Connecting Gross-motor Movement, Dance, and Mathematics in the Elementary Curriculum

Virginia Usnick
Marilyn Sue Ford
Curriculum and Instruction
University of Nevada, Las Vegas
Las Vegas, NV 90154-3005
vusnick@unlv.nevada.edu
fordm@unlv.nevada.edu

A group of teachers in a week-long workshop designed to help them connect mathematics and art was asked to name three artists. No teacher named Baryshnikov, Tallchief, or Astaire. In fact, no dancers were mentioned at all. The most commonly identified artist was Van Gogh, followed closely by Monet. In a distance third was Picasso with Escher in fourth. Frank Lloyd Wright's name appeared twice and Mozart, Joplin, McCartney, and Homer each appeared once. Homer was the only literary artist listed. One teacher mentioned her aunt who, she stated, "dabbles" in painting. Of the 20 individual artists named, 75% were best known as painters; few would be considered contemporary artists. It seems, at least for the majority of this group of teachers, that "art" refers to something visual, static, and possibly permanent; and that an "artist" may be someone already deceased. The possibility that art was visual but fluid and ephemeral did not arise and the idea that an artist might be contemporary or even a peer rarely occurred.

The leader of the workshop (one of the authors of this paper), having spent much of the first half of her life in a dance studio, was surprised by the lack of any mention of the art of dance. She had always felt her dance training had helped her learn mathematics, especially geometry. At about the same time as the workshop, the other author was volunteering in her first-grade son's classroom. One day, during recess, she and the classroom teacher were turning rope for a group of jumpers. The teacher commented that those with good jumping skills were her good readers. The volunteer mother said, "No, those are your good mathematicians." These two incidences triggered our on-going interest in connections between movement and mathematics, and between gross-motor development and elementary-aged children's achievement in school mathematics.

One of the most obvious connections between movement and mathematics is in the area of spatial sense. Del Grande [1] identified several spatial factors (e.g., eye-motor coordination, position in space percention, visual discrimination) important for the learning of mathematics. Several of these have also been identified in the physical education literature as important for development of movement skills [2]. Other connections include time, force, and patterns. When one focuses on potential content within both domains, the list continues to grow.

The notion of using movement to teach mathematics (typically, arithmetic) is not new but regained interest during the latter half of the 20^{th} century [3,4]. This renewed interest may have been sparked by Piaget's theories regarding child development and supported by Gardner's theory of multiple intelligences.

In addition to the literature in the fields of psychology, mathematics education, and physical education, the connection between movement and academic achievement is gaining support from medical research into brain development. A fatty substance called myelin forms an insulating sheath around nerve fibers and helps transmit impulses through the nervous system. The thicker the sheath, the quicker the transmissions. The advantages in an academic setting seem obvious.

Myelinization (also called myelination) is the process of laying down this insulating sheath. There is a strong possibility that gross-motor movement stimulates this process [5]. Bilateral (cross-body) and midline (cross waistline) movements may be most necessary in generating synaptic connections between the two hemispheres of the brain.

As mathematics educators, we became concerned when our local school district removed recess from the school day. So we decided to investigate the potential relationship between movement and mathematics achievement. We were familiar with the KeyMath, an individually-administered mathematics assessment [6] and a colleague in physical education gave us an unpublished taxonomy of gross-motor development with evaluation information for each level of movement.

We have collected data from first and second graders. Preliminary results are showing a significant correlation (at the .05 level) between mathematics achievement and gross-motor development, especially throwing and striking. While the correlations are strong for first graders, they are even stronger for second graders. Could it be that gross-motor development is more important for academic achievement as children grow older?

References

[1] J. Del Grande, *Spatial sense*, Arithmetic Teacher,Vol. 37, no. 6, pp. 14-20. 1990.

[2] L. Nilges & V. Usnick, *The role of spatial ability in physical education and mathematics*, Journal of Physical Education, Recreation and Dance, Vol. 71, no. 6, pp. 29-33, 52-53. 2000.

[3] R. Ashlock & J. Humphrey, *Teaching Mathematics Through Motor Learning*. Charles C. Thomas Publishing Company, Springfield, IL. 1976.

[4] R. L. Memmel, *Arithmetic through play*, Journal of the American Association for Health, Physical Education and Recreation, Vol. 24, p. 31, 47. 1953.

[5] E. Marsh, *Black patent shoes: Dancing with MS (Multiple Sclerosis)*. Sideroad Press, Copetown, Ontario, CANADA. 1996.

[6] A. Connolly., W. Nachtman, & E. M. Prichett, *KeyMath: Diagnostic Arithmetic Test*. American Guidance Service, Circle Pines, MN. 1988.