core focus™

CoreFocus™ learning activities:
Research Connections in the Early Elementary Education Setting

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The purpose of this White Paper is to present the research basis for CoreFocus, which is designed to increase children's reading and mathematics success in kindergarten and first grade. Within the CoreFocus™ learning activities you may also be interested in Teacher Talk which provides brief, but in-depth research for each of the content areas.

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SETTING THE STAGE: ENTRY INTO KINDERGARTEN

Understandably, as the first step on the path of formal schooling, kindergarten is a crucial time for children. The experiences children have before they enter kindergarten in part influence the degree to which they will succeed in school. These experiences impact factors such as physical well-being, social functioning, cognitive skills and knowledge, and children's approaches to learning[1]. Kindergarten represents new and positive opportunities for most children; while some are at increased risk for school failure, entering after several formative years lacking resources and support. Children who display early literacy skills and have had a prior positive literacy environment (such as being read to), who have a positive approach to learning, and whose general health is very good or excellent demonstrate better reading and mathematics performance after one and even two years of formal schooling compared with children who do not have these resources[2].

KEY SKILL AREAS FOR SUCCESS

While physical, social/emotional, and cognitive functioning make up the three primary developmental domains, educators know these are interrelated in complex ways. Due to this, all the domains need attention because they all influence one other. One relevant example is that children's early experiences are linked to their impulse management and social skills. When a child has self-regulation and can relate well to others, he or she can more fully benefit from an educational setting. This can then allow for growth in the cognitive domain. Research shows that understanding and attending to such links between domains is needed for high quality learning and development[3]. For the purposes of description however, we will look at these areas separately in the following section.

Cognitive Skills and Knowledge

Often considered the cornerstone of school success, cognitive development can be seen as an extended set of skills and proficiencies which are multidimensional and include language/literacy, math reasoning, and general knowledge about the world around them[1]. There are some areas where children are making good progress and other areas where this is less the case. According to the USDOE Early Childhood Longitudinal Study with national data on 22,000 children (ref), letter recognition begins with about two-thirds of children recognizing their letters when they start kindergarten, and after two years of school, essentially all children could recognize them. About one-third of children understood the letter-sound relationship at the beginning of words and about one in six children the letter-sound relationship at the end of words at the start of kindergarten. By the end of kindergarten, about three-quarters of children made the letter-sound connection at the beginning of words, but only just over half of children made this connection at the ending of words. After two years of schooling, there had been improvement for almost all children in this area. About five in six children could recognize common sight words by the spring of grade 1, but only about one-half of children understood words in context at this point[2].

In math, while most beginning kindergartners were able to recognize numbers, shapes and counting to 10, only a little more than half understood relative size (sequencing patterns and using units of length to compare objects), and less than a quarter were proficient in understanding ordinal sequence (position of an object in a sequence—second in line). The concept of relative size (for example,

counting beyond 10 and understanding and using units of length to compare objects) did improve for most children by the end of kindergarten, and most did show competence by the end of two years of schooling. However, only about three-quarters demonstrated proficiency in adding and subtracting basic whole units. On the other hand, there were some advanced children (about one quarter) who could multiply and divide simple whole units by the end of first grade.

Children at risk. Differences in children's achievement by background persisted from kindergarten through the end of first grade. First graders from non-poverty families were better able to recognize words by sight and understanding words in context than those from poverty families. The pattern was similar in math. Almost twice as many first-graders from non-poverty families were proficient at addition and subtraction and performing multiplication and division as first-grade children from poor families[2].

Social Skills

To be successful with regard to a variety of settings and people, including school, children must have positive interpersonal and social skills[4]. This goes beyond just "getting along with others" because knowledge is constructed within young children by interacting with others and their environment[5-7]. From the USDOE Early Childhood Longitudinal Study, teachers report about three-quarters of first-time kindergartners are accepting of peer ideas and form friendships, while a small number (about 10 percent) argue with others, fight with others and easily get angry often to very often.

The role of self-control and self-regulation. A number of studies support the notion that self-control is a resource that can be increased through suitable "exercise". Self control includes emotional as well as behavioral regulation and should increase with age due to the development of the sensory system. Children with more well-developed self-control are empowered, engaged, and enthusiastic at school. Children who have developed self-control find it easier to follow rules and obey the teacher, but self-control is more than being compliant. The term self-regulated can be used to describe learning that is guided by metacognition (thinking about one's thinking), strategic action (planning, monitoring, and evaluating personal progress against a standard), and motivation to learn[8,9]. In this way, it is connected to approaches to learning.

Approaches to Learning

For young children, how they approach learning is an essential ingredient in the school success recipe and revolves around how they address the task of learning. Approaches to learning are not a set of skills but rather how children construct meaning and orient themselves to learning. The National Education Goals Panel defined approaches to learning as "inclinations, dispositions, or styles rather than skills that reflect the myriad ways that children become involved in learning and develop their inclinations to persist"[1].

A review of the literature identified learning dispositions of children that reflect important approaches to learning[10]:

Curiosity/Initiative. Choosing to engage in a variety of activities that are new and challenging.
Persistence. Persisting in and completing tasks and activities.
Attention. Demonstrating increased attentiveness during activities led or directed by the teacher.

Self-direction. Ability to set goals, make choices, and manage time and effort with independence that increases over time.
Problem solving. Ability to solve problems in a variety of ways, such as finding more than one solution, exploring, and learning through peer interaction .
Creativity. Showing cognitive flexibility, imagination, and inventiveness.

According to the USDOE Early Childhood Longitudinal Study, as children begin kindergarten, teachers report that about two-thirds to three-quarters persist at tasks, seem eager to learn, and are able to pay attention, but this does leave a considerable number of children who have not developed these characteristics[11].

The Role of Critical Thinking. Young children can benefit from instruction that views cognitive gains as occurring in an interrelated manner. When children are exposed to a wide range of thought processes, they are better prepared for the tasks they will face in school[12]. Critical thinking encompasses many of the aspects of such thought processes. According to Glaser, critical thinking can be defined as "(1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods" [13]. Critical thinking can be seen as having two components: 1) a set of information and processing skills, and 2) the habit of using those skills to guide behavior. To qualify as critical thinking, the methods must go beyond just acquiring information or just using the skills as an exercise without real attention to and acceptance of the results/outcomes.

TEACHING YOUNG CHILDREN

The most important consideration when working with children is to consider developmental appropriateness.
The concept of developmentally appropriate practices refers to providing an environment in which the content, materials, activities, and approaches match a child's level of development and readiness[14]. A child's social/emotional, physical, and cognitive development are considered and practices and decisions are based on "(1) theories of child development, (2) individually identified strengths and needs of each child uncovered through authentic assessment, and (3) the child's cultural background as defined by his community, family history, and family structure"[15].

Content
There are now several landmark studies that have informed the field on the content needed by young children to be successful in literacy/reading and mathematics.

A Scientific Synthesis of Literacy Development and Implications for Intervention. Large-scale studies have shown that young children entering kindergarten and first grade have wide variation in their attainment of the early precursor skills that serve as the foundation for later literacy learning[16,17]. A review of research was commissioned by Congress to determine how reading and writing achievement could be improved in the early elementary grades. The Report of the National Reading Panel: Teaching Children to Read[18] has been influential in guiding reading-education policy and practice in the United States. However, that report did not examine the state of affairs practices with children prior to

kindergarten. To address this gap, the National Early Literacy Panel[19] was convened. **Following are the major findings from both reports.**

The National Reading Panel focused on alphabetics (phonemic awareness and phonics), fluency, and comprehension (including vocabulary). With regard to Alphabetics-Phonemic Awareness (higher level within phonological awareness related to the smallest units composing spoken language), the results of the experimental studies led the Panel to conclude that training in phonemic awareness was the cause of improvement in students' phonemic awareness, reading, and spelling. For Alphabetics-Phonics (which stresses the acquisition of letter-sound correspondences and their use in reading and spelling), the meta-analysis found that systematic phonics instruction produced significant benefits that were significant for students in kindergarten through 6th grade as well as for children having difficulty learning to read. Fluent readers read orally with speed, accuracy, and proper expression and fluency is necessary for reading comprehension. The Panel found that oral reading procedures that were repeated and guided had a significant and positive impact on word recognition, fluency, and comprehension across a range of grade levels. However, the Panel could not find a positive relationship between large amounts of independent reading and reading achievement improvement. The studies on comprehension via vocabulary suggested that vocabulary instruction does lead to comprehension gains, but that provided the methods are age and ability appropriate. Within text comprehension the panel found teaching a combination of reading comprehension techniques to be the most effective, and capable of assisting students in recall, question answering, question generation, and summarization of texts.

The National Early Literacy Panel followed the understanding that conventional reading and writing skills that are developed in the years from birth to age 5 have a clear and consistently strong relationship with later conventional literacy skills. A main interest of the panel thought was to look at emergent (early or precursor) literacy skills. Six areas representing these literacy skills had strong 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 include:

- Alphabet Knowledge (AK): Knowledge of the names and sounds associated with printed letters
- Phonological Awareness (PA): Ability to detect, manipulate, or analyze auditory aspects of spoken language (including the ability to distinguish or segment words, syllables, or phonemes), independent of meaning
- Rapid Automatic Naming (RAN) of letters or digits: The ability to rapidly name a sequence of random letters or digits
- RAN of objects or colors: The ability to rapidly name a sequence of repeating random sets of pictures of objects (e.g., "car," "tree," "house," "man") or colors
- Writing or Writing name: The ability to write letters in isolation on request or to write one's own name
- Phonological Memory: The ability to remember spoken information for a short period of time.

Scientific Research Basis for Teaching Young English Language Learners. A common thread that unifies the research on ELL children and monolingual English-speaking children is the emphasis on the development of oral language proficiency as a necessary prerequisite for later literacy[20]. A well accepted finding at this point is that children taught in English-only classrooms or those transitioned to English instruction before they can fully demonstrate well-established oral language abilities in their own language and have achieved some degree of English oral proficiency, do not progress as well as those who have the chance to learn and become competent and proficient through and in two languages[21,22]. The Report of the National Literacy Panel on Language Minority Children and Youth found that "English language learners may learn to read best if taught both in their native language and English from early in the process of formal schooling. Rather than confusing children, as some have feared, reading instruction in a familiar language may serve as a bridge to success in English because decoding, sound blending, and generic comprehension strategies clearly transfer between languages that use phonetic orthographies, such as Spanish, French, and English"[23].

The following are instructional approaches recommended based on a review of three national data sets[24].

- Use the children's main language in a strategic manner and build upon home language skills;
- Have expectations, instruction, and routines that are consistent;
- Provide extensions of explanations and opportunities for practice;
- Use visual cues and physical gestures;
- Highlight the similarities/differences between English and the native/home language;
- Restate children's language and encourage them to expand on that language;
- Frequently assess comprehension.

A Scientific Synthesis of Early Math Development and Implications for Intervention. 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[25]. The committee found that 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. Unfortunately, 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.

There is expert consensus from the Committee 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. It is important to concentrate on

number and operations and on geometry and measurement in the early childhood period, with a greater portion of time spent on number and operations. Number is central to all of later mathematics, and geometry and measurement have a vital supporting role in number concepts development directly to later mathematics. Based on research that young children generally follow particular paths when learning number-relations-operations and geometry-measurement, the report lays out teaching-learning paths for children from ages 2 to 6 that consist of the significant steps in learning in a particular topic[26-29]. In addition, general mathematical reasoning processes, which are central in every content area and at every level of mathematics, have been identified by the National Council of Teachers of Mathematics (NCTM) and are: (1) representing (including analyzing representations mathematically and visualizing internally), (2) problem solving, (3) reasoning, (4) connecting, and (5) communicating. These processes allow children to "deepen, extend, elaborate, and refine their thinking and to explore ideas and lines of reasoning"[30]. According to NCTM, these processes are to be continually intertwined within and throughout the teaching and learning of mathematics.

Social-Emotional Skills

Longitudinal studies reinforce the importance of social-emotional skills for adjustment in childhood through adulthood[31,32]. Self-regulation and the ability to relate well to others shape a child's capacity to benefit from educational experiences[33]. Large scale studies show that a high quality preschool experience fosters the growth of these skills[34] and evidence is growing that interventions (specific teaching practices and curriculum materials) are effective in promoting skill growth in this area[35,36]. Positive social-emotional development facilitates engagement in learning which is important for cognitive growth and academic achievement, facilitates positive peer relationships which is a key developmental milestone; and both, in turn, facilitate adjustment in early childhood. Social-emotional skills buffer children against risk and promote mental health. Children who fail to gain these competencies during early more often experience learning problems and academic delays.

To promote positive outcomes, educators can**:**

- Create an environment that promotes every child feeling good about coming to school,
- Design an environment that promotes child engagement,
- Focus on teaching children expectations,
- Teach skills that children can use in place of challenging behaviors, and
- Provide opportunities for children to develop critical social/emotional skills using the backdrop of cognition in a variety of familiar as well as new contexts and environments.

<u>Culminating in a strong sense of self-efficacy.</u> Providing children with challenging tasks and meaningful activities that can be mastered, and chaperoning these efforts with support and encouragement will help ensure the development of a robust sense of self-efficacy, the belief that they can set goals and accomplish them[37]. Students who have been verbally encouraged to set their own goals experience increases in confidence, competence, and commitment to attain those goals.

Approaches to Learning

Educators can create supportive environments that support and encourage the development of the characteristics described above by helping children create meaning from the new experiences, relationships, and concepts they encounter in school. Some of these include[38]:

- Use the knowledge and understanding children currently have of their world to build advanced knowledge.
- Allow children to take risks and try new ideas.
- Value the creative processes of learning.
- Nurture children as they explore self-expression.

Critical thinking is a lifelong endeavor, but can and should begin early with children. An overarching component is comprehending and using language accurately and clearly. Some of the skills appropriate to focus on for children include[13]:

- Gathering and using relevant information
- Recognizing the existence (or nonexistence) of logical relationships between ideas or concepts
- Drawing warranted conclusions
- Making appropriate generalizations

Scaffolding

Combining child-directed discovery along with direct teacher instruction on basic academic skills such as vocabulary, language, and math, as well as social skills, supports the most effective learning for young children[3]. Scaffolding sets up a positive and meaningful interaction between the child and the teacher. With foundations in well established educational theory and practice (for example, Vygotsky's Zone of Proximal Learning[7]; and Differentiated Learning for individualized instruction[39]), scaffolding allows for teachers to build on each child's interests and level of functioning in order to develop skills. After a teacher models for the child, then she or he can guide the child 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 their own. Children can learn very effectively when an adult scaffolds the instruction. This also helps children progress from being "other-regulated" (the teacher) to "self-regulated" as their attention, cognitive, language, and motor skills advance. The development of critical thinking as children interact with experiences is both a part of and an outcome of using scaffolding with children.

The Role of Play in Learning. Early writers such as Vygotsky[7] and Piaget[6] as well as many recent researchers, described play as an adaptive, organized activity through which children make sense of their environment (physical and social). A large research literature shows that children learn through play[40-42]. However, to gain the greatest benefit, structured play is most effective. In particular, play does need the scaffolding support of attentive adults for it to reach its potential as a cognitive and socially adaptive human capacity that is also enjoyable[7]. To help children enjoy and learn through play, an adult-supported setting that fosters discovery and exploration has been shown to be the most effective.

Educational Standards

Educational standards serve an overall purpose of helping ensure children receive a high quality education and specifically help teachers ensure their students have the skills and knowledge they need to be successful. Standards do this by providing clear and realistic goals for student learning. This is helpful both for educators and for families. They allow educators to be on the 'same page' and they

allow other stakeholders (such as administrators, support staff, parents) to both know what is expected and needed for their children.
Standards are not intended to tell teachers how to teach, but to assist them in understanding the knowledge and skills their students should have. They serve as a kind of 'road map'. In this way teachers can create the best learning environments. With standards, teachers still must develop lesson plans and tailor instruction to meet the individual needs of the children in their classrooms. There are generally two types of standards—content and performance. Content standards indicate what children should know and be able to do. Performance standards (rubrics) measure how well a student's work meets the content standard and usually has levels of performance.

Common Core State Standards. The Common Core State Standards Initiative is a state-led effort coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO)[43]. The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn in language arts and mathematics for K-12. They are designed to be robust and of relevance to the real world, meaning a reflection of the knowledge and skills that youth need for success in college and careers. The standards were developed in collaboration with teachers, school administrators, and experts, and were informed by the most effective models from states across the country and countries around the world.

ASSESSMENT/ PROGRESS MONITORING IN EARLY CHILDHOOD

Assessing and teaching are highly and necessarily connected. When children are assessed as part of the teaching-learning process, teachers are able to learn what each child can do, and determine what he or she is next ready to learn. Teachers can use formal and informal assessments to establish what children already know and understand, what things could be understood with more practice and experience, and what things are too difficult without providing additional support. Assessments of children's learning can also be utilized by teachers for feedback on their own teaching practices in order to modify curriculum, adapt instructional activities, and fine-tune classroom routines to be the most effective possible. It can be challenging to capture the skills and abilities of young children because they may be better able to show what they know through actions rather than always through language (either speech or writing). It is important not to use methods that are merely a downward extension of those appropriate for older children, but to gather reliable and valid information by using assessment methods that support developmental changes along a continuum[44,45]. When good practice is implemented, including the reciprocity of assessment and curriculum, the concerns over "testing" children can be addressed.

The Special Place of Portfolios. The term "authentic assessment" is used by educators to recognize and describe a performance-based, realistic, and instructionally fitting method of assessment[46]. One method of authentic assessment very appropriate for young students is the use of portfolios[47]. A portfolio is a purposeful collection of student work showing effort or achievement in one or more areas[48,49]. The portfolio is a record of the child's learning over time and incorporates what the child has learned; how the child has gone about learning; how the child thinks, questions, analyzes, synthesizes, produces, and creates; and how the child interacts—intellectually, emotionally and socially—with others[50].

In deciding which material to include, teachers can turn to reflecting on the purpose of the portfolio. In this way the portfolio can be fully utilized and not become just a random sample of children's work. Several purposes for portfolios have been identified[51,52], such as to:

- Make sense of children's work,
- Communicate about their work,
- Relate the work to a larger context,
- Motivate children,
- Promote learning through reflection and self-assessment, and
- Be used in evaluations of children's thinking and writing processes.

The most effective portfolio includes an ample variety of work samples. To make the portfolio even more meaningful, successive drafts of work on specific projects or tasks can show the progress a child has made. Researchers also agree that allowing children to have some input into which items they would like to include in their own portfolios leads to children's becoming more aware and analytical about the work they complete[49,50]. Some of the common elements of a portfolio include:

- Work samples
- Photographs
- Audio and visual recordings
- Observation notes
- Instructional objectives checklists
- Screenings

The use of the portfolio approach has several benefits for educators. One is for evaluating growth and achievement through the capability to compare the individual child's current work to his or her previous work-as it is not appropriate to use portfolios to compare children to one another[49]. An important consideration is to link how the child is progressing toward standards connected to the curriculum (both of which, naturally, need to be developmentally appropriate). This connection supports curriculum and instructional planning[53]. A final area of strength is that one of the most meaningful ways that educators can share information with parents is through the portfolio because it represents such a concrete example of a child's work and progress[54].

THE ROLE OF TECHNOLOGY IN EDUCATING YOUNG CHILDREN

Research is building that technology can play a key role in both cognitive skills and social skills development preparation. Technology can positively and strongly support young children's learning and they are developmentally able to benefit from well-designed educational and instructional 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 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. For example, research has found that children who used computers with supporting activities for key learning goals, had more gains than children without computer experiences. These included gains in knowledge, long-term memory, verbal skills, problem solving, and school readiness[55, 56]. A set of studies with low-income children found those who received a computer curriculum had increases in cognitive, motor, and language scores compared to similar children in a regular curriculum[57, 58].

Computers constitute environments that support teaching and learning by providing effective, supportive experiences[59,60]. Several characteristics of effective computer software must guide its development, including[61]:

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

Technology and Children with Disabilities. Young special needs children who have been unsuccessful in interacting with their environment through traditional methods can often experience immediate success through access to appropriate technology[62-65]. As children with disabilities experience these successes, their self-esteem improves and inclusion efforts are less challenging. Children with special needs can experience success in school if their learning environments are adapted to their needs and goals. Technology such as interactive whiteboards can greatly facilitate their ability to participate in learning and appropriate content can engage and inspire them to progress.

HOW THE COREFOCUS™ LEARNING ACTIVITIES SUPPORTS LEARNING AND TEACHING

As with all the Hatch educational technology products, CoreFocus is founded on good design, such as being success-based, offering a meaningful context for children, and being developmentally appropriate through providing content, activities, and approaches that match children's' level of development and readiness.

The main activities in CoreFocus are in the areas of reading and mathematics. In particular, they are informed by the findings and recommendations of the National Reading Panel and the National Early Literacy Panel, and the National Research Council Committee on Early Childhood Mathematics. For reading/literacy, these include print concepts, alphabet knowledge, language (including vocabulary), phonological awareness, phonics, fluency, comprehension, and writing. For mathematics, the activities are in the areas of counting, operations & algebraic thinking, data & measurement, and geometry. The activities are additionally informed by and linked to the Common Core Standards, which are a developmentally appropriate, cumulative progression of skills and understandings and are written as grade-specific end-of-year expectations. **CoreFocus provides assessment and progress monitoring to support teachers in** learning what each child can do, and to determine what he or she is next ready to learn. **The System uses a portfolio approach known to be appropriate with young**

children because it is performance-based, realistic, and an instructionally fitting method of assessment.

Drawing on the known effectiveness of scaffolding, the activities are scaffolded so that children have the 'competent other' they need in the form of both the teacher and the learning activities. Because of the variability of the skills children bring to kindergarten, the system includes several pre-emerging activities whose purpose is to bolster children's readiness for school. All of the activities are designed to encourage critical thinking, and to directly teach critical thinking such as gathering and using information, understanding relationships, and drawing conclusions; CoreFocus offers Skill Connections. **CoreFocus supports the building of pro-social and self-regulation skills through encouraging behaviors such as turn-taking, cooperation, collaboration, and processing as children engage in the activities in large and small group settings; and provides an environment that supports approaches to learning (such as curiosity, creativity, problem solving, and persistence). Knowing too, that children learn through play, CoreFocus is designed with this in mind through offering a game-like environment as well as an Independent Play area.**

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