

Яркий старт: когнитивный тренинг для детей

Г. Карл Хейвуд, Университет Вандербилт

Пенелопа Г. Брукс, Университет Вандербилт

Авторы выделяют несколько процессов, лежащих в основе когнитивного развития. Данные процессы могут являться основой для когнитивного и метакогнитивного подходов к раннему образованию. К таким процессам относятся: повышение эффективности обработки; расширение рабочей памяти; автоматизация когнитивных процессов (снижение потребности в объеме рабочей памяти); иерархическая структуризация понятий (концептов), образование и контроль процессов внимания, способствующих сбору информации. Дальнейшие потребности включают в себя доступ к стадии конкретных операций, развитие внутренней мотивации и метакогнитивной осведомленности. Исходя из этих предположений, авторы представляют набор принципов для развития программ раннего когнитивного тренинга, обобщая концепцию стадий развития Пиаже, культурно-исторический подход Выготского, концепцию структурной когнитивной модифицируемости и опосредованного эмпирического обучения, а так же транзакционный подход к человеческим способностям Хейвуда.

Результатом является тренинг Яркий старт, состоящий из систематизированной теоретической базы, опосредующего стиля преподавания, восьми когнитивных/метакогнитивных учебных единиц, когнитивно-опосредованной системы поведенческого управления и программы вовлечения родителя. Учебные единицы направлены на следующие сферы: саморегуляция, количественные отношения, сравнение, выбор ролей, классификации, последовательности и паттерны, отличительные особенности и трансформации. Тренинг детально описан.

Исследования эффективности Яркого Старта выявили позитивные и длительные эффекты на показатели IQ, внутренней мотивации, способности детей с особыми потребностями к академической успеваемости в обычных классах, когнитивному развитию как таковому, а так же последующие школьные достижения у широкого круга детей, включающего в себя детей с интеллектуальными трудностями, а так же расстройствами развития, социо-экономическое неблагополучие, расстройства слухо-, речевой- и языковых функций, а так же на культурные различия.

Ключевые слова: когнитивное развитие, метакогнитивный подход, раннее обучение, нарушения развития, эмоциональная неустойчивость, мотивационное развитие, среда когнитивного развития.

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Bright start: a cognitive curriculum for young children

H. Carl Haywood, Vanderbilt University

Penelope H. Brooks, Vanderbilt University

The authors identify several basic processes that underlie cognitive development and that are capable of providing the foundation for cognitive and metacognitive approaches to early education. These include: increased processing efficiency; expansion of working memory capacity; automatization of cognitive processes (to lessen demand on working memory capacity); hierarchical structuring of concepts; educating and controlling attentional processes that help one to gather information. Further needs include accession to the concrete operatory stage, development of intrinsic motivation, and a metacognitive awareness and focus. Proceeding from that basis, the authors present a set of guiding principles for the development of a cognitive early education program, generalizing on Piaget's stages concepts of cognitive development, Vygotsky's social-historical approach, Feuerstein's concepts of structural cognitive modifiability and mediated learning experience, and Haywood's transactional perspective on human ability.

The resulting curriculum, Bright Start, consists of a systematic theoretical base, a mediational teaching style, eight cognitive/metacognitive instructional units, a cognitive-mediational system of behavior management, and a program of parent participation. The instructional units are addressed to self regulation, quantitative relations, comparison, role taking, classification, sequence and patterns, distinctive features and transformation. The curriculum is described in detail.

Studies of the effectiveness of Bright Start reveal positive and durable effects on IQ, intrinsic motivation, ability of children with special needs to function academically in "mainstream" classes, cognitive development itself, and subsequent school achievement in a broad range of children, including those with intellectual and developmental disabilities, social-economic disadvantage, hearing, speech, and language disabilities, and cultural differences.

Keywords: cognitive development, metacognitive approach, early education, developmental disability, emotional disturbance, motivational development, cognitive learning environment.

Individual differences in *intelligence* come from two major sources: the biological endowment and the social/physical world. Although there is progress in preventing genetic and biological abnormalities in children, we are currently rather limited to making changes in the social/physical context if we want to enhance functioning by improving cognitive development (see distinction between intelligence and cognition later in this paper). A second limitation in attempting to make young at-risk children and children with special needs more effective learners is that we cannot know who arrives at school already

possessing what abilities and how much of each. Young children's cognitive deficiencies may not appear until school age, and diagnosis of developmental problems is expensive, time consuming, and imprecise. The intervention problem becomes, "How do we design our intervention to prevent specific problems when we do not know what those problems will be?" Part of the answer is that we must behave as if all potential deficiencies can be prevented and target all of them all of the time. We must design a strategy for teaching children that immerses them in opportunities to develop all of their cognitive abilities. Another part of the answer is that, in the case of children with disabilities, we must give particular attention to the underdevelopment of certain critical cognitive and metacognitive processes, habits, attitudes, motives, and behavior and help them to gain access to their abilities.

Cognitive Needs

On the basis of the information processing literature, we know that several basic processes underlie cognitive development.

1. Increased processing efficiency (Demetriou, Christou, Spanoudis, & Platsidou, 2002). In order to get children's processing to be more efficient, what can caregivers do? How can children be prodded to keep the goal in mind amid distractions, e.g., not stopping and looking in the mirror or hitting their siblings on the way to the bathroom, keeping on track when solving a problem, actively storing information in appropriate mental cabinets, attending to only the relevant attributes of a stimulus/
2. Working memory; Some theorists believe that children's working memory may increase with development (see Demetriou et al., 2002, for a summary of this position), thus allowing children to consider more factors as they are confronted with problems. If increasing working memory is the goal, how can caregivers and teachers help children to reach that goal? More concretely, how can parents and teachers get children to keep two things in mind at the same time, e.g., a promise to a friend to return skates and parents' admonition to ask permission before going outside, or that the comparison jar is both taller and thinner than the one next to it in the conservation problem?
3. Ancillary processes. Other processes are important and help with the intake and organization of information: automating of cognitive processes so that they do not take up working memory space; hierarchical structuring of concepts to reduce the working memory load; educating and controlling attentional processes that help us gather information. At a more macroscopic level, Piaget has delineated a number of tasks to be accomplished by at the pre-operational stage of cognitive development, all of which involve processing efficiency and working memory: reducing egocentrism, adding and subtracting relevant features of problems such as the conservation problem and the seriation problem, space and time features, causality, classification, and number. All of these have some relation to the foregoing information processing categories but the relationships are not elaborated enough to make specific curriculum units that address them.

4. Motivational processes: Motivational processes are a critical part of cognitive development. Children must enter into learning interactions under their own volition. They must engage the world around them and, in turn, continue to be internally driven to continue that engagement. We know that caregivers and teachers do this in many different ways: modeling, using the social bond to scaffold problems so that children do not get discouraged, giving feedback, and others.
5. Self knowledge. Children must learn about themselves, not only the actions of their bodies in time and in space, but also the inner workings of their minds. They must acquire strategies for using their cognitive abilities so that the "executive" in their processing system can direct learning and problem solving. It is this latter knowledge, *metacognition*, that we consider essential in providing children with the cognitive equipment that will generalize across situations and problems they encounter. The question of what parents and teachers, can do to encourage *metacognition* is added to the question of what they can do to encourage cognition.

The adjective "cognitive" refers broadly to thinking and specifically to the processes of systematic, logical thought. Haywood (in press) has defined cognitive education as "*a teaching and learning strategy whose major goal is the development and encouragement of systematic processes of perceiving, thinking, learning, and problem solving.*" A cognitive curriculum is thus a program of education whose focus is on development and application of systematic processes of logical thinking. The goal of cognitive curricula is to have the children acquire a set of logic modes that will enable them to think systematically, logically, and effectively by using the logic modes that they have acquired. The term "metacognitive" has two aspects. The first is to focus the children's attention on their own thinking processes and to make them acutely aware of the processes that they themselves use to make order out of the multitude of stimuli that impinge on their senses at any moment. Piaget, for example, observed that children often engage in little conversations with themselves in which they ask themselves such questions as "Have I seen anything like this before?" "How did I do this the last time I saw such a problem?" "How do other people do this?" "Do I have all the information I need?" and "How else could it be done?" More recently, such self conversations have been characterized as "private speech" (see, e.g., Berk, 2000). These are metacognitive questions. In its second meaning, the term metacognitive refers to specific tactics of thinking--"tricks," if you will--that people use to organize their thoughts, to improve their memory, to focus their attention, or to think through a problem logically. Thus, most people recognize that they are more likely to remember a list of items, such as a shopping list, if they repeat the list over and over. Some people recognize that they are more likely to remember all the items on their grocery shopping list if they organize the list by categories, such as fruits and vegetables, dairy products, frozen food, canned food, and meat, just as these items are classified in the super market. Strings of numbers are recalled more accurately if they are grouped. In the US, everyone has a social security number that consists of 9 digits. These numbers are grouped into 3, 2, and 4 digits. Remembering 987-68-0355 is easier than remembering 987680355. Telephone numbers are recalled by using the same strategy: a 1 to indicate "long distance," a three-digit "area code," followed by a seven-digit number that itself is divided into two groups of 3 and 4 digits. These are metacognitive strategies designed to facilitate storage and retrieval of information.

The Bright Start Curriculum

Bright Start is a cognitive and metacognitive curriculum for young children between 3 and 6 years of age, and children who have intellectual and/or developmental disabilities up to about 8 or 9 years of age. Developed originally for use with typically developing children who were at high risk of school failure (i.e., children from poor, culturally different, and ethnic minority families in the United States), *Bright Start* has been used successfully with children who have mild to severe handicapping conditions, including intellectual disabilities, emotional disturbance, learning disabilities, autism and "pervasive developmental disorders," neurological impairments, sensory impairments (in vision and hearing), cerebral palsy, and orthopedic handicaps as well as transcultural, culturally and linguistically different children and children of recent immigrant families.

This curriculum was designed as a total immersion into an environment that promotes cognitive development. The first task was to define a set of guiding principles. Once the guiding principles were in place, the components of the curriculum (the cognitive context) could then be designed.

The Guiding Principles

Bright Start is based on theories of Piaget, Vygotsky, Haywood, and Feuerstein, as well as on the empirical work of contemporary cognitive and developmental psychologists. Philosophically, it lies somewhere between a strict Piagetian constructivist position and the social-cultural position of Vygotsky. It is reasonable to characterize it as one of the "mediated learning" programs that overlap Feuerstein's concepts of structural cognitive modifiability and mediated learning [10; 11]. Following Haywood's transactional perspective on development of human ability [27; 29; 30], the curriculum places strong emphasis on metacognition and on the transactional relation of intellectual, cognitive and motivational development.

Piaget. The ontogenesis of intelligent thought has been described extensively by Piaget and his associates (e.g., Piaget, 1952, 1960; Piaget & Inhelder, 1969). According to Piagetian theory, thought processes develop in sequential fashion with later, more mature processes dependent upon, but not foretold by, the presence of less mature processes.

The children for whom **Bright Start** was developed, i.e., 3-6 year old children, are normally approaching the age when one expects the development of concrete operational thinking from a pre-operational status. The major domains within this stage are: classification and class inclusion, relations (including seriation, transitivity, space, time, and causality), conservation, and number. The greatest accomplishment of this developmental period is activity that depends upon representational or symbolic thought. Piaget emphasized both the sequential and the hierarchical nature of cognitive development: predictable steps of growing competence within stages of development, followed by qualitative progression to new stages.

Vygotsky. In contrast to Piaget, Vygotsky [5; 50-52] has emphasized and described the role of the social environment in the development of children's cognitive processes. Children initially experience cognitive challenges and problems in the presence of adults.

Adults, in essence, "model" (or fail to model) for children their interactions with the physical and social world. At later stages, children attempt to confront problems themselves, and adults, if present, guide, correct, and reward them in these attempts. Finally, children become capable of learning and solving problems more-or-less independently as they require less and less help from adults. Thus, children's problem solving is, at first, "other-regulated," but becomes "self-regulated" with appropriate guidance from adults. In the context of appropriate guidance, Vygotsky introduced the concept of the "zone of proximal development," defined as "the distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978, p. 86). Thus, the zone of proximal development is another name for the ability of a child to benefit from interacting with an adult (or competent peer) in the context of solving problems. As such, it is essentially a social concept that describes children's ability to internalize the problem-solving strategies available to them in the social environment. For present purposes, two Vygotskian concepts are especially important: (a) the necessity of having an appropriate social environment that includes instruction in problem solving, and (b) the quality of the interaction between the social environment and the child, including the availability of models of logical thinking.

Haywood has proposed a "transactional perspective on human ability"[27; 29-31] that incorporates three essential dimensions in the development, elaboration, and application of human ability: intelligence, cognitive processes, and intrinsic motivation. An important part of this conception is a sharp distinction between intelligence and cognitive processes, including differences in their origin, their relative modifiability, their nature and content, the methods by which individual differences can be assessed, and the differential contributions of parents and other adults to their development [30]. For present purposes, the primary parts of that distinction that should be emphasized are two: (a) Although intelligence is largely genetically determined, cognitive processes must be acquired, often through learning; (b) Intelligence is only modestly modifiable, whereas cognitive processes, having been acquired by learning, are relatively easily modifiable. Thus, it is sensible to intervene in development of abilities by concentrating on developing systematic cognitive processes, i.e., modes of logical thinking, and that is precisely the emphasis of *Bright Start*.

A major aspect of Haywood's transactional perspective is his *motivational theory of cognition* [24]. According to this conception, "task-intrinsic" motivation provides the motive force to propel cognitive development and cognitive applications. Its principal aspect refers to the motivation that inheres in the performance of tasks, or as Hunt [32] wrote, motivation inherent in information processing and action. Behavior that demonstrates task-intrinsic motivation includes exploration, seeking of novel stimuli, reasonable risk taking, engaging in tasks for the sake of information processing itself—all of which are necessary for the development of specific cognitive processes and for enthusiasm for learning. On the other hand, some success at learning is necessary if one is to be enthusiastic about it, to seek opportunities to learn, to explore, seek novel stimuli, and engage in reasonable risk taking. That is to say, task-intrinsic motivation and cognitive development have a mutually dependent relationship [18]. Effective learning is dependent in part upon deriving pleasure from learning, but deriving pleasure from learning may develop out of an experiential background that includes success at learning.

An essentially metacognitive emphasis is also a part of the transactional perspective on ability. According to this conceptualization, intelligence alone is not sufficient for effective learning. One must also have development of appropriate cognitive processes, some efficient level of intrinsic motivation, and experience in metacognition, defined dually as (a) awareness of and concern with one's own thinking processes, and (b) specific modes of logical thinking that can be organized, controlled, and applied by the thinkers themselves.

Feuerstein. Emphasis on the quality of the social environment sets the stage for Feuerstein's description and further elaboration of the necessary characteristics of social environments that enhance cognitive development. It is focused upon enhancing the parents' and teachers' effectiveness in reducing the discrepancy between children's typical performance and their potential performance.

Feuerstein [10; 11] has proposed and elaborated a **theory of structural cognitive modifiability** in which intelligence is seen as consisting of a finite number of basic cognitive functions. Such functions are compounds of native ability, learning history, attitudes toward learning, motives, and strategies. These basic cognitive functions have been identified primarily through clinical work with children who have learning problems in school or who are socially maladjusted. Feuerstein has proposed a list of "deficient cognitive functions" that are found often in such children and adolescents, such as blurred and sweeping perception, unsystematic exploratory behavior, lack of or impaired spatial and/or temporal orientation, or lack of or impaired capacity for considering multiple sources of information. Many of these overlap in as-yet-to-be-specified ways with the constructs of information processing discussed earlier. Given that the basic cognitive functions are necessary to the learning of academic and social material, when there are developmental deficiencies in such functions there is inadequate learning, indeed, learning that is even below the mental age expectation for these persons [16; 28].

The basic cognitive functions are acquired through learning, both by the children's "direct exposure" to environmental events, including environmental feedback on their own behavior, and by a teaching process known as "mediated learning experience" [9] that is conducted by parents, grandparents, or older siblings. In fact, Feuerstein views this process of mediated learning as essential to the adequate cognitive development of children. It is an outgrowth of children's attachment to caregivers and capitalizes on the social bond for motivation to engage problems.

The proximal etiologic condition associated with inadequate cognitive development (hence with ineffective learning and problem solving) is lack of sufficient mediated learning experience (MLE) rather than intellectual disability (in child or parents), psychiatric disorders, sensory impairment, or impoverished environment. These mediated interactions are normally carried out between children and their parents or parent surrogates, but can be accomplished later, by professional teachers.

The **mediational teaching style** is the single most important and distinguishing characteristic of teachers' behavior in a cognitive curriculum. In a cognitive classroom the teacher serves as a catalyst, bringing about a cognitively important reaction between children's thought processes and events in their experience. They help children to understand the generalized meaning of their experiences, of new learning, and of relationships. The goal is to extract from every encounter the children have with content

materials the maximum learning of generalizable principles and strategies of perceiving the world, of thinking systematically, clearly, and effectively, of learning, and of problem solving. Even when mediational teachers are teaching specific content, for example, counting, they teach it in such a way that the children will understand its applicability to other contexts. Thus, counting is taught as a cognitive strategy, a way of finding out how many of anything one has, rather than as a procedure for its own sake.

Gibson. The perceptual development approach of E.J. Gibson [13] was used as the basis of one unit of the curriculum: letters and shapes. The underlying principle is that children have to "learn" (perceptual system must be educated) to attend to the distinctive features of letters. This emphasis is relevant to cognitive education because it involves educating the perceptual system to discriminate the critical, distinctive features of sounds, tastes, smells, visual stimuli, and events. Discrimination is the product of perceptual comparison; e.g., we taste various wines to extract what we call "richness," "fruitiness," "dryness," "sweetness." Winetasters can discriminate between the top and bottom halves of a bottle of aged Bordeaux. Topography, X-rays, characteristics of plants, faces, as well as letter and sound recognition are further examples of perceptual learning. "Defining" or "distinctive" features of the capital letter A are the facts that (a) it has no curved lines, (b) it is horizontally symmetrical, (c) it is vertically asymmetrical, and (d) its "standing up" lines are diagonal rather than strictly vertical. The research of Gibson and her students has helped to establish which attributes of letters of the alphabet are perceived as defining by children, and which are incidental. That research-based knowledge is extended in **Bright Start** by generalizing the principle of distinctive versus incidental features to a wide variety of non-alphabetic events.

Construction of a Cognitive Learning Environment

Teachers and their interactions with children. In contrast to content-oriented teachers, cognitive/mediational teachers do more of the following things: (a) examine any interaction with children to determine to what extent it meets the criteria of mediated learning suggested by Feuerstein (see preceding section); (b) elicit evidence of thinking from the children; (c) use process-oriented questioning rather than answer-oriented questioning; (d) accept as much as possible of the children's answers while challenging process; (e) challenge answers, both correct and incorrect, requiring justification and process explanation; (f) teach inductively, asking children to form generalities from successive examples, objects, or events; (g) work to enhance the children's metacognitive functioning, i.e., make the children aware of their own thinking processes; and (h) emphasize the order, structure, and predictability of the universe and the use of scientific strategies for discovering or imposing such order. A good mediational teacher wastes very few words; most are purposeful in that they are designed to elicit some kind of cognitive function from the student.

The curriculum content: The content of the curriculum is carried by the 8 cognitive units and by the daily lessons within the units. Table 1 shows the "cognitive small-group units" that form the heart of the curriculum.

Table 1. Cognitive Small Group Units in Bright Start

UNIT NAME	FUNCTIONS OF UNIT
Self Regulation	Bring behavior under control of external stimuli, then internalize control; understand role of rules; temporal summation
Number Concepts	Understand concepts of number, correspondence, ordinality, cardinal number, conservation, counting as a strategy
Comparison	Compare on single and multiple dimensions and in face of irrelevant variations; develop spontaneous comparative behavior
Role Taking	Develop ability and disposition to take different perspectives; move role taking from physical to social realm
Classification	Group by similarity; form classes and assign abstract labels; subordinate and superordinate classes (class inclusion)
Sequence and Patterns	Extend concept of seriation; decode and construct patterns and sequences by following logical principles
Letter/Shape Concepts	Identify distinctive features of visual stimuli and distinguish these from incidental features
Transformation ^a	Use specific instances to induce rules, then deduce the rules' appropriate application to new problems

^aAdded to program after original publication of this chapter, this unit is modeled after the *boîte à transformation* (transformation box) of Paour (1992).

These curriculum units comprise the lessons that are actually focused on cognitive functions and metacognitive processes. They are typically (but not necessarily) employed in the classroom in the order shown here, which follows roughly a normal cognitive developmental sequence. We recommend that these sharply focused lessons be given by the teacher to a small group of children, between 3 and 6 at a time. Thus, in a large class a teacher might have to repeat a lesson several times during the day, while an assistant engages the other children in some different activity. Each unit comprises from 15 to 35 lessons, so that by the end of the academic year the children have typically received approximately 175 cognitive small group lessons.

Figure 1 shows a typical cognitive small group lesson from ***Bright Start***.

Lesson 12

COGNITIVE FUNCTIONS

1. ROLE-TAKING
2. HYPOTHETICAL THINKING

RATIONALE

The purpose of this lesson is to help the children to put themselves in someone else's shoes by acting out being someone else, and by thinking and talking about hypothetical situations.

Note: This lesson should be repeated for several days, using a different scenario each day.

MAIN ACTIVITY

- a. Read aloud a short story or make one up about one of the following situations:
 - (1) A child has to go to the doctor or dentist and is scared.
 - (2) A child has to stay in the hospital for some minor surgery.
 - (3) The family goes on a picnic or a trip.
 - (4) The family goes to visit relatives.
 - (5) Someone gets hurt by falling down.
 - (6) The family goes to the supermarket to buy what they need for a week.
 - (7) A child is served a new food and doesn't want to eat it.
 - (8) Read *Peter's Chair* by Ezra Jack Keats about how a child feels about the arrival of a new baby.
- b. Have the children act out the situation, each of them playing a different role. Point out to them that they have to put themselves in the shoes of these other people by making believe that they are now the mother or father, for example, and are acting as that person would act.
- c. When the play-acting is finished, discuss how the children played the roles and pretended to be someone else. Discuss how they felt in their different roles. Discuss, for example, why the child who was to have surgery was very scared, but friends visiting him or her were not scared, or less scared than he or she was.

VARIATION

Have the children think of situations and tell their own stories.

GENERALIZING ACTIVITY

Ask the children to play Mom, Dad, a sibling, or a teacher when that person is angry, happy, or sad. Discuss a specific, possibly problematic, incident and compare the perspectives of the child and the other person.

BRIDGING DISCUSSION

- a. Discuss some incidents that have occurred in the classroom, in which, for example, someone was angry at someone else. Discuss how each person felt. Be sure the children recognize the different feelings.
- b. Elicit and discuss other times when the children might feel differently than do other people about something or vice versa. Some examples might include when the teacher asks them to stop doing something they like; when they want to make noise but someone is sleeping; when their parents go out and they have to stay at home with a babysitter.

OTHER BRIDGING DISCUSSION

School:

Home:

Peer group:

Other:

COGNITIVE MASTERY CRITERION

Each child should be able to tell one or two things that make another person, such as his or her mother, or a friend, happy or mad.

13 Role-Taking

Figure 1. A typical cognitive small group lesson from Bright Start: Lesson 12 from the Role Taking unit.

In this lesson, the children learn first to assume the identity of another person, explore several variations in which it might be useful to know how others behave and feel,

and then learn to think about events that have not happened (yet), that is, hypothetical thinking of the "what would happen if?." variety. We can see from this page that the authors have specified the cognitive functions that are to be emphasized (role taking and hypothetical thinking), have explained the cognitive reasons for the proposed activities, have then described in detail what activities are to be done, have suggested alternative activities, and have emphasized the importance of "bridging" from the cognitive concepts covered in the lesson to the activities and circumstances of the children's daily lives. At the end, "cognitive mastery criteria" are proposed; that is, some standards are given by which teachers should know when it is time to leave this lesson and move on to the next one. The format is the same for all of the 180 or so lessons over the 7 cognitive small group units. Even though cognitive small group lessons, focused sharply on metacognitive processes themselves, occupy only about 20 minutes each school day, the cognitive functions that are the targets of these lessons are pursued in all of the other school activities through the day, and the children are encouraged often to think of and to discuss examples of other times in their daily lives when using this kind of thinking is required or helpful.

The structure of the day. In a ***Bright Start*** class, the following are required sessions: planning time, summary time, small group lessons and large group lessons. The planning and summary time give a future and a past to the day's activities. Teachers discuss with the children what is going to happen and in what sequence, and then at the end of the school day they talk about what happened—not only events but what was learned and how the "cognitive function of the day" was applied throughout the day. The small group lessons provide a sharp focus on the cognitive functions and metacognitive content of the day. "Large group" lessons (the entire class at once) cover the declarative knowledge that preschoolers are supposed to have in their culture. In the United States, it is, for example, the calendar (seasons, days of the week, holidays), "community helpers," numbers, colors, a bit of science (often beginning with weather), perhaps the alphabet and some pre-reading knowledge, depending on the children's prior preschool experience.

Adjustments for individual differences in children's development. Bright Start is deliberately flexible in the sense that it can (indeed, must) be adapted to meet the developmental needs of a wide variety of young children. Originally designed for one school year, the curriculum can be applied more slowly with children who have intellectual disabilities. The principle is one of mastery rather than coverage; that is, lessons should be repeated, with as many variations as necessary, until there is evidence that the children understand and are able to apply the cognitive and metacognitive concepts and practices of those lessons. Thus, instead of one small group lesson per school day, as in the typical case, teachers of children with special needs often devote two or more daily small group periods to a single lesson. This means that the program cannot be completed in a single school year. The negative effects of this limited coverage are mitigated by the redundancy of cognitive functions through the curriculum; that is, the same functions tend to be emphasized in different units across the curriculum, using different contexts to foster generalization of the principles.

Experienced teachers of children with autism and autism spectrum disorders have determined that some of the Bright Start small group units are relatively more important than others, and have spent very large blocks of time on those units [4].

Effectiveness of Bright Start

Program evaluation is extraordinarily difficult in the case of educational intervention, largely because classical methods of controlling variables that could possibly influence the outcomes of such interventions are always difficult and frequently impossible. The approach we have taken to evaluation of the effectiveness of **Bright Start** is not to rely on a single, "critical" study, but instead to aggregate the results of multiple studies in different locations, with samples of children from different populations, under different educational and research circumstances. The program's authors have not been major participants in most of the studies that have been done.

In general, in evaluating the effectiveness of educational programs one would like to see the following elements of research design:

1. Random selection (All children in the designated population have an equal chance of being selected to participate in the study)
2. Random assignment (All children have an equal chance of being assigned to "experimental" or "control" groups)
3. Controlled implementation (Experimenters monitor delivery of the treatment)
4. Specification of methods (Clear presentation of the treatment, so it can be replicated by others)
5. Multiple teachers per method
6. Selection of criterion variables (Assessment of domains that the program has been designed to change, not just what is easily measurable or convenient)
7. Blind testing (Examiners do not know which children were in which treatment group)
8. Multiple assessments (Not just before and after the treatment)
9. Follow-up (Assess the durability of effects)
10. Appropriate control or comparison group

It is a rare educational study indeed that has the benefit of all of these desirable characteristics of evaluation design. One frequent problem in educational research is the necessity to take whole classes, rather than individually selected children, into the treatment groups. Random assignment is sometimes not possible because school administrators do not permit it, sometimes deliberately offering children who have the greatest need for some special intervention. In the group of studies that we present here, constituting the major evaluation research that has been done on **Bright Start**, not a single study is totally without design flaws. Fortunately, the same flaws are not repeated across the group of studies. Confidence in results of these studies grows as a function of the extent to which (a) similar outcomes are found in multiple studies, (b) the studies represent different educational and research situations, and samples from different populations of children, and (c) the same flaws are not repeated across the group.

All of these studies have been reported and are available; therefore, rather than discussing each of them in detail, we summarize the studies by outcome classes; i.e., to list the desired or potential outcomes of **Bright Start** intervention, and then to determine what studies have offered support, or not, for those outcomes. These principal **Bright Start** evaluation studies include those by Cèbe and Paour (2000), Dale and Cole¹ (1988), Haywood, Brooks, and Burns (1986), Paour, Cèbe, Lagarrigue, and Luiu (1992), Paour, Cèbe, and Haywood (2000), Price (1992), Tzuriel, Kaniel, Kanner, and Haywood (1999), Tzuriel, Kaniel, Zeligler, Friedman, and Haywood (1998), Vanden Wijngaert (1991) and Warnez (1991). Table 2 shows the design characteristics of each of these studies.

Table 2. Design Characteristics of 12 Evaluation Studies of Effectiveness of Bright Start

Study	Control Group	Random Selection	Random Assignment	Monitor Treatment	Specify Method	>1 tchr	Appropriate Criteria	Blind Tests	Follow-up	>2x Assmt
Cèbe & Paour, 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dale & Cole ^a , 1988	Comparison	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Price, 1992	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Haywood, Brooks, & Burns, 1986	Yes	No	No	Yes	Yes	Yes	Limited	Yes	No	No
Paour et al. 1993	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paour et al. 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tzuriel et al., 1998	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tzuriel et al., 1999	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Vanden Wijngaert, 1991	No	No	No	Yes	Yes	No	Yes	No	No	No
Warnez, 1991	No	No	No	Yes	Yes	No	Yes	No	No	No
Molina & Vived, 2004	No	No	No	Yes	Yes	Yes	Limited	NA	Yes	Yes
Tzuriel et										

al. 2005	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes
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^aThe studies by Dale and Cole and their colleagues cannot be seen as definitive Bright Start evaluation studies because they used a program based on a very early version of Bright Start.

Intelligence. It is quite impossible to assess intelligence directly, so the data we can report concern individual differences in IQ. That is to say, "intelligence" is the latent variable, unseen, only inferred, and not directly measurable, whereas IQ, the score on intelligence tests, is the manifest variable, easily observable. Nobody knows to what extent IQ actually measures intelligence, but at the moment it is the best estimator we have. IQ change has been reported in several of the **Bright Start** studies; in fact, in all studies in which it has been included as a criterion variable. In the very first study of the effects of **Bright Start**, Haywood, Brooks, and Burns (1986) had three groups of preschool participants: children with mild-to-moderate intellectual disability (ID) and typically developing children who were at "high risk for failure" (from poverty-level families, ethnic minorities, inner-city residents), both of which groups were given **Bright Start** for seven months of a school year, and a second high risk group who did not receive **Bright Start** but got instead a good non-cognitive preschool program. According to pre-post assessments with the McCarthy Scales of Children's Abilities, the **Bright Start** children with ID gained 12.15 points on the General Cognitive Index (equivalent to IQ: mean of 100, standard deviation of approximately 15) and the **Bright Start** high risk children gained 8.92 points, whereas the high risk control children gained 1.09 points.

Samuels, Fagan, McKenzie, and Killip [44] studied the effectiveness of **Bright Start** versus a good non-cognitive preschool education program with children who had severe learning difficulties. Over the course of the school year, the children who got **Bright Start** gained 8.1 IQ points, while the children in the comparison group (not given **Bright Start**) lost an average of 1.8 points, for a net difference between the two groups in IQ change of 9.9 points.

Dale and Cole [8] studied primarily preschool and kindergarten children with ID, applying an early and incomplete version of **Bright Start** that they referred to only as "a mediated learning" curriculum. Also using the McCarthy Scales, as in the two previous studies, these authors compared the effects of this version of **Bright Start** with the effects of DISTAR (a program of "direct instruction" that emphasizes academic content and makes use of a behaviorist methodology). They found that, among the preschool children, those in the "mediated learning" group gained an average of 6.4 IQ points while those in the "direct instruction" group lost an average of 2.4 points, for a net difference in gains of 8.8 IQ points. These results were not replicated in the kindergarten samples, where there was only one significant difference and that was in favor of the direct instruction group. Follow-up research has been reported by Cole and Dale and by Mills, Dale, Cole, and Jenkins [7].

Paour, Cèbe, Lagarrigue, and Luiu [38] used Raven's Colored Progressive Matrices to assess individual differences in intelligence. They had two **Bright Start** groups and two comparison groups. The first comparison group, like the **Bright Start** children, represented immigrant children living in poverty-level homes with typically unemployed parents and

speaking at home a language other than French (while relying on French at school). The second comparison group was composed of "metropolitan" French children, that is, of European ethnicity, born in France, and coming from relatively affluent families. Following their experience with *Bright Start* versus a non-cognitive preschool education program, the *Bright Start* children attained significantly higher scores than did either of the comparison groups – even the children from affluent families!

Cèbe and Paour (2000), studying similar groups of children in the south of France, replicated this phenomenon. When compared on Raven's Colored Progressive Matrices (RCPM) in kindergarten, first grade, second grade, and third grade, the immigrant, low socio-economic status (SES) children who participated in *Bright Start* during kindergarten scored significantly higher than did either comparison group (immigrant low-SES and non-immigrant high-SES) at first and second grade, and significantly higher than did the immigrant low-SES group at third grade, as well as in magnitude of gain from kindergarten to third grade. This is an especially important finding because nothing special happened with the children after kindergarten, when the immigrant low-SES children were often in the same classes with the same teachers. Figure 2 shows the progression of raw scores on RCPM for these three groups of children.

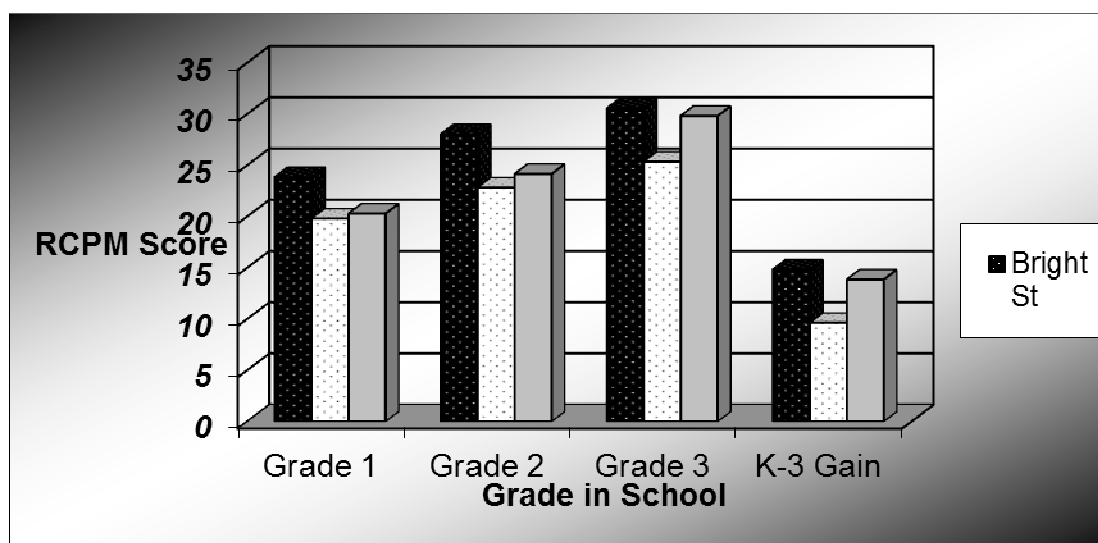


Figure 2. Scores on Raven's Colored Progressive Matrices for Bright Start, low SES controls, and high SES controls, Grades 1, 2, 3 and difference between kindergarten and Grade 3 [6].

Molina and Vived [36] applied a Spanish adaptation of Bright Start over two successive years with groups of children who had Down syndrome. Pre- and post-testing with the Wechsler Intelligence Scale for Children (Revised) and the McCarthy Scales of Children's Abilities revealed dramatic and progressive gains in verbal, nonverbal, and full-scale scores. The children made their most impressive gains in the first year of intervention, but they made further gains in the second year, which suggests that continuing the cognitive curriculum beyond the single preschool year yields continuing benefits with children with Down syndrome. A 6-month follow-up showed that these gains had held.

Table 3 is a summary of the empirical effects of *Bright Start* on IQ.

Table 3. Summary of Effects of Bright Start on IQ or Equivalent in All Studies in Which IQ Has Been a Criterion Variable

STUDY	BRIGHT START	COMPARISON
Haywood, Brooks, & Burns, 1986:		
Intellectual Disability Socioeconomic High Risk	+12.15 +8.92	+1.09
Molina & Vived (2004)	20+ IQ points	(Not applicable)
Samuels, et al. 1988	+8.1	-1.8
Dale & Cole, 1988		
Preschool	+6.4	-2.4
Kindergarten	-1.2	+4.1
Paour et al. 1993	(significant gain)	(no significant gain)
Cèbe & Paour, 2000		
kindergarten to Grade 3	+14.83 RCPM raw score pts	
High SES control		+13.86 RCPM raw score pts
Low SES control		+9.36 RCPM raw score pts

All of the studies whose authors included assessment of intelligence in their designs revealed a positive and significant effect of *Bright Start* on IQ as compared with children who received a program that was different from *Bright Start*. What is especially impressive is that the studies employed two different kinds of tests (high cultural loading on the McCarthy and Wechsler tests, relatively lower cultural loading on Raven's Colored Progressive Matrices). Whether the *Bright Start* experience increased intelligence is not knowable, but it did increase IQ, perhaps because it enhanced the children's ability to gain access to the intelligence they already had and to apply it to learning and problem solving—and test taking.

Motivation. One important goal of *Bright Start* is to enhance the children's development of task-intrinsic motivation (see earlier discussion of that topic). It is difficult, but not at all impossible, to assess individual differences in intrinsic motivation, and even more difficult to measure change in that trait over a relatively short time. In spite of that difficulty, there are two kinds of information from these studies that address that goal. First, at the anecdotal level, all investigators have noted increased voluntary participation in classroom activities by the children who had the *Bright Start* experience, but, unfortunately, they had not taken systematic data on that variable. Haywood, Brooks, and Burns [25] reported a significant tendency for the children in the *Bright Start* group to engage in less "confirmation seeking" than did those in the control group. That means that the *Bright Start* children had increased confidence in their own thinking processes, and were more willing to take chances that their responses were correct. At the level of empirical data, demonstrations of effects on intrinsic motivation are scarce. Tzuriel, Kaniel, Zeligler, Friedman, and Haywood [47] gave their participants the Mazes Test of Intrinsic Motivation. In this test, children are given a set of paper-and-pencil mazes and told to begin tracing through the mazes at the "start" point and to continue working until they can reach the "goal" without lifting their pencils and without crashing through any of the wall-lines of the mazes. They are also told that, when they reach the first goal, they have the choice of stopping this work or of entering and completing the next maze. One criterion is the number of mazes entered voluntarily, that is, how much of this mental work the participants will choose to do when they do not have to do it. In the study by Tzuriel et al., the children who had experienced *Bright Start* in kindergarten showed a significantly greater increase in intrinsic motivation scores between the beginning of the school year and the end of the year than did children in the control condition (from 5.50 to 7.17, an increase of 1.67 or 30%, versus 5.92 to 6.42, an increase of 0.50 or 8%; $p < .05$).

Paour, Cèbe, Lagarrigue, and Luiu [38] reported a greater increase in intrinsic motivation scores, also on the Mazes Test of Intrinsic Motivation, for *Bright Start* children than for children in the low-SES control group, but this difference was not significant when *Bright Start* children were compared with those in the high-SES control group.

We have to conclude that the data on the effects of *Bright Start* on intrinsic motivation are too sparse to infer that the effects are large or consistent. Even so, in all studies in which this variable has been examined the effects have been positive and as predicted.

Cognitive Development and Metacognitive Functioning. If the evaluation data are sparse in some domains, they certainly are not so with respect to effects on cognitive developmental variables.

Both Warnez [53] and Vanden Wijngaert [49] studied the effects of *Bright Start* on children with speech, hearing, and language disorders. Both authors used Groenendaal's [14] *Vragenlijst DenkProcessen* (VLDP; Thinking Processes Questionnaire) to assess cognitive developmental level before and after several months of *Bright Start* experience. There was not a control group in either of these studies, so we have to look only at the difference between pre-intervention and post-intervention scores for the *Bright Start* children. In both studies, children who had *Bright Start* made significant gains in the total score of the VLDP ($p < .01$ in both cases). In the Warnez study, they also made significant gains in three of the four subtests, while in Vanden Wijngaert's study they gained significantly in all four subtests ($p < .01$). Vanden Wijngaert also reported that the *Bright Start* children showed an increase in language age of 12.3 months over the 8 months of his study, thus decreasing significantly the discrepancy between these children's language age and their chronological age.

Tzuriel et al. [46] studied the effects of a 10-month *Bright Start* experience on low-SES children in kindergarten and first grade, who had been randomly assigned to experimental and control conditions. In this study, the children in the control condition had significantly higher scores than did those in the *Bright Start* condition on almost every criterion variable at the beginning of the study; nevertheless, the *Bright Start* children closed the gap with bigger gains. These researchers gave a Cognitive Development test on which the *Bright Start* children moved from a mean score of 15.88 to 21.08, a gain of 5.20 points or 32.7%, while the control children moved from a mean score of 20.91 to 22.08, a gain of 1.85 points or 8.8%. The difference in gains was significant at $p < .001$. They also gave Tzuriel's Children's Analogical Thinking Modifiability Test (CATM), a test of the ability to form analogical relationships and to apply that logic mode to the solution of problems in single and multiple progression. On the CATM, the *Bright Start* children moved from a mean score of 30.54 to 35.84, a gain of 5.30 points or 17.4%, whereas the control children moved from a mean score of 36.15 to 36.33, a gain of only 0.18 point or 0.5%, the difference in gains being significant at $p < .03$. Finally, these authors gave the children Rey's Complex Figure test, which assesses the ability to organize and structure one's perceptions and then to translate that organization into drawing a structured and organized complex figure, both copying and from memory. This test was given only after the 3-month intervention. Although we can assume that the children in the control group would have had higher scores at pre-test than would the *Bright Start* children (because they did on all the other tests), the *Bright Start* children scored significantly ($p < .05$) higher on both copying and memory performances. Following a copy phase and a production-from-memory phase, participants were given mediational instruction on discerning structure and imposing organization, and then were tested again for both copy and memory. Following the mediational instruction, the performance of the *Bright Start* children was still higher than that of the control children (8.60 vs. 7.33 for copy II, 7.16 vs. 5.79 for memory II), but the difference was not significant ($p > .05$).

Some of these same tests of cognitive development were given by Tzuriel, Kaniel, Zeliger, Friedman, and Haywood [46]. These researchers studied the effects of only three months of *Bright Start* versus a "basic skills" academic program (non-cognitive), also with low-SES children in Israel. On the same Cognitive Development test, once again the *Bright Start* children improved their performance significantly more ($p < .0001$) than did the control children. Again using Tzuriel's CATM test, both in a static mode and as a dynamic assessment instrument, the researchers scored the test by two methods: "all or none," and "partial credit." By both methods of scoring, the *Bright Start* children gained significantly

more from pre- to post-treatment testing. When given at the end of the *Bright Start* intervention as a dynamic assessment instrument, that is, with teaching interposed between administrations of two parallel forms of the test, the CATM yielded rather different findings. In this latter case, the control children showed greater benefit from the interposed mediational teaching than did the *Bright Start* children. This finding is difficult to interpret, unless one assumes that the *Bright Start* children had already approached their maximal performance and therefore had little room to improve further.

The Complex Figure test was administered as a dynamic assessment instrument both before and after the intervention, and both copy and memory performances were scored for accuracy (to what extent did the participants get the right parts into their productions of the figure) and location (whether they had the parts in the right places). All of these variables were analyzed in a multivariate analysis of variance, because they were all correlated with each other, making separate analyses hazardous. Whereas the *Bright Start* group increased from a mean score of 33.94 to 48.52, the control group actually declined from a mean pre-intervention score of 42.93 to a mean post-intervention score of 39.99. The decline in performance can be attributed to the fact that a more difficult form of the test was given at the post-intervention phase. The *Bright Start* children handled that challenge by elevating their performance, but this was not true of the control children.

Tzurriel, Haywood, and Mandel [48] used only one of the curriculum units of Bright Start, Sequence and Pattern, with kindergarten children whose families had moved from Ethiopia to Israel. The children were pre- and post-tested on seriation problem solving and math problem solving. The results suggested that these immigrant children were characterized by *cultural difference* rather than *cultural deprivation*. Their performance benefited significantly from the cognitive early education experience, revealing evidence of improved cognitive development.

Cognitive development tests that were part of the Paour et al. [38] study included 10 tests of comparison and three tests of "metacognitive control." It was important to test the children's mastery of the comparing operation, because in this study only two units of *Bright Start* were used: Self Regulation and Comparison. The 10 comparison tests could be seen, then, as assessment of the success of teaching comparison, that is, as mastery tests. There were two experimental groups, both of mostly immigrant children from low-SES families, who received *Bright Start* during their kindergarten year, and two control groups who did not. The first control group was drawn from the same socioeconomic circumstances as the two *Bright Start* groups, i.e., low-SES; in fact, they came from the same public housing development and the same schools. The other control group was composed of native French children from relatively affluent families in another town. The *Bright Start* children scored significantly higher than did children in both control groups on 9 of the 10 comparison tests. The researchers also calculated the number of zero-credit responses given by the children: 5 by Bright Start children versus 60 by control children. Thus, one can conclude that the teaching of comparison was successful.

Metacognitive control was assessed by two measures derived from the Mazes Test of Intrinsic Motivation. The *Bright Start* children were significantly superior to their low-SES control counterparts, but not to high-SES controls, on both measures: not crashing through walls of the maze, and number of correct choice-point decisions. A third

metacognitive control measure was following instructions in the various tasks. The **Bright Start** children were again significantly superior to the low-SES control children. The high-SES controls were not tested on this measure.

Avoiding special education placement. One major goal of **Bright Start** is to help children avoid unnecessary and inappropriate placement outside the educational mainstream, especially in segregated special education classes. A primary function of cognitive education in general is to "level the playing field" by equipping all children with the learning tools they will need in order to master the academic work of schools. Only one set of studies has addressed that goal specifically, and that is the work done in Calgary, Canada [43-45]. Comparing the effects of **Bright Start** during the kindergarten year versus a non-cognitive preschool education program, both with children who had "severe learning difficulties," these authors followed the school progress of the children after kindergarten. In one study, there were 24 children who were independently evaluated by school psychologists, who then recommended the children's first-grade placement: either regular, "mainstreamed" classes or special education classes. It is important to observe that the school psychologists did not know which of the two programs the children they examined had experienced. On the basis of these independent evaluations and recommendations, 9 of 12 **Bright Start** children were assigned to regular classes and only 3 of the 12 to special education, whereas the proportions were exactly the reverse for comparison children: 3 in regular classes, 9 in special classes. Price (1992) reported a three-year follow-up on regular versus special class placement for the children who had experienced **Bright Start** at kindergarten. Given that the researchers began a new **Bright Start** class each year, it was possible during the follow-up period to study the placement of the first cohort to the beginning of their fourth year of primary school, i.e., to fourth grade. The children who received **Bright Start** in the second year were followed into third grade, and those who had **Bright Start** in the third year were followed into second grade. Table 4 shows the percentage of each cohort who were placed in regular classes, in each year of the study following their participation in **Bright Start** at kindergarten.

Table 4. Percentage of Successive Cohorts of Children with Severe Learning Difficulties Who Were Placed in Regular Education Classes Following Bright Start at Kindergarten [43].

Cohort	Grade 1	Grade 2	Grade 3	Grade 4
First year	35%	25%	16%	21%
Second year	55%	59%	53%	NA
Third year	24%	57%	NA	NA

Given that 100% of these children had been diagnosed with "severe learning difficulties," special education placement for them might have been assumed to be virtually inevitable, so the data in Table 4 would seem to indicate that the **Bright Start** experience had indeed helped them to be able to function in regular classes alongside their age peers

rather than being segregated in special classes. Such an interpretation, although tempting, should be viewed in light of the fact that there are no data on the placement of children who did not get **Bright Start**, and this research was done at a time of great social change in expectations for special class placement, with social policy moving swiftly toward inclusion of children with special educational needs in regular classes. What we do know is that a significant number of these children did indeed avoid special education placement. Whether or not **Bright Start** was at least partially responsible is a question that we cannot answer with confidence.

School achievement. The data presented so far have demonstrated that *Bright Start* was probably instrumental in helping children to acquire the prerequisites for effective school learning: enhanced cognitive development, higher IQ, enhanced intrinsic motivation. The biggest goal has been to help the children to use these prerequisites to achieve efficient and effective learning of the academic subjects in the early school years. The principal studies that have included school achievement as a set of criterion variables are those by Tzuriel, Kaniel, Kanner, and Haywood [46], Tzuriel, Paour, Cèbe, Lagarrigue, and Luiu [45], Paour, Cèbe, and Haywood [39], and Cèbe and Paour [6].

Tzuriel, Kaniel, Kanner, and Haywood [46] compared **Bright Start** with a program of enrichment of basic school readiness skills, in a direct confrontation of process and content models. The 82 low-SES children in the **Bright Start** group, mean age of 56.52 months, got 10 months of the program, whereas the 52 children in the comparison group, mean age of 57.78 months, got basic skills enrichment. The **Bright Start** children showed significantly greater improvement in cognitive development, knowledge of numbers, intrinsic motivation, and several dynamic assessment tests of cognitive functioning at the end of the school year. There was a one-year follow-up study to determine the durability of these gains and to assess the effects on reading comprehension and mathematics achievement in first grade. The cognitive and motivational gains held up. In spite of the initial superiority of the comparison children on all of the tests, and the greater instruction that they received in basic academic skills, the reading comprehension and math achievement scores favored the **Bright Start** children, but the differences were not large enough to be statistically significant. (Reading: mean= 20.94, standard deviation 3.83 for **Bright Start**; mean=18.69, standard deviation 5.91 for comparison group. Math: mean=43.70, standard deviation 11.53 for **Bright Start**; mean=42.35, standard deviation 12.54 for comparison group.) It could be argued that the **Bright Start** experience helped the children who had initially low scores on predictor tests to catch up with their more competent age peers, and even slightly to surpass their achievement, but in the absence of repeated measures on achievement scores the data are not conclusive on that point, resting on the rather weak argument that "the two groups were equal in first grade achievement when all the predictors indicated that the comparison group should have been superior."

Paour et al. [38] found strong effects on school achievement. Their criterion variables included general knowledge and two tests of reading words, given during the year following the kindergarten **Bright Start** (or control) experience. Although this study included two control groups, of low and high SES, the high SES children were not tested on these criteria in the follow-up year, so the comparisons are between low SES children who received **Bright Start** at kindergarten and similar low SES children who did not. On a test of general knowledge, the **Bright Start** children's mean score was significantly higher than was that of the control children. This was also true on a test of reading familiar words. On both of these, the differences, although statistically significant, were rather small. It was on

a test of reading novel words, words that the children had not been taught and were unlikely to have encountered, that the difference was dramatically in favor of the *Bright Start* children: 4.2 versus 1.9. These encouraging results led to further study of effects on school achievement.

Paour, Cèbe, and Haywood [39] were able to compare the effects of *Bright Start* with effects of a regular, non-cognitive kindergarten program, and to follow the children through second grade. That study is so important that its sampling characteristics are given in Table 5.

Table 5. Characteristics of Subject Samples in the Study by Paour, Cèbe, and Haywood [39]. By permission of the Journal of Cognitive Education and Psychology.

GROUP	CHARACTERISTICS	TREATMENT
E	Low SES; high risk of school failure	<i>Bright Start</i> in kindergarten
C-1	Low SES; high risk of school failure, from same classes as E group	"Regular" (non-cognitive) preschool program
C-2	High SES; high achievement potential; from a different school in a more affluent community	"Regular" (non-cognitive) preschool program
E-E	Low SES, high risk of school failure, not selected (all children in second and third grade classes who had received <i>Bright Start</i> in kindergarten)	<i>Bright Start</i> in kindergarten
C-1-E	Low SES, high risk of school failure, from same classes as E-E group, had full three years of preschool experience	"Regular" (non-cognitive) preschool program

Table 6 shows these comparisons with respect to school achievement variables from the beginning of kindergarten to second grade.

Table 6. Differences in School Achievement from Beginning of Kindergarten to Second Grade for Children Who Did and Did Not Get Bright Start in Kindergarten [39].

CRITERION VARIABLE	Treatment Group			Contrast Group Difference			df	Effect		
	N	M	SD	N	M	SD		t	p	size
Overall school achievement, entry to Grade 1, without comparison tasks	20	11.75	3.04	20	9.65	2.60	38	2.35	<.001	0.74
Overall school achievement, entry to Grade 1, including comparison tasks	20	7.45	0.82	20	6.15	1.14	38	4.14	<.0001	1.32
Mathematics, Grade 2, year's average score	22	33.02	8.63	17	26.41	10.80	37	2.12	<.02	0.68
Problem-solving games, Grade 2, year's average	22	33.08	7.74	17	25.45	10.10	37	2.71	<.005	0.85

Effect sizes were calculated, using the formula: experimental group mean minus comparison group mean, divided by the average standard deviation. One can see from Table 6 that the effects were not only statistically significant but were sufficiently large to be of practical value (effect sizes greater than about .40 are generally considered to reflect useful differences).

All of these children were given a standardized national school achievement examination, prepared by the French Ministry of Education, at the beginning of Grade 3. In French, 62% of children in a national sample of 2500 attained a passing score. Of the high-SES control children in the Paour et al. (2000) study, 67.6% attained a passing score. For the **Bright Start** children the percentage was 51.6, and for the low-SES controls 41.8. In Mathematics, the percentage attaining a passing score was: national sample, 61.7; high-SES controls, 59.2; **Bright Start**, 48.7; low-SES controls, 36.6. This same pattern of superior achievement by the high-SES control group, intermediate achievement by the **Bright Start** group, and very low achievement by the low-SES control group was repeated in all of the other areas of the examination: Problem-solving, Reading (symbol system knowledge), Written Composition, Number Operations, Geometry Operations, Spatial and Temporal Orientation. In one subject, Measurements, the **Bright Start** group actually exceeded the performance of the high-SES controls, and in another subject, Problem Solving, the difference between them was very small (6.88 for the high-SES controls versus 6.30 for **Bright Start**, but 4.17 for low-SES controls, SDs 2.4, 2.9, and 2.3 respectively). In 12 of the 13 comparisons (Tables 5 and 6) there was a significant difference in favor of the **Bright**

Start group (as compared with the low-SES controls), with effect sizes ranging from .52 to 1.32.

In this study, reading tests were given as early as December of Grade 1, and a different test at the end of Grade 1. On all six variables examined, the performance of the **Bright Start** group significantly exceeded that of the low-SES controls, with effect sizes ranging from .56 to 1.53.

The final study to be discussed here is that of Cèbe and Paour [6], in which the focus was on evaluating the effects of **Bright Start** at kindergarten on learning to read in the primary grades. Samples were from the same populations that were sampled in the studies by Paour et al. [38; 39].

Figure 3 shows a comparison of the **Bright Start**, low-SES control, and high-SES control groups on Izizan's reading test, across four subscores. The only area in which the performance of the **Bright Start** group was not superior to that of both of the control groups was Speed, a result that was entirely predictable because an essential part of the **Bright Start** method is teaching the children to work slowly but carefully.

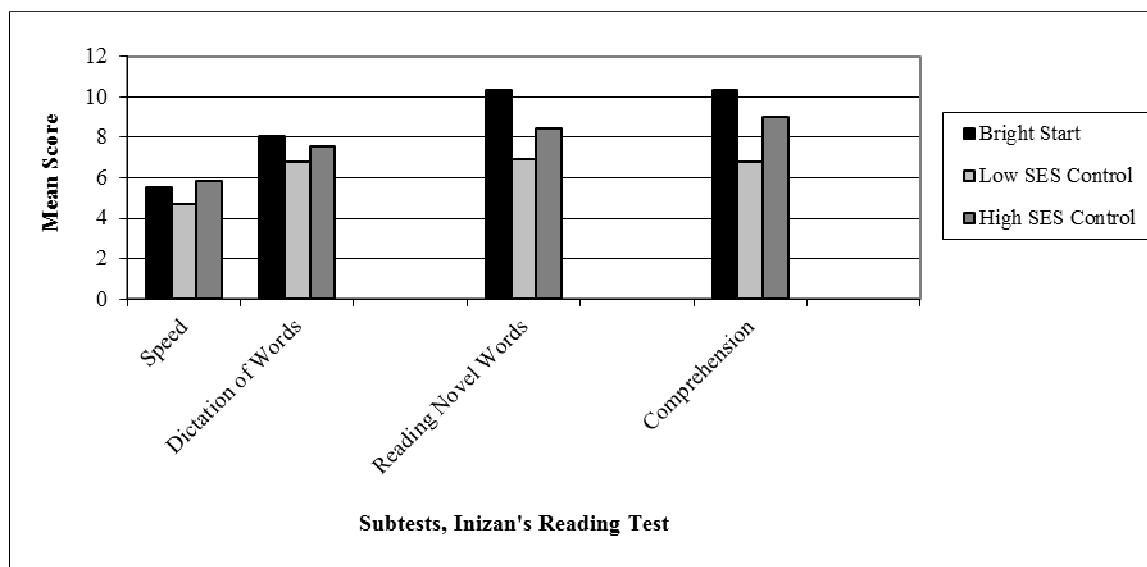


Figure 3. Reading in Grade 1: Scores on Speed, Dictation of Words, Reading of Novel Words, and Reading Comprehension, for all three groups [6].

In Grade 2 the children were given Bentolila's [2] ARTHUR reading test and Goigoux's test of reading comprehension. Figure 4 shows the groups' relative performance on the ARTHUR test, and Figure 5 the Goigoux test results.

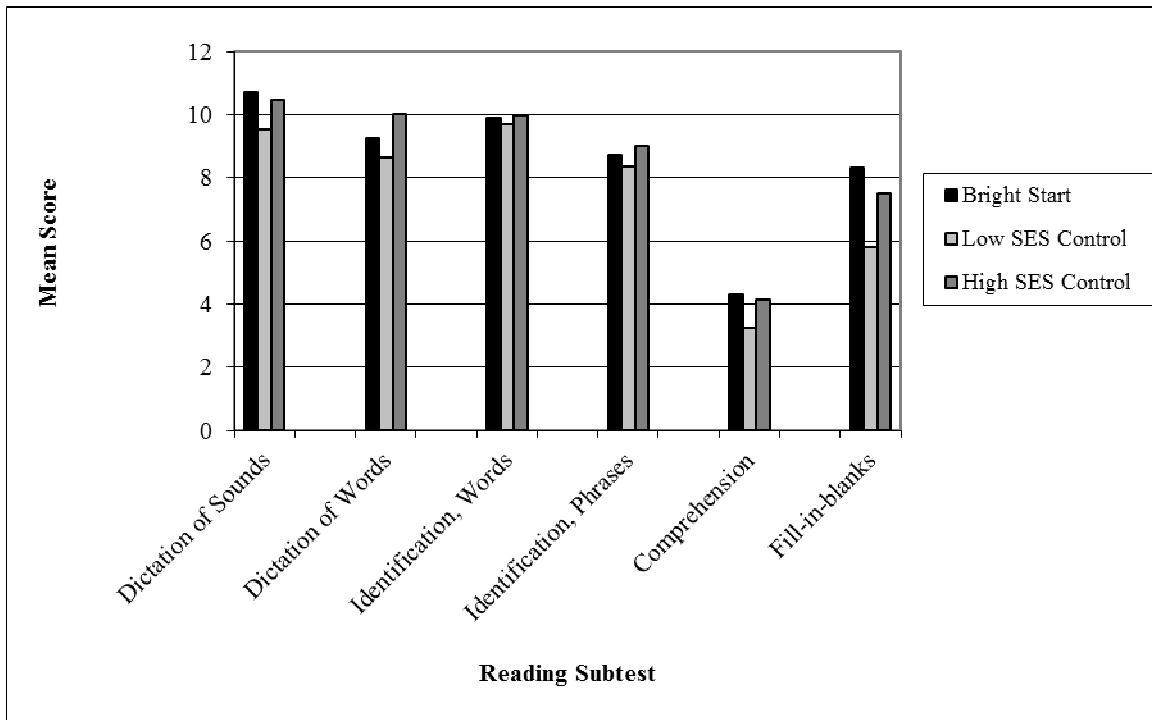


Figure 4. Reading in Grade 2: Performance of the three groups on Bentolila's ARTHUR Test.

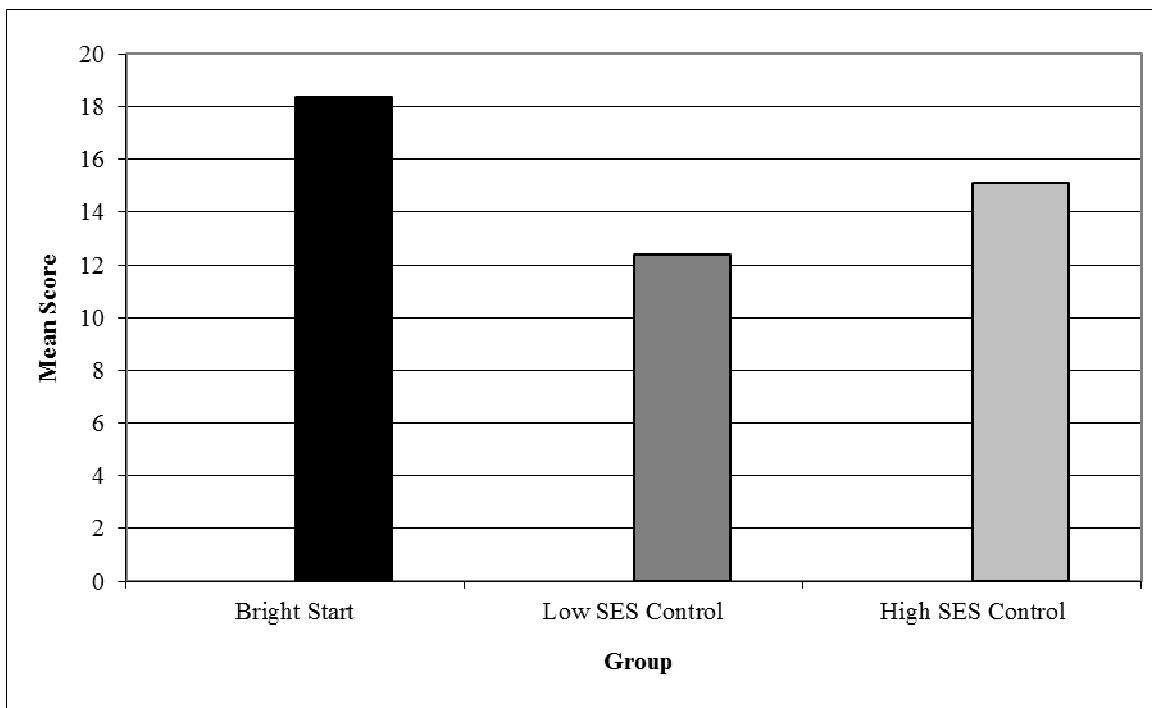


Figure 5. Reading in Grade 2: Goigoux's test of reading comprehension, all three groups [6].

At the end of Grade 3, all groups were given Aubret and Blanchard's [1] *Assessment of Reading Competence*. These results are presented in Figure 6.

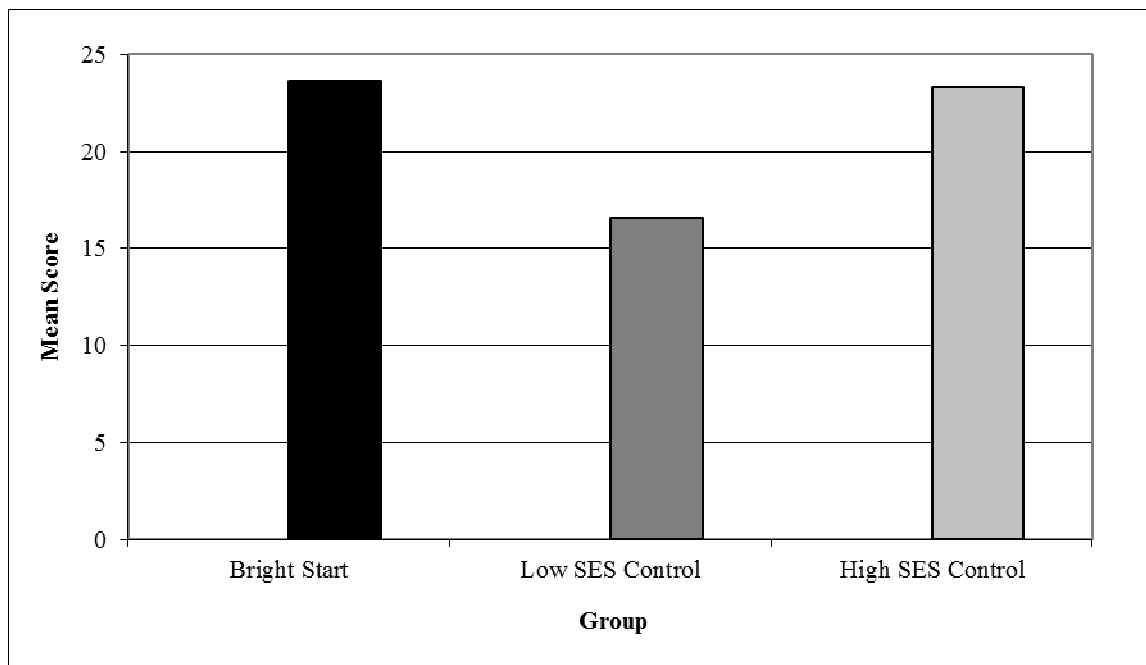


Figure 6. Reading in Grade 3: Aubret and Blanchard's Assessment of Reading Competence, all three groups [6].

One can see from these figures that the reading performance of the *Bright Start* children was consistently superior to that of the low-SES controls, and, right up to Grade 3, actually superior to that of the high-SES controls. At Grade 3, the high-SES control children had caught up with the *Bright Start* children so that there was no significant difference between them in reading achievement, but the low-SES controls never did catch up.

INFORMATION FOR APPLICATION, AND CONCLUSIONS

Practical Information on *Bright Start*

Bright Start is a classroom-oriented educational program that was designed to help young children, between 3 and 6 years of developmental age, to acquire, elaborate, and apply the fundamental metacognitive operations that are essential for learning the academic material of the primary grades, as well as to perceive the need for such strategies, generate their own, and know when and how to apply them to new learning and understanding. Benefiting from the theoretical positions of Vygotsky, Piaget, Feuerstein, and Haywood, the program relies on a mediational style of teaching, is concentrated in 8 curriculum "units," and encompasses a cognitive-mediational system of behavior

management as well as a program of parent participation. It is available in English, French, Spanish, German, Italian, Portuguese, Finnish, Dutch/Flemish, and Hebrew. Implementation of the program requires special training for teachers and supervisors, which can be given in intensive workshops of 30-40 hours beginning with certified teachers. Materials consist of a teacher manual, a parent manual, a set of theory papers, and a record-keeping booklet, all intended for the use of adults and all available from the commercial publishers. There are no consumable materials for children other than those provided for copying, with the teacher manual; thus, the materials are re-useable, that is, there is nothing that has to be acquired every year.

Information and materials can be obtained from the American publisher of the English edition: Charlesbridge Publishing, 85 Main Street, Watertown, MA, USA, or from their website: www.charlesbridge.com. Teacher trainers are available for teaching in English, French, Spanish, Portuguese, Italian, Flemish/Dutch, Finnish, German, and Hebrew, and can be identified by writing to the authors: carl.haywood@vanderbilt.edu, or penny.h.brooks@vanderbilt.edu.

The program has demonstrated utility with typically developing children, culturally "different" and linguistically different children, and children with a variety of handicapping conditions, including intellectual disabilities, severe emotional disturbance, autism, learning disabilities, speech, hearing, and language delays, and chronic illness.

Conclusions

From this review of the Bright Start curriculum and the research that has been done on its effectiveness, it is possible to reach some conclusions and to develop some new questions.

1. When systematically applied by teachers who have been trained in its methods, this program of cognitive/metacognitive early education has demonstrated positive effects on IQ, although that is not the most important criterion variable. Rather than believing that the program results in increased intelligence, the authors' interpretation of the IQ data is that cognitive early education helps children to gain access to the intelligence that they already have and to apply their intelligence more effectively and efficiently to new learning.
2. There are indications that this program may help to enhance children's development of a task-intrinsic motivational orientation. The research support for such a conclusion is fairly minimal, but the question itself is of prime importance. Other preschool education programs have led to increased motivation to learn (Lazar & Darlington, 1982), so such an outcome would not be surprising. It is only through enhanced task-intrinsic motivational systems that one can expect enthusiasm for and pursuit of learning to continue past formal education. It is thus an essential ingredient if one wishes to help people to become life-long independent learners.
3. There are also indications that this program can help to "level the playing field" in such a way that children with disabilities can be educated well in regular

classes; i.e., it can help to avoid unnecessary and inappropriate special education placement. As is true of the research on motivational effects, this area has not been studied as extensively as have some other criterion variables, and requires further empirical study.

4. The program's positive effects on cognitive functioning and development itself are well demonstrated. The effects of a cognitive intervention on cognitive functioning and development, together with effects on motivation, must be considered primary effects. Failure to find such effects would mean that there would be little chance of discovering effects of such secondary or tertiary variables as learning and school achievement. These effects on cognitive functioning appear also to be durable, which is a good basis for inferring that development itself has been affected.
5. The ultimate criterion in studies of the effects of early education is subsequent school achievement. In the United States, we are quite accustomed to seeing early education programs produce positive effects on "predictor" variables (such as IQ), and even on early school achievement, and then watching in dismay as both effects disappear by the third or fourth follow-up year. The studies reported here demonstrate convincingly that a program of cognitive early education can have generalizable and durable effects on school achievement across a variety of academic subject domains. From a theoretical point of view, these results help to answer affirmatively the question, "Is early cognitive learning generalizable to later learning in different content domains?"

The data reported here bear upon an issue that has become widespread around the world: the apparent low level of educability in children who are from low socioeconomic levels, who are culturally and/or linguistically different or even the objects of social discrimination, or transcultural (e.g., of recent immigrant status). These data, especially from the Israeli and French studies, strongly suggest that cognitive early education as represented in *Bright Start* can at least partially overcome the educational disadvantage that is seen so often in so many places in the world among such children, and can effectively close the gap in educational achievement between poor children and children from more advantaged circumstances. Evaluative data further support the conclusion that cognitive education systematically applied at preschool age can offset a significant portion of the cumulative academic deficits usually seen in children who have a wide variety of intellectual and developmental disabilities. These positive outcomes are accomplished not by creating more intelligence in these children but by helping them to gain access to and to apply the intelligence they already have, through development and elaboration of quite basic cognitive and metacognitive processes.

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