McCormick Center
FOR EARLY CHILDHOOD LEADERSHIP
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Research Notes

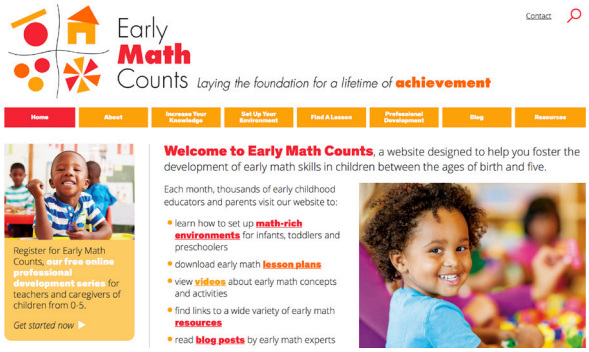
Effective Online Professional Development for Early Childhood Educators: An Evaluation of the Early Math Training Model

Given the diversity of the current early childhood education and care (ECEC) workforce and varying educational attainment and preparations, professional development has been identified as an effective way of increasing knowledge, skills, confidence, and capacities of early childhood teachers in impacting young children's development (Sheridan, Edwards, Marvin, & Knoche, 2009). Therefore, promoting professional development has become an important focus of early childhood program leadership in continuous quality improvement efforts. However, the opportunities and accessibility of professional development can be limited for many early educators, such as family child care providers and professionals who work in full-year, full-day programs in under-resourced communities (Warner-Richter, Paschall, Tout, & Lowe, 2020).

CHALLENGES TO EFFECTIVE PROFESSIONAL DEVELOPMENT FOR THE EARLY CHILDHOOD WORKFORCE

Most professional development opportunities for early childhood teachers are offered as face-to-face sessions (in various formats, including workshops, coaching, and college courses), tailored for teachers in traditional school- or center-based child care, offered during a traditional academic year, or during summer, or on professional development days when children do not attend (Sheridan, Banzer, Pradzinski, & Wen, 2020). These professional development sessions often involve lecturing, reflective practice, peer collaboration, and coaching/mentoring for individual feedback. Notably, none of these models fully meet the needs of the current early childhood workforce.

Early childhood educators indicate that time, location, and cost are factors limiting access to professional development opportunities. Educators often cannot easily leave their classrooms or may be geographically restricted (Olsen, Donaldson, & Hudson, 2010). Early educators who work in non-school settings (e.g., family child care homes or full-day, year-round child care centers) often cannot engage in traditional in-person professional development due to constraints of operating hours, limited funds, or programs that cannot afford to close to attend trainings or workshops. In addition, most professional development workshops are short-term in nature and do not provide follow-up supports that allow sustained exploration and application of the content and pedagogical instructional approaches covered in the training. Long-term models of professional development and in-person coaching are beneficial, but can be costly.



Recommendations for effective professional development are that the learning opportunity be long-term, sustained, and focused on content areas, so that early educators can actively return to materials over time (e.g., Desimone, 2011). Online professional development has the potential to overcome some of the barriers identified through providing access, relevance, and content level specificity that early childhood educators seek. Educators can access professional development at a time and place that is convenient to them, potentially eliminating the geographic and time constraints of traditional professional development, with low or no cost (e.g., Stone-MacDonald & Douglass, 2015). Modularized, resource-based, well-designed online trainings are received favorably by early childhood educators (Kyzar, Chiu, Kemp, Aldersey, Turnbull, & Lindeman, 2014). In this review, we will present one of the nation's first online professional development models that target early math teaching and learning.

EARLY MATH COUNTS – AN ONLINE PROFESSIONAL DEVELOPMENT MODEL

Research indicates that early childhood teachers often lack the confidence, knowledge, or classroom practice skills to include math in their classrooms (Brenneman et al. 2019). Thus, professional development in early math is especially important. In response to this need, a grant-funded project was initiated in Illinois to develop online early math resources and to create a series of online math courses that center around the big ideas

in math. The home for the early math resources is a free access website called Early Math Counts. The website provides early childhood educators with information about the mathematical concepts necessary to teach and facilitate mathematical learning and how to best set up their environments (both in centers and in homes) to foster math literacy.

The site includes over 120 developmentally appropriate math lesson plans for young children organized by age group, standard addressed, topic, and materials used. In addition, there are short videos that are designed to help early educators understand basic mathematical concepts as well as videos to assist in setting up a mathematically rich environment. There are links and resources for early educators to access other web resources, standards, videos, and related information. There is also an active blog to update users with early math concepts and information and to help create a sense of community where users can communicate with the blogger and each other. There are interactive blog posts written by invited early math experts and a comment section where early childhood educators can share thoughts, ideas and best practices, and ask and answer pressing questions.

The web resources were also developed into a free, on-demand, eight-course online curriculum which introduces early childhood educators to mathematical concepts such as math literacy, number sense, patterns, geometry, measurement, data collection, and math processes. The courses are housed on a State of Illinois early childhood provider registry and are free for all ECEC professionals including home visitors, curriculum coordinators, directors, and educator trainers/coaches. Professional development and continuing education units are awarded at the end of each hour-long course.

Since January 2016, over 9,711 early childhood professionals in the State of Illinois have participated in this online professional development program. There were more than 48,558 individual course completions and most participants took more than one course (the average number of courses taken was four). A sister website, Early Science Matters, has recently been launched, with similar format, resources, and structure as the *Early Math Counts* site.

EVALUATION OF THE EARLY MATH ONLINE PROFESSIONAL DEVELOPMENT MODEL

An evaluation study has been published in the journal of *Early Education and Development* to test the effectiveness of this early math professional development model (Sheridan & Wen, 2020). The study involved 2,332 early childhood professionals from 78 counties (out of 102) in the State of Illinois. Less than half of the participants (43%) were classroom teachers, the majority (57%) were comprised of family child care providers, center directors, education coordinators, and home visitors.

Their perceived effectiveness of the model was measured through various quantitative and qualitative data, including: (1) course evaluations; (2) quizzes at the end of the courses; (3) rating of to what extent the courses improved the educators' confidence in teaching early math, refined their pedagogical content knowledge in early math, changed their instructional practices in early math, and increased their awareness of how to incorporate math activities into classroom practice; and (4) qualitative feedback about their learning from the program. In addition, a subsample of 95 early educators took pre- and post-surveys regarding their attitudes, confidence, beliefs, and knowledge in teaching early math.

The results showed that participants rated the courses as helpful, they were satisfied with the online learning experience, felt the courses were easy to navigate, and were highly likely to recommend the courses to others. On average, the participants had mastery of the course content, reviewed most of the course content and materials carefully, and rated themselves as highly engaged with the course materials. In addition, participants had overall positive ratings that the courses improved their confidence in teaching early math, refined their pedagogical content knowledge in early math, changed their instructional practice in early math, and increased their awareness of how to incorporate math activities into classroom practice. African-American and Hispanic/Latino participants had consistently more positive ratings than Caucasian or other ethnic groups on their course experiences as well as their engagement with the course materials. Participants' overall engagement level and the amount of course materials and content reviewed were significantly and positively associated with all outcome variables, except for the quiz scores.

More rigorous evidence on program effectiveness comes from the pre- and post- surveys comparison among the same group of participants who took paired surveys on four subscale measures, including (1) their general attitudes towards math, (2) attitudes towards teaching early math, (3) beliefs about children's early math learning, and (4) knowledge about early math concepts. The finding showed promising results in that there were significant differences between the pre- and post-surveys on all four measures of participants' attitudes, beliefs, and knowledge regarding early math teaching and learning, with significantly higher scores after taking all eight of the courses (Table 1). In addition, rich qualitative data suggested that the professional development promoted participants' knowledge and skills in children's math learning, environment setup, activity planning, math concepts and vocabularies.

DISCUSSION

Access to effective professional development opportunities is critical for promoting child care quality, and there are various factors at the individual, program, and system levels that affect this accessibility. Federal, state, and local systems need to share responsibility for structuring, coordinating, and financing these professional development efforts. ECEC program administrators need to maximize these resources by targeting supports where they will be most effective and meaningful. The learning opportunities for early educators need to be sustainable, accessible, self-directed, and relevant. Online professional development programs offer some unique features (e.g., easy access, low cost or free, extended accessibility, time convenience, no geographic barriers) and are potentially more scalable than the traditional, face-to-face models. The evaluation of *Early Math Counts* showed that online asynchronous professional development can be a powerful and exciting learning opportunity for early childhood educators, including those hard-to-reach professionals such as family child care providers and teachers working in full-day, full-year centers.

Table 1. Pre-Survey vs. Post-Survey: Pair Wised T Test Results (N = 95)

	Pre-Survey		Post Survey		
	Mean	SD	Mean	SD	T Tests
Attitudes towards math	3.41	.95	3.74	.89	-6.76**
Attitudes towards teaching early math	3.65	.60	4.08	.57	-6.77**
Beliefs about children's early math learning	4.07	.58	4.21	.52	-2.88**
Knowledge about early math	4.02	.74	4.47	.57	-6.72**

***p<.01.*

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