Standards for Preschool and Kindergarten Mathematics Education

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The standards-based accountability movement that has dominated elementary and secondary education reform for the last decade has now reached preschool and kindergarten. The most obvious manifestation of this trend is the requirement for child outcome-based accountability in the 1998 reauthorization of Head Start. Other evidence is readily available as increasing numbers of states develop guidelines for prekindergarten learning. Professional organizations are also extending their learning standards down to preschool, while technical reports such as the National Research Council’s *Preventing Reading Difficulties in Young Children* include statements of literacy accomplishments for children, even below the age of 3 (Snow, Burns, & Griffin, 1998). In its revised standards, the National Council of Teachers of Mathematics (NCTM, 2000) for the first time includes prekindergarten mathematics standards.

This paper addresses the advantages and disadvantages of such standards-based accountability strategies with very young children, and the particular implementation issues involved in the field of early childhood education.

**What are the disadvantages and advantages of having specific mastery goals for young children?**

Historically, early childhood educators have been resistant to specifying learning goals for very young children for several reasons. Their frequently voiced concerns mirror the basic disadvantages of having specific mastery goals for young children’s learning. A major concern has arisen from the fact that children develop and learn at individually different rates so that no one set of age-related goals can be applied to all children. A specific learning timeline may create inaccurate judgments and categorizations of individual children. Early childhood educators are wary that outcomes will not be sensitive to individual, cultural, and linguistic variation in young children. These concerns are not without basis in reality given that readiness testing for preschool and/or kindergarten entrance and exit are common, and negative consequences are more frequent for certain groups of children.

A second common concern has been that specifying learning outcomes would limit the curriculum to those outcomes and would also lead to inappropriate teaching of narrowly defined skills. This concern is similar to the “teach to the test” phenomenon that occurs with older children. It arises in early childhood education primarily because the field has a long, valued tradition of emergent curriculum and following individual children’s interests and needs in teaching. A related concern is that the learning outcomes will be limited to a few academic areas without adequately addressing the development of the “whole child”. Early childhood educators are especially concerned that the physical, social, emotional, and aesthetic dimensions will be
neglected, and these are critical areas of development during the earliest years of life. Finally, a fundamental concern is that mastery goals set for young children will be developmentally inappropriate, that is, they will not be achievable as well as challenging for the majority of children within a given age range, nor will they be responsive to individual, cultural, and linguistic diversity.

While all these potential disadvantages are real and warrant attention, each of them is based on the same assumption: that the mastery goals set will be the wrong goals. If this assumption could be confronted and changed, then many of the potential disadvantages could be turned into advantages.

Just as there are potential disadvantages, there are several potential advantages to specific mastery goals. First, teachers of young children need guidance about what are appropriate expectations for children’s learning. When goals are achievable and challenging, that is developmentally appropriate, they provide a valuable and useful framework for planning and implementing curriculum and individualizing teaching. A common criticism of early childhood programs is that the curriculum lacks depth and intellectual rigor. Designing curriculum using agreed-upon, empirically-based goals would undoubtedly raise the bar on the learning experiences and outcomes for children.

Precedents are now arising in several arenas of work in early childhood education. For example, the International Reading Association and the National Association for the Education of Young Children recently published a joint position statement on developmentally appropriate practices in early literacy (IRA/NAEYC, 1998; Neuman, Copple & Bredekamp 2000). In working on the position statement, we found that teachers welcomed more specific guidance on learning goals linked to age/grade levels. Such information not only helps guide planning and instruction, but also helps teachers identify children whose learning progress is outside the typical range.

The assumption that goals will be inappropriate or unachievable is unfair. As long as goals are developed drawing on research and the wisdom of practice, goals can be excellent contributions, as the NCTM standards have been. However, for specific mastery goals to truly be useful guides for teachers, they need to be more closely connected to age/grade levels than the NCTM standards have been. The draft standards list mathematics accomplishments that cover the broad range of prekindergarten through second grade and each section states: “all children should”. This format makes sense when the emphasis is on indicating the full range of development and learning in a particular mathematics area. It also makes sense from the point of view of not wanting to put limits on children’s learning nor on lowering our expectations for their achievement. These are very important considerations; however, for most teachers the more fundamental questions are what to teach and when to teach it. Teachers need a clearer picture of the overall developmental/learning continuum from which to assess children’s learning. The NCTM standards do not intend that every prekindergartner “should” have mastered all the math content listed and yet, they could easily be interpreted that way. The intent of the standards
needs to be as clear as possible. Providing guidance about appropriate mastery goals for children’s learning is especially crucial in the area of mathematics where teachers’ own knowledge of the discipline is usually inadequate to make these judgments.

How do standards take into consideration the wide range of what is developmentally appropriate?

Any standards document must acknowledge at the outset that there is a wide range of individual variation, and there is a wide range of expectations that are well within the range of typical, i.e. developmentally appropriate. Such statements commonly appear on most standards documents but unfortunately, they are essentially ignored when standards are implemented in assessments or decisions about children. Therefore, a more useful strategy is to articulate goals/standards for young children as a developmental or learning continuum. Certain subject areas including language, literacy, and mathematics lend themselves more easily to such treatment.

The IRA/NAEYC position statement emphasized the concept of learning to read and write as a developmental continuum rather than an all-or-nothing phenomenon. The concept has been well accepted by early childhood educators as well as reading specialists. A comparable collaboration between experts in mathematics and early childhood would be a useful strategy to promote understanding. The emphasis should come from mathematicians, however, because the message of individual variation is expected from early childhood educators and is less likely to be influential.

How do we implement such standards considering such a wide range of adults who care for children, especially preschool children?

The biggest challenge to implementing any set of learning goals for very young children is the range of qualifications of the adults who teach them. Preschool-aged children are served in a variety of settings including family child care homes, child care centers (that vary widely in quality), and public schools. (In addition, many children do not experience an out-of-home educational program.) The qualifications of workers in these settings range from a high school diploma (or less) in child care centers to a CDA or associate degree in Head Start to a baccalaureate degree with a teaching certificate for public schools. Most state child care licensing standards require very little pre-service training. Texas, for example, requires 8 clock hours! Therefore, the challenge of implementing early childhood curriculum reform and standards-based accountability is overwhelming.

It is also important to point out that even among better educated teachers, very few would have taken more than one course in mathematics and perhaps part of a course in math methods for young children.

The low qualifications of the early childhood work force are directly linked to very low salaries which are in turn, related to high rates of turnover in the field. To significantly raise educational qualifications of early childhood teachers, it will be necessary to raise compensation
significantly. Setting high standards for children’s learning will have little effect unless high standards are also set for teachers. However, we cannot wait until the intransigent problem of compensation is solved before we act to improve the quality of learning experiences and outcomes for young children.

In the meantime, the target for such standard-setting efforts such as that of NCTM needs to be teacher educators, curriculum developers, trainers, and others who influence the quality of practice in programs for children. For instance, Head Start has an entire infrastructure of training and technical assistance providers, most of whom are blissfully unaware of NCTM, not to mention new knowledge about mathematics learning in young children. Commercial developers continue to offer the same, shallow “mathematics” worksheets with numbers 1-10 and sell that as a math curriculum.

A concerted effort needs to be made to come to consensus among early childhood educators and mathematics educators about what the standards should be for preschool and kindergarten. Then an implementation plan is needed to move the standards into practice by reeducating teacher educators and making sure classroom teachers have the materials and knowledge they need to implement well-designed curricula. Math is one area of the early childhood curricula that if left to emerge is likely to be limited to passing out napkins and counting attendance.

**Should we have standards for children or standards for programs, or both?**

Early childhood education has a history of program standards. These are usually licensing standards for child care, but the field also has more than 15 years experience with NAEYC accreditation criteria, and more recently family day care accreditation by the National Association for Family Child Care (NAFCC). These systems set the parameters within which a program should operate. They do not specify any one curriculum, but they do have curriculum implementation standards. For the most part, such standards are based on research on the effects of various program components on outcomes for children. Recently such outcome research has focused more on child care and found that higher quality programs result in learning benefits into elementary school, including in mathematics (Cost, Quality, and Child Outcomes Study Team, 1999).

Given the diversity of regulators, funders, and auspices in the field of early childhood education, it remains necessary for the foreseeable future to establish program standards, at least in part because programs that meet such standards don’t just protect children from harm but actually contribute to their development and learning. Program standards in early childhood provide the opportunity for adults to learn about standards and therefore, are essential to provide the context for child-outcome standards to be applied.

But we can no longer rely on program standards alone to ensure quality. We need to be sure that what we’re doing with children is making a difference for them. We also need to test program standards against outcomes. Are children making expected progress? Are we accelerating
learning progress for those children who come to preschool far behind the typical expectation for their peer group? To answer these questions, we must know what the expected standard is, we must know what to do to help children achieve it, and we must know how to assess what children have learned. So setting standards is only the first step. Connecting standards to curriculum, teaching, and assessment is essential if the standards are to be implemented.

The NCTM standards draft recognizes these connections admirably and addresses them to a large extent, but not in the area of preschool. There is minimal attention to teaching the child below kindergarten and little clarity about what appropriate expectations should be. For the document to be really useful, it must take the next step and get even more specific. Admittedly, by doing so, other problems will arise, such as were referred to earlier under disadvantages. But if this work is done very carefully and followed up by training and technical assistance through early childhood networks, the results could be quite positive. We have already begun to see both positive and negative effects on the field of the new information coming out of the early literacy work. Compared to mathematics, language and literacy were well-explored areas of the early childhood curriculum. So the potential to create change is great. But the time is now, while there is still motivation and before the curriculum becomes totally consumed by reading.

Conclusion

Perhaps, a bigger question than any of the four addressed here is how to distinguish between what children can learn and what they should learn. Standards should be research-based and a growing body of research in early mathematics education demonstrates that we have greatly underestimated children’s cognitive capacities. For example, research demonstrates that children can learn numbers up to 100; but should every child in preschool be expected to know numbers to 100? Children tend to exhibit these competencies under particular conditions. How can those conditions be translated into the average preschool or kindergarten classroom? Any further work on setting more specific mathematics learning goals for preschool/kindergarten needs to pass the can vs. should filter. The NCTM draft now says all children should for each standard. If that’s the verb, then we know how the standards will probably be used and should act accordingly.

References


