The iStartSmart™ learning system is founded on the interrelationship among key components known to promote positive experiences and school readiness for young children. These include:

I. Child Development
II. Effective Early Childhood Education Practices
III. Critical Content for School Readiness
IV. Developmentally Appropriate Educational Technology

I. Child Development

The principles from theories which have had the most substantial impact on early childhood education guided the creation of the iStartSmart. These include:

- Piaget-Children actively construct knowledge as they manipulate and explore their world.
- Vygotsky-Zone of proximal (or potential) development is a range of tasks that the child cannot yet handle alone but can accomplish with the help of more skilled partners.
- Information Processing-Children make gains in many aspects of thinking, from attention, memory, and categorization skills to complex problem solving.

The iStartSmart learning system is based on the recent understanding of brain development, in particular that between age 2 and 6, children gain in physical coordination, perception, attention, memory, language, logical thinking, and imagination.

II. Effective Early Childhood Education Practices

Several features of preschool programs are connected to school readiness and are incorporated seamlessly in the iStartSmart learning system. The social relationships between teachers and children, and the nature of the classroom environment, contribute to effective learning for young children. For example, these programs have:

- A great deal of reading occurring,
- One-on-one teaching,
- Functional and environmental print displayed for children,
- The presence and use of planful lessons,
- Materials for play available that support literacy, and
- Opportunities for children to have meaningful experiences firsthand.

More about Scaffolding. Taken from the application of Vygotsky's focus on scaffolding and differentiated learning for individualized instruction, Hatch developed iStartSmart with built-in robust scaffolding. Scaffolding sets up a positive and meaningful interaction between the child and the teacher-in this case the learning system. Scaffolding allows for iStartSmart to build on each child's interests and level of functioning in order to develop skills. With ample models for the child, the system guides the learner in reproducing the behavior, determining along the way if the skill should be presented more simply or in a more advanced manner for the child, and finally seeing the child carrying out the target end behavior on his/her own.

III. Critical Content for School Readiness: Literacy and Mathematics

A. Literacy Learning in Early Childhood

Large-scale studies have shown that young children—those entering kindergarten and first grade—vary greatly in their attainment of the early precursor skills that provide the launching pad for later literacy learning. In 1997, the U.S. Congress asked that a review of research be conducted to determine what could be done to improve reading and writing achievement. The resulting Report of the National Reading Panel: *Teaching Children to Read* has been influential in helping to guide reading-education policy and practice in the United States. However, that report did not examine the implications of instructional practices used with children from birth through age 5. To address this gap in the knowledge base, the National Early Literacy Panel (NELP) was convened.

Identification of the Domain of Early Literacy Skills. Conventional reading and writing skills developed in the years from birth to age 5 have a clear and consistently strong relationship with later conventional literacy skills. Six areas representing early literacy skills or precursor literacy skills had medium to large predictive relationships with later measures of literacy development. These not only correlated with later literacy as shown by data drawn from multiple studies with large numbers of children but also maintained their predictive power even when the role of other variables, such as IQ or socioeconomic status (SES), were accounted for. These six areas are all represented in iStartSmart and include

- Alphabet Knowledge (AK)
- Phonological Awareness (PA)
- Phonological Memory
- Rapid Automatic Naming (RAN) of letters or digits
- Writing or Writing name

Instructional Practices that Enhance Early Literacy Skills. The panel also set out to identify studies that employed experimental or quasiexperimental methods to determine the effectiveness of instructional strategies, programs, or practices in imparting conventional literacy skills or any of these precursor skills to young children. The strongest of these were code-focused interventions: Interventions designed to teach children skills related to cracking the alphabetic code. Most code-focused interventions included PA instruction. The code-focused instructional efforts reported statistically significant and moderate to large effects across a broad spectrum of early literacy outcomes. Code-focused interventions consistently demonstrated positive effects directly on children's conventional literacy skills. *It should be noted that the interventions that produced large and positive effects on children's code-related skills and conventional literacy skills were usually conducted as one-on-one or small-group instructional activities.*

B. Mathematics Learning in Early Childhood Findings

Mathematics education has risen to the top of the national policy agenda as part of the need to improve the technical and scientific literacy of the American public. There is particular concern about the chronically low mathematics and science performance of economically disadvantaged students and the lack of diversity in the science and technical workforce. Particularly alarming is that such disparities exist in the earliest years of schooling and even before school entry. Recognizing the increasing importance of mathematics and encouraged by a decade of success in improving early literacy, the Mathematical Sciences Education Board of the Center for Education at the National Research Council established the Committee on Early Childhood Mathematics. The majority of support for this study was provided by the U.S. Department of Health and Human Services, ACF, and Office of Head Start among other sponsors.

Identification of the Domain of Early Math Skills. The committee found that, although virtually all young children have the capability to learn and become competent in mathematics. In fact, well before first grade, children can learn the ideas and skills that support later, more complex mathematics understanding. There is expert consensus that two areas of mathematics are particularly important for young children to learn: (1) number, which includes whole number, operations, and relations, and (2) geometry, spatial thinking, and measurement. The iStartSmart learning system is built on these skills.

Instructional Practices That Enhance Early Math Skills. For most children the potential to learn mathematics in the early years of school is not currently realized. This stems from a lack of opportunities to learn mathematics either in early childhood settings or through everyday experiences in homes and in communities. This is particularly the case for economically disadvantaged children, who start out behind in mathematics and will remain so without extensive, high-quality early mathematics instruction. Pre-K children in the National Center for Early Learning & Developing (NCEDL) studies were exposed to mathematics content in only 6% of the classrooms observations. In the state-funded Pre-K classrooms observed in the NCEDL study, mathematics was often taught in conjunction with art, music, and fine motor activities. The committee thinks that the integration of mathematics with other activities may or may not be effective in supporting children's mathematics knowledge development. Apparently, mathematics teaching and learning is relatively rare even in classrooms that are otherwise judged to be high quality. Many widely used early childhood curricula do not provide sufficient guidance on mathematics pedagogy or content. When early childhood classrooms do have

mathematics activities, they are often presented as part of an integrated or embedded curriculum, in which the teaching of mathematics is secondary to other learning goals. Emerging research indicates, however, that learning experiences in which mathematics is a supplementary activity rather than the primary focus are less effective in promoting children's mathematics learning than experiences in which mathematics is the primary goal. The iStartSmart learning system therefore has specific strong activities for mathematics.

IV. Developmentally Appropriate Educational Technology

Experts confirm that preschool age children are developmentally ready and able to benefit from instruction with technology. The use of educational technology is now known to have a major, positive impact on the social, emotional, language, and cognitive development of children. It is recommended that many opportunities be given during the preschool years for exploration using technology tools in a playful, supportive environment. Researchers further agree that a number of technology applications have the potential to support and extend learning in the young child through their unique capability to provide excellent instruction in these important developmental areas that are critical for educational success

The Power of Computers to Teach is Exemplified in the iSS. Computers constitute quite different experiences that support teaching and learning. "The computer aids the meta-cognitive aspect of spatial activity, enabling the child to go beyond the physical world limitations." (Clements & Battista, 1991; Johnson-Gentile, Clements, & Battista, 1994) "Several characteristics of effective computer software can guide its creation and selections." (Clements & Sarama, 2005, 2008b). Hatch closely followed these recommendations when developing the iStartSmart learning system, including:

- Actions and graphics provide a meaningful context for children.
- Attention to reading level, attention span, clear instructions, and simple choice.
- After adult support, children should be able to use software independently, with multiple opportunities for success.
- Feedback should be informative.
- Children should be in control.
- Software should allow children to create, program, or invent new activities.

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