concepts such as circle, triangle, and their properties were associated with dances. As an illustration, students used their arms to represent acute, obtuse, and right angles and used their legs and movement to demonstrate different types of triangles. Similarly, Male Rosenfeld (2013a), a nationally famous percussive dancer, presented her dance–mathematics integrated teaching strategies Math in Your Feet, which included a number of movement variables (e.g., foot position, movement direction, and movement degree) for students to create and perform dance within a square.

METHOD
Participants and Settings

This study was conducted at a research university located in a medium-sized metropolis adjacent to the southwestern border of the United States. The university has an enrollment of more than 20,000 students, and more than three quarters of the student body are Hispanic. As part of a line of explorations conducted for the purpose of gaining understanding into preservice teachers’ perceptions of teaching mathematics through hybrid entertainment–education activities (e.g., An, Ma, and Capraro 2011; An and Tillman 2014; An, Tillman, Shaheen, et al. 2014; An, Tillman, and Paez 2015).
2015; An et al. 2016), this study used data from 76 preservice teachers who enrolled in the spring, summer, and fall semesters during 2015. Specifically, data were employed from participants who registered in one of four sessions of a senior-level mathematics teaching methods course, and demographic information collected from the participants indicated that 87 percent of participants self-identified as Hispanics, around 11 percent were White, and 2 percent were African American.

Exhibition of Alternative Mathematics Teaching Methods

A series of dance activities were introduced to participating preservice teachers to help them understand how mathematics concepts could be associated with dance performance and choreographic processes. Rosenfeld’s (2013b) instructional design method of using paired percussion dance as a geometry learning activity was employed, and a follow-up variation of the activities was co-developed by a team of college professors across four disciplines including mathematics education, music education, early childhood education, and educational technology (some of whom are co-authors of this article) to pedagogically link various mathematical concepts and skills with dance. A series of progressively more advanced dance activities were developed, and then delivered to the participants during two regular class meetings (four hours of total instruction per student) across four sessions of a mathematics teaching methods course taught by the first author. All preservice teachers in this study were offered equivalent opportunities to practice and evaluate the proposed activities.

Toward the beginning of the intervention activities, preservice teachers watched the video of Rosenfeld’s (2013a) TED talk “Jump into Math,” which describes how she used percussive dance as the platform for associating choreographic and mathematical inquiry with her own dancing demonstrations. After watching the video, the participants engaged in the following activities by designing a series of dances within nine-box grids including: (1) solo choreography based on foot position variations (see Figure 1); (2) duet choreography based on reversed foot positions between the two dancers (see Figure 2); (3) four-person choreography with algebraic patterns such as growing and repeating patterns (see Figure 3); and (4) six-person group choreography with no limitations.

As an alternative mathematics teaching method, the activities were presented as the following steps. First, the instructor introduced background information and played dance videos for participants so they would understand the relationships between specific mathematics topics and dance movements. Second, the mathematical criteria for the dance choreography was introduced, such as foot positions based on four rotations of 45 degrees. Third, participants choreographed the dance based on the criteria given, such as a nine-box grid with specific length and width. Fourth, participants practiced their dance for the upcoming rehearsal. Fifth, participants performed their dance before the whole class, while their classmates identified and evaluated the mathematical patterns within the choreography. Finally, the dancers discussed their choreography’s rationale in terms of the mathematical patterns present.

FIGURE 1 Sample foot positions for preservice teachers within the nine-box grid.

FIGURE 2 Sample foot positions for preservice teachers within the nine-box grid for a duet dance (Dancer A and Dancer B) based on reflections.
Data Collection and Analysis

Data collection occurred both during and after the intervention. An online discussion forum was employed where the participants could share their formative perceptions about the dance–mathematics activities after each instructional session, and a written essay was assigned to all of the participants wherein they provided their summative perceptions at the end of the semester about teaching mathematics through dance activities. A total of 468 pieces of qualitative data were collected in this study from 76 preservice teachers. The data included 147 online discussion entries (with an average length of 212 words) with 248 follow-up comments (with an average length of 103 words), and 73 individual reflection essays (with an average length of 266 words). Data analysis employed a grounded theory approach for identifying themes and subthemes that were recurring across different data sources (Corbin and Strauss 2008).

RESULTS

The data analysis of the coded responses resulted in 49 specified themes, which in turn, generated three main theme areas. Response counts within each main theme category, as well as the response rates for respondents who reported a response relevant to each theme, are summarized in Table 1. The response rate within each theme was calculated based on the ratio between the number of identified specific themes across all pieces of qualitative data and the number of participants in this study. Some participants addressed multiple or repeated themes within and across each online discussion entry, follow-up comments, and reflection essay—and that count was added only when a different theme appeared, and in such a case the repeated theme was not counted. In particular, disposition and learning environment (e.g., excitement and engagement) and creativity and authenticity within mathematics education were the most prevalent themes that were documented across all 76 participants, with response rates of 1.71 and 1.05, respectively. The theme of conceptual understanding through connection, representation and communication (e.g., physical and visual connection, and teamwork opportunity) has a response rate of 0.82.

Disposition and Learning Environment

Relevant to disposition and learning environment, participants in this study, with a response rate of 1.71, stated that dance activities could help teachers set an enjoyable environment for mathematics learning, as well as facilitate students’ development of productive dispositions toward mathematics. Among these responses, one of the consensus opinions across participants was that dance activities might address some common issues in mathematics education, such as anxiety and disengagement in mathematics. For example, in contrast with traditional mathematics teaching, one participant pointed out how dance can help mathematics learners to maintain a positive disposition in learning mathematics:

I believe that as a child you want to have fun and you need something that will keep you interested and motivated. I can honestly say that as a child when there was a teacher standing in front of the classroom lecturing about math it was seldom effective. Also, having multiple math assignments and worksheets assigned to me would cause me to zone out and lose focus. On the other hand, I believe that teaching mathematics through dancing activities can improve young students’ mathematics attitude in that they will be interested in how you can use dance for learning about math. They are also likely to have fun with this concept and the lessons. Not to mention that it is something new that they are probably not really accustomed to as a method of learning math. If students are having fun while learning, they will not even notice the amount of knowledge that they are gaining!

Similar responses were expressed by other preservice teachers. They indicated that dance as a school subject has the potential to be developed as interdisciplinary teaching strategies for mathematics. Such active and entertaining learning experiences might arouse students’ interests in exploring mathematics outside of the formal classroom. As another participant noted:

All students have the belief that the only way they learn math is by using long and complicated steps, formulas to where they have to learn how to combine them in order to get a result. Also they have learned these complicated math terms that just make it so much harder. However, if I were to tell the students that we are going to use a different approach to mathematics, I am sure this would spark the interest of those students who hate math.

Dance-Themed Mathematics Education
<table>
<thead>
<tr>
<th>Main theme</th>
<th>Specified themes within coded responses</th>
<th>Response rates</th>
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</thead>
<tbody>
<tr>
<td>Disposition and learning environment</td>
<td>Positive attitude (10)</td>
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<td></td>
<td>Learning environment (19)</td>
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<td></td>
<td>Confidence (2)</td>
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<td></td>
<td>Cheerful mood (15)</td>
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<td>Excitement (8)</td>
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<td>Motivation (9)</td>
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<td>Learning without painful experiences (3)</td>
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<td></td>
<td>Nonthreatening learning (2)</td>
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<tr>
<td>Learning environment</td>
<td>Real-life engagements (11)</td>
<td>1.71</td>
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<td></td>
<td>Allowing teachers and students to feel</td>
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<td></td>
<td>focused, and prepared to learn (2)</td>
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<tr>
<td></td>
<td>An atmosphere of familiarity (3)</td>
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<td>Less stress and anxiety (17)</td>
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<td>Relax and calm down (13)</td>
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<td>Not getting bored (12)</td>
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<td>Creativeness and flexibility within math</td>
<td>Imagination (3)</td>
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<td>education</td>
<td>Wonderment (2)</td>
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<td>Creativity (9)</td>
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<td>Self-expression (11)</td>
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<td>Unconventional experiences (9)</td>
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<td>Freestyle/set minds free (7)</td>
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<td>Personal taste (3)</td>
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<td>Balance between abstract and concrete (4)</td>
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<td>No preknowledge requirement (3)</td>
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<td>Authenticity (5)</td>
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<td>Everyone can do (6)</td>
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<td>Conceptual understanding through connection,</td>
<td>Knowledge transfer (3)</td>
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<td>representation, and communication</td>
<td>Reducing misconceptions (2)</td>
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<td>Breaking language barrier (6)</td>
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<td>Sharing ideas with peers (4)</td>
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<td>Teamwork opportunity (7)</td>
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<td>Self-explanatory demos (2)</td>
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<td>Social interactions (6)</td>
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<td>Translation between thinking and behavior (1)</td>
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<td></td>
<td>Muscle memorization to brain memorization (2)</td>
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change the way of thinking. I think dance is a wonderful idea for their lower graders because they will be having fun and not even notice that they are learning. I wish I would have been taught this way when I was small. It may have helped me not develop this math anxiety that I still struggle with even in my adult life. This type of phobia or anxiety could be prevented if teachers adopt new ways to teach math like through math and movements.

In addition to sharing autobiographical stories about mathematics anxiety, a few preservice teachers discussed the importance of stress-free learning environments and why a positive mathematics learning environment has the potential to facilitate students’ long-term mathematics learning. For example, one participant commented that dance-themed pedagogy created an enjoyable learning environment, in which learners could share their ideas with each other and learn through student-centered learning experiences. Specifically, she said:

Traditionally mathematics has been perceived as a tough subject, so students are influenced for the adult beliefs, and they are more defensive when a negative attitude of a teacher or their own parents is present. If students have fun while learning, they would learn better because stress would not be a factor. If the students enjoy what they are doing they will learn faster and inappropriate disruptions will be avoided, and if students have their minds busy on math assignments which they enjoy, the classroom environment will be positive with more time spent wisely. Instead of a teacher-led mathematics class, student-centered activities such as dance creation and group performance would create an atmosphere of familiarity, contribution, and shared responsibility.

Creativeness and Flexibility Within Mathematics Education

The second most prevalent main theme among preservice teachers, with a response rate of 1.05, was about creativeness and flexibility within mathematics education. For the topics on creativeness, preservice teachers generally noted that dance-themed activities could facilitate students developing creativity within their mathematics learning process. Many participants believed that traditional teacher-centered mathematics teaching, relying heavily on lecturing and worksheet drills, limits students’ capacities for flexibility and critical thinking. For example, one participant said:

A young student full of imagination and wonderment should not be put into the box of a black line master or pages of notes. Dancing allows the student to cultivate and enrich their imagination and creativity. Particularly dancing has a feature that can make it personal to each dancer. This means that through dancing, one can add a personal taste, and in order to do that, the creativity and imagination need to be set free. A unique characteristic of dancing is that it can either free-style or it can also have a routine, which offers space for students to grow their creativity.

Flexibility during mathematics lesson design and implementation was another popular subtheme that preservice teachers discussed in their responses. Overall, participants indicated that teaching mathematics through dance activities provided alternative ways for mathematics teachers to ensure equitable teaching by helping address the needs of English language learners (ELLs), students with special needs, young children, and female students. Preservice teachers mentioned that body movements can be used as a different language for students to break communication barriers and to help make accommodations for less verbal students. For example, one participant offered his comments about the unique benefits of dance in mathematics education for students who have particular learning disabilities:

Things like vocabulary words can be acted out through dance, ELLs would greatly benefit from it. This could be a form of enriching their knowledge about math vocabulary in an authentic and engaging way. ELLs need more exposure to things of this nature and while they are learning the math words the other students are partaking in all other things listed. Lastly, students who may be struggling with motor skills could use dance while learning math as an opportunity to practice these skills. It takes coordination to dance especially when dancing with a partner. I do suggest having dance lessons in a special education classroom or in the general education classroom if there are ADHD [attention deficit hyperactivity disorder] students since they do have a hard time to sit still. It [dance activities] can be used as an accommodation, or modification in the lesson.

Among collected responses, another participant made strong arguments about how dance can be used across different grade levels in elementary school, and why dance activities may help reduce gender inequity in mathematics education:

Dance activity is great and could be done with students from any grade level. Dance is unique because it also involves moving your body, which is something that everyone can do. The activity can be simple or complex, and [this feature] makes learning math through dance possible for even young children. We can set the difficulty level based on students’ comfortable zones by either making the dance slower (to practice your moves) or faster (to challenge yourself). When students are satisfied, we can then let them increase the level of difficulty, or try a different dance.

Conceptual Understanding Through Active Learning

Another overarching theme, with a response rate of 0.82, was that dance-themed activities might facilitate students’ conceptual understandings of mathematical topics. Participants emphasized that students might understand mathematics concepts better when offered opportunities to (1) contextualize mathematics within dance activities, (2) represent mathematical concepts through body movement along with traditional written and oral language, and (3)
share their experiences with classmates through creative communications such as performing choreography. One participant shared her own experiences of a dance-based learning process and discussed how body movement was used as a distinctive method to physically represent mathematical concepts:

When I was in high school, I was a dancer. I found that one of the most interesting things you gain from dance is muscle memory. I feel like if students practice and learn math through dance, it will be easier for them to retain the information because they are processing it in a multitude of ways. The student can inject themselves into the dance and the learning outcome while at the same time finding a physical and visual connection to the learning concept that they will never forget. Another feature that is great about dancing is that it allows the students to learn with their whole bodies. Students can jump in the air and learn about measurement or observe patterns when watching others. They can become aware of sequences that form and different combos that arise from the dances. Students can also observe different angles that are made with their outstretched arms or legs!

Similarly, another participant stated that dance could provide an alternative approach for students to comprehend mathematics via traceable representations. This preservice teacher argued that dance can be used to facilitate understanding by symbolizing mathematical concepts, and a bigger picture of mathematics, beyond its discipline boundary, and thus become accessible to students. She stated:

Dance allows the students to think as a problem solver. They have to find ways to use their body to translate what they are thinking. Therefore, they are completely focused and engaged with the lesson that is being taught. When using activities such as dance to learn math students can remember certain dance moves to help them to remember math concepts. Students are more likely to remember a math concept by connecting it to a dance move than they would be to connect it to a problem that they worked out on a piece of paper because there is not as much mind stimulation as there is in dance when you are moving your whole body to represent a math concept. I also think that when carrying out a dance to better understand math you can see the bigger picture much clearer because you are actually applying it with an action. You can continually practice dance moves while having fun and by eventually learning the math concept at hand.

Opportunities for student–student interactions was identified as another benefit that the dance activities could offer during mathematics education. Teamwork experiences during the dance activities could allow students to provide diverse answers to open-ended problem-solving tasks, during which they exchange personal ideas and perform peer evaluations. One participant shared his thoughts on how dancing can help students improve communication and encourage teamwork:

In my experience as a student, and as an educator, I have learned that the hardest thing to learn and to teach, is to make students work cooperatively and with a common goal. Dancing allows them to work in teams and with a common purpose. Whenever a routine is created, and a group of students are assigned to follow it, unconsciously the students start communicating in order for the routine to come up good. Also, communication is an excellent feature, as it allows the students to express what they have and what they need. Not only will dancing help students learn math, it allows them to express what they have and what they need, but it can also teach them social skills and how to work as a team.

**DISCUSSION**

This study examined preservice teachers’ perceptions of dance-themed mathematics pedagogy as an approach to teaching elementary students. Rather than merely treating dance as a superficial “cover story” for mathematics education as has sometimes been done in the past (e.g., Trudeau and Shephard 2010) this study systematically placed dance-themed activities within a series of mathematics lessons that incorporated the choreographic elements into the actual pedagogy. Overall, the findings from this study were consistent with those from previous research, which indicated that preservice teachers were mostly lacking in experience with purposeful interdisciplinary teaching (Parker, Heywood, and Jolley 2012), and that receiving professional development experiences with interdisciplinary teaching strategies, especially arts-themed mathematics pedagogy, could positively affect their view of teaching mathematics (e.g., An, Tillman, Boren et al. 2014; An et al. 2015). As seminal empirical studies previously discussed, one of the key challenges facing teacher education programs across the country is helping the preservice teachers they serve develop positive attitudes toward mathematics education. This includes helping them understand an interdisciplinary perspective that connects mathematics with other school subjects and real life, rather than isolating mathematics in an academic silo divorced from real-world applications (Darling-Hammond and Baratz-Snowden 2007).

The findings in this study indicate the participating preservice teachers believed that arts-themed pedagogy, in this case dance, could potentially offer a remedy for some of the recurring issues in mathematics education, such as student disengagement and anxiety (An, Tillman, Boren et al. 2014; An et al. 2015). One of the prevalent reasons that the preservice teachers gave for believing that dance could reduce anxiety and improve engagement during the mathematics learning process is that dance activities could help generate an enjoyable learning environment with kinesthetic foundations. Many preservice teachers said something similar to that sentiment—such as “It doesn’t feel like a job to learn,” and “It’s so fun to me as an adult, not even to mention about kids.” While investigating mathematics, the participants used their own bodies in the process of original aesthetic creation. Dance movements were (1) arranged based on complex algebraic patterns and geometrical
transformations and (2) recorded and represented by using mathematical symbols to pinpoint locations and shapes, as well as other measurement-related information such as speed, time, and dynamics. When participants completed the activities, they often reported feeling a cheerful sense of accomplishment at achieving the mathematical learning goals while enjoying their own dance-themed creations.

Instructional flexibility was one of the key features that preservice teachers described experiencing when they were reflecting on participating in the intervention activities. Depending on their own personal backgrounds and abilities, participants chose the difficulty level of the mathematics and the choreography for their math-based dance performance. Such learning experiences, designed to occur within each participant’s zone of proximal development (Vygotsky 1978), were intended to offer a safe environment for learners to take risks and accept challenges comfortably, so that their individual self-confidence regarding mathematics learning would gradually be increased through experientially reinforced pedagogy. During the dance activities, learners communicated their mathematical thinking to their peers, and through the interactions within and across groups, they became further exposed to their own untapped potential for learning mathematics. We aimed to generate a social, as opposed to individualistic, approach to learning and engagement with mathematical ideas, wherein participants learned from each other and critically evaluated each other’s ideas (Bandura 1977).

Before proceeding to final thoughts, several limitations to this study should be noted. This was a small-scale research sample with ethnically homogeneous participants, and there was no preassessment of participants’ perceptions toward dance-themed mathematics pedagogy. Nevertheless, even with these limitations, this study provided insight into examining possible opportunities for assisting preservice teachers’ mastering of interdisciplinary pedagogy for instructing elementary mathematics. The findings from this study invite further empirical research on (a) the effects of dance–mathematics integrated activities on preservice teachers’ self-efficacy toward teaching mathematics and (b) in-service teachers’ classroom implementations of such types of lessons for specific mathematics topics. Also warranted is longitudinal research on students’ dispositions and achievements in mathematics as a result of learning mathematics within other arts-themed contexts. Teacher education programs should offer more experiences to preservice teachers wherein they can develop, implement, and evaluate innovative mathematics teaching strategies. By encouraging discoveries that come from authentic teamwork, and with an emphasis on real-life problem solving that compares and contrasts multiple legitimate solutions, employing contextualized challenges within interdisciplinary themes can revolutionize traditional mathematics education (Gresham 2008; Knoblauch and Hoy 2008). This study offered several practical insights for teacher educators who wish to employ the arts, such as dance, in instructing mathematics teaching methods to their preservice teachers. With dance educators’ support and guidance, dance—like many of the arts, perhaps all of them—can be developed as a mathematics teaching resource that helps students to better explain, represent, and apply mathematics within personally meaningful contexts.

REFERENCES


Dance-Themed Mathematics Education


