



# An embodied cognition approach to enhancing reading achievement in New York City public schools: Promising evidence

Roisin P. Corcoran <sup>a, b, \*</sup>

<sup>a</sup> IRINSTITUTES, Dover, DE, USA

<sup>b</sup> UCD, Ireland

## HIGHLIGHTS

- This study examined the impact of a dance program involving embodied cognition.
- The sample included fourth grade students in New York City Public Schools.
- The analysis of student achievement scores and teacher survey results are reported.
- Results reveal an increase in reading scores between pretest and posttest.
- Teachers reported adequate fidelity of implementation.

## ARTICLE INFO

### Article history:

Received 23 February 2017

Received in revised form

2 November 2017

Accepted 8 November 2017

### Keywords:

Academic achievement

Dance

Embodied cognition

Schools

Teachers

## ABSTRACT

The study purpose was to examine the relationship between the Mark DeGarmo Dance (AKA Dynamic Forms, Inc.) (MDD) program, involving principles of embodied cognition, and student achievement over time. The sample included fourth grade students ( $N = 169$ ) in schools ( $N = 4$ ) in New York City Public School District whose teachers and students participated in the MDD program. Using a pretest posttest single group design and hierarchical linear modeling, the results of this study analyze student achievement as measured by standardized test scores. Teacher survey results are also reported. The achievement results reveal a significant increase in reading between pretest and posttest for students that were in the program. Teachers reported adequate fidelity of implementation.

© 2017 Published by Elsevier Ltd.

## 1. Introduction

Too many children in Title I schools are failing to develop an adequate basis in reading in their early schooling, and this may hold them back in key learning concepts for their entire lives. With educational reform that stresses accountability dominating the current policy climate, improved student academic achievement is critically relevant. Over the last decade, researchers and policy-makers have increasingly focused on the effectiveness of arts and culture programs in raising student achievement and transforming schools. Yet, research shows that only 7% of U.S. elementary schools teach dance as part of regular curriculum. In addition, less than 4% of schools receive outside funding for a dance program (Bonbright,

Bradley, & Dooling, 2013). Despite this, there exists some literature that supports links between dance programs and student achievement, highlighting the need for arts and culture in schools, and the implementation of dance in particular (Bonbright et al., 2013; Catterall, Dumais, & Hampden-Thompson, 2012). Researchers and theorists that support this link point to the mechanism of embodied cognition which may facilitate enhanced learning through dance.

The relationship between emotion, cognition, and the body matter in teaching, learning and learning to teach (Corcoran & Tormey, 2010; 2012a; 2012b). Neuroscientific research and theory on embodied cognition is well established (Alibali & DiRusso, 1999; Anderson, 2003; Ansari, 2008; Broaders, Cook, Mitchell, & Goldin-Meadow, 2007; Fayol, Barrouillet, & Marinthe, 1998; Goldin-Meadow et al., 2009; Johnson, 1987; Link, Moeller, Huber, Fischer, & Nuerck, 2013; Varela, Thompson, & Rosch, 1991; Wilson, 2002). While many embodied cognition theories exist (Wilson, 2002), the

\* IRINSTITUTES, Dover, DE, USA.

E-mail address: [rcorcoran@irinstitutes.org](mailto:rcorcoran@irinstitutes.org).

basic interpretation refers to how “human cognition is originally rooted in sensori-motor processes and thus determined by bodily experiences” (Fischer, Moeller, Bientzle, Cress, & Nuerk, 2011, p. 178). Recent research in cognitive neuroscience has suggested strategies that may help young children build foundational concepts and skills. Recent evidence from cognitive neuroscience suggests that academic skills are linked to parietal and frontal brain areas responsible for body movement in space, and lab experiments suggest that teaching children emphasizing movement and space may help them learn. Yet these principles have not been rigorously tested in applied settings or in preparing teachers and school leaders to meet the demands of the profession (Corcoran, 2017a, 2017b; Corcoran, & O’Flaherty, 2016; 2017a, 2017b).

The current study attempts to examine the effectiveness of the Mark DeGarmo Dance program (AKA Dynamic Forms, Inc.) (MDD). The approach evaluated grows directly out of cognitive neuroscience theory and research on embodied cognition, and represents the first rigorous evaluation of an approach supported by cognitive neuroscience lab research in actual schools over a significant period of time (i.e., a minimum study duration of 12 weeks). The criterion of 12 weeks has been applied in previous systematic reviews (Samdal, Eide, Barth, Williams, & Meland, 2017).

### 1.1. Problem

Far too many students in high-need schools across America do not read at national norms (National Center for Education Statistics, 2015). Children who are both non-proficient readers and living in high poverty are at even higher risk. According to a 2015 report of the National Assessment of Educational Progress (NAEP), 52% of fourth grade children not qualifying for reduced or free lunch scored above or at “proficient” in reading compared to 21% of fourth grade children qualifying for reduced or free lunch. Further, 46% of whites scored above or at “proficient,” compared to 21% of Hispanics and 18% of African-Americans (National Center for Education Statistics, 2016). Students who struggle to read are at much greater risk for referral to special education, grade retention, and school drop-out (Neuman & Dickinson, 2003). Students who can read proficiently are more likely to be career and college ready (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996). Conversely, students experiencing difficulty reading are at risk for long-term struggles with academic achievement (Neuman & Dickinson, 2003). Clearly, all U. S. schools have a great deal of room for improvement, but schools that serve many high-need students, and disadvantaged students of all races, are in crisis. New solutions including evidence-based programs<sup>1</sup> are needed to improve reading achievement nationwide for all subgroups of children.

### 1.2. Theory and research on embodied cognition

In the field of affective, cognitive, and neuroscience research, researchers often attempt to explain phenomena using a conceptual framework that encompasses three distinct, but inter-related levels of analysis: psychological processes, experience and behavior, and neural systems (Ochsner, Silvers, & Buhle, 2012). In conjunction with objective measurement, neuroimaging procedures allow phenomena to be observed in a behavioral and neural level and researchers can then utilize these observations to deduce the relationship of mediating affective and/or cognitive processes (Ochsner

et al., 2012). Using this as a starting point, this review of the extant literature is organized in terms of the behavioral level phenomena. In other instances this review will be structured in relation to problems that concern the neural-level pathways from which the research has made considerable strides within the field. As a whole, the research being reviewed limits and impacts our understanding of whether a teaching approach based on embodied cognition leads to significant improvements in reading achievement.

Embodied cognition is well established in neuroscientific theory and research (Alibali & DiRusso, 1999; Ansari, 2008; Broaders et al., 2007; Dehaene, 2005; Fayol et al., 1998; Goldin-Meadow et al., 2009; Gracia-Bafalluy & Noël, 2008; Immordino-Yang & Damasio, 2007; Link et al., 2013; Menon, Rivera, White, Glover, & Reiss, 2000; Tschentscher, Hauk, Fischer, & Pulvermüller, 2012; Wilson, 2002). The basic interpretation describes how “human cognition is originally rooted in sensori-motor processes and thus determined by bodily experiences” (Fischer et al., 2011, p. 178). Research (Barsalou, 2008; Wilson, 2002) shows that embodied cognition concepts increase student’s satisfaction and confidence about learning (Zhou, 2012), and may improve academic achievement (Fischer et al., 2011). Developments in neuroscience specifically links body movements with academic achievement. For example, in fMRI research Michaux et al. (2013) and Krinzinger et al. (2011) found that finger movements are linked with mental arithmetic.

There exists a growing body of literature to suggest that having children participate in whole-body or finger movements in order to aid in internalizing mathematical concepts complements the learning process when compared to identical actions that lack whole-body or finger movements (e.g., Fayol et al., 1998; Gracia-Bafalluy & Noël, 2008). Link et al. (2013) conducted a study where first graders were taught to designate a researcher-provided number by walking via a number line on the ground to the location of the same number. These children improved substantially from this procedure compared to those children who were assigned the same number line directions, but did not move to the numbers.

Alibali and DiRusso (1999) discovered that having preschoolers gesture while they counted objects improved precise counting and minimized errors. When child participants made hand gestures while explaining solutions to unique problems, this provided a mechanism for solving the immediate problem but also aided in solving future problems, compared to those children who were not instructed to use hand gestures (Broaders et al., 2007). Another study found similar positive effects of encouraging children to utilize gestures for problem solving (Goldin-Meadow et al., 2009).

Fischer et al. (2011) found high-need students that took part in a digital dance mat activity showed improvements on a standardized achievement test. Fisher, Hirsh-Pasek, Newcombe, and Golinkoff (2013) showed that preschool students acquired increased geometric knowledge as a result of “guided play” compared to students taught using traditional, didactic methods.

These research projects empirically support the premise that actively participating in activities may improve students’ academic performance. However, much of this prior research involves brief and artificial studies. Rigorous research is needed to test embodied cognition in a more intensive classroom intervention, both to learn how strategies applying this neuroscience principle might increase learning, but also to enrich theoretical work with pragmatic findings worth subjecting to more structured tests.

### 1.3. Mark DeGarmo Dance (AKA Dynamic Forms, Inc.) (MDD)

Mark DeGarmo Dance (AKA Dynamic Forms, Inc.) (MDD) was founded in 1987 based on a commitment to education and the arts, dance arts creativity and performance, and intercultural community. Its educational vision is to inspire social responsibility through

<sup>1</sup> In this article, the term “program” refers to any combination of professional development, textbooks, computer software, professional development, or interventions that a teacher or school could implement in order improve outcomes, particularly achievement.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات