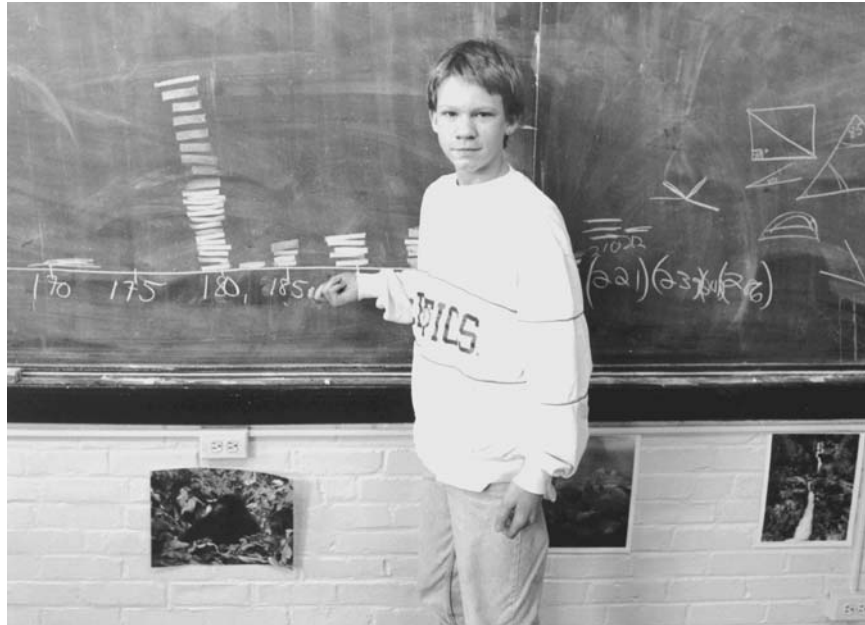


CHAPTER 1

Youth Development and Student Learning in Math and Science

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OUR INTEREST IN THE RELATIONSHIP between youth development and student learning has led us to study educational and psychological interventions designed by nonprofit, government, and corporate partnerships. Our research has shown that paying attention to students' development does not detract from student learning. In fact, promoting the highest levels of development among students seems to be what helps them reach high academic goals.

In response to the performance of U.S. students in the Third International Mathematics and Science Study (TIMSS), there have been calls for higher standards, better instruction, and tougher assessments. We believe that the real question is not how to create higher standards. *The real question is how to help schools implement programs that will meet the already high standards.* Yet, we are confronted with an overcrowded curriculum that no longer serves either students' developmental needs or their learning needs. How can schools possibly focus successfully on both?

Many schools throughout the country believe that they are taking youth development into account by teaching a "developmentally appropriate" curriculum. We have found that merely packaging a curriculum in terms of "ages and stages" does not actually address the true developmental needs of students. A course or two on child development in graduate school is helpful in learning about the discipline of youth development, but it is not sufficient to ensure that teachers will routinely act in ways that promote students' development. Schools concerned about promoting children's development have added social skills programs, after-school programs, and health clinics—yet they have not considered touching the core academic mission of the school. Nor have they designed ways to use the curriculum to impact students' developmental trajectories.

Young people need to have some sense of where they're going, what they want for themselves, their responsibilities to other people, and their responsibilities to the larger society. The day after the results of the Third International Mathematics and Science Study (TIMSS) were released in 1996, James P. Comer, founder of the Yale School Development Program, said that learning the formulas and procedures of mathematics and the sciences is essential, but knowing only formulas and procedures will not help the young make sense of our rapidly changing world. They need an education that will enable them to handle technology, the sciences, and all

the contradictions that are involved in the social world—to empathize with and care about people who are not as successful as they are. Today’s students need an education that trains them to assess, decide, and act in ways that are good for themselves and society—and this requires that their teachers continuously demonstrate their knowledge not only of math and science but also of social and emotional development.

This chapter is based on two related premises: (1) Students can learn more effectively if their development and their social and emotional learning are reflected in teaching strategies and the curriculum, and (2) those who are concerned with promoting the social and emotional well-being of children need to learn the nuts and bolts of teaching math and science. Too often, programs designed to promote students’ social and emotional learning do not take into account students’ major job in their lives: to study, learn, and successfully use the information and notions taught in their academic courses. There is a strong relationship between student learning and youth development, including social and emotional aspects of development. The school schedule is a tool that schools may use to spark developmental experiences, the outcome of a process that aligns and balances curricular units with students’ developmental needs (more about this later). Developmental experiences stretch students’ future orientation, which we understand as the ability to conceive of one’s own development. Thus, continuing academic learning and youth development lead to increasingly accurate self-awareness and resourcefulness in all situations, in school and in the wider world outside.

STUDENTS’ LEARNING IN MATH AND SCIENCE IS RELATED TO THEIR SOCIAL AND EMOTIONAL LEARNING

At the Yale Child Study Center, our Impact Analysis and Strategies Group (IASG)¹ conducts research on educational and psychological interventions designed by nonprofit, government, and corporate partnerships. While looking for other things, we repeatedly have uncovered links between social competence in tough situations and achievement in math. For example, we administered the Behavior Assessment Schedule for Students (BASS) (Haynes, 1995) to a total of 831 middle school students in School Development Program schools. BASS is designed to measure students’ self-reported thinking and beliefs about their social interactions and problems. We also obtained the students’ achievement scores in mathematics. The strength of the relationship between students’ social knowledge of themselves and others and their achievement in mathematics was found to be strong.² This makes sense. In both math and social interactions, success depends on

awareness of the challenge and of an ideal outcome, skills to map out a strategy to solve the problem, and willingness and skill in persisting at and refining the strategy until a positive outcome is achieved. (Summaries of our foundational studies appear in the appendix to this chapter.)

If we can show the nature of the relationship between youth development and student learning, then we can guide those who are intervening in the lives of children to help children succeed in learning math and science. With a better understanding of this relationship we should be able to clarify whether individual students are not achieving in math and science because of youth development issues or because of math and science issues. Most important, we should be able to guide public policy regarding how to improve the quality of education for all students.

The act of learning is described by Jerome Bruner. In *The Process of Education* (1977), Bruner reports on the Woods Hole gathering of some 35 scientists, scholars, and educators who came together for 10 days in September 1959 to discuss how education in science might be improved. Bruner discusses the act of learning and notes:

Learning a subject seems to involve three almost simultaneous processes:

1. Acquisition of new information—often information that runs counter to or is a replacement for what the person has previously known implicitly or explicitly.
2. Transformation—the process of manipulating knowledge to make it fit new tasks.
3. Evaluation—checking whether the way we have manipulated information is adequate to the task. (p. 48)

How child development and student learning are related has been a topic of heated debate since the early years of the past century: Is child development independent of learning? Is learning actually development? Are learning and development mutually dependent and interactive processes? Or does learning awaken development? (Vygotsky, 1978). How Vygotsky apparently viewed the relationship between learning and development is explained by Eric Bredo (1997), who uses the metaphor of a tennis game: “*Learning* might involve improving one’s forehand return in tennis, while *development* would involve being able to place elements of this act in the context of the likely reactions of one’s opponent” (p. 38, emphasis in original).

Students’ development may be balanced, constrained, or uneven depending on the way students understand their experiences. In optimal circumstances, that understanding is guided by skilled and caring adults who are available and accessible at critical moments. Development is usually constrained when the student has physical or psychological needs that

aren't met. When development is uneven, there is an overemphasis on one aspect of development to the detriment of overall development in the present and, possibly, in the future. To illustrate the latter, if students' cognitive development has been overemphasized to the detriment of their social development, they may be at grade level in their learning of math and science, but may be unable to successfully engage in teamwork and group problem solving, which ultimately may impact their success at higher levels of mathematics.

Mature adult development is expressed through, among other things, professional conduct, participation in groups or networks in which people exchange thoughts and ideas, and a sense of one's place along one's lifepath. At each point along the lifepath, one's desirable human functioning is defined through reflecting on what one has learned from past experiences and orienting oneself to the future. In adult development, desirable human functioning includes taking care of oneself and family, personal control, respecting the rights and needs of other people, responsible citizenship, productive employment, and taking advantage of appropriate opportunities. Development is an unending, incremental process that continues throughout an individual's life. (In our research, we discuss youth development and student learning in terms of competencies. See the appendix to this chapter for definitions of the youth development variables—competencies—that we measure in our surveys.)

When the school is a healthy place for adults and students, students begin to see themselves as part of a collective set of thoughts and actions. They develop the sense of security that they need to try out their ideas, to puzzle through new concepts, and to grow and identify with increasingly larger groups.

Consider students' participation in classroom discussions. If students are not readily participating, is it because of a math and science issue or a youth development issue? For example, the process of seeking truth includes experiences such as going out on a limb to confront distortions and misconceptions and to challenge known facts. For classrooms to nurture the open-minded, skeptical, and self-critical disposition of the scientist, classroom communities must be anchored in healthy relationships so that students will be willing to take risks and also won't perceive their teachers' efforts to correct their thinking as punitive. The learning process can be painful when assumptions are held up to the test of the scientific method. A classroom imbued with respect and trust enables the student to engage in this process with the knowledge that insights will be given attention and errors will not be publicly or privately ridiculed. A respectful tone of voice, respect due to one's elders, and the respect given to differing viewpoints do not naturally unfold among students, but must be modeled and learned.

(In a classroom riddled with mistrust and disrespect, the budding scientists' healthy skepticism could be misinterpreted as insolence. Consequently, inquisitive students could be barred from engaging in scientific debate and shy students might hold back, lacking a taste for that debate.)

Knowledge of youth development enables us to see that supportive relationships enhance students' engagement and motivate students to continue to study and learn. Whenever instructional activities in math and science become too abstract, whenever students become disinterested and disillusioned, the generative relationships that students have with others—and with their own selves—have the power to sustain them in the learning process. Gradually, they can reorganize their everyday experiences under the rubric of mathematical and scientific concepts (see Vygotsky, 1978), incorporating ever more abstract notions in this incremental way.

Schools should be healing places—places in which adults promote students' attainment of the highest levels of development without stigmatizing youth whose development is uneven. Healthy youth development and student learning are more likely in a school community in which all the adults provide a place that is predictable and a model for all future relationships.

THE RELATIONSHIP BETWEEN LEARNING AND DEVELOPMENT: DEVELOPMENTAL EXPERIENCES

Developmental experiences are the building blocks of young people's competencies and worldview. They are characterized by (1) cognitive processing that leads to a sense of well-being that, in turn, promotes future interest (J.P. Comer, personal communication, 1998), and (2) a reorientation of the self into a larger context. Even though the process at first may be painful, developmental experiences eventually produce a sense of psychological pleasure as the individual realizes that he or she can deal with conflict and/or handle the increased choices of how and what to think and feel and how to behave in this larger context.

Activities provide the spark or trigger, and the students' self-awareness provides the proof of whether an experience has been developmental: When students think about, are able to write about, and express what they derived from the activity and response (what they are now able to do with this new learning), then the activity can be considered to be one that promotes a developmental experience.

Our research shows that when adults intervene appropriately in children's lifepaths, they are setting up the conditions for developmental experiences to occur.

Young people also may have negative developmental experiences:

those that limit choices for thoughts, feelings, and behavior. Experiences such as being told to mouth the words instead of being taught how to carry a tune, or being told to go home and study longer and harder instead of being taught specific strategies for studying more effectively and efficiently, are negative developmental experiences. These experiences lead to world-views in which others can sing, but “I am tone deaf,” or others can do math, but “I am stupid,” each of which is an identity label that tends to limit future positive development.

Youth development is a continuum of growth, of acts of learning, and of experiences of self-awareness that become part of the structure of the young person’s lifepath. As on a hiking path, at each step along one’s lifepath one can look back, look to all sides, look to one’s footing, look up, and look ahead. At any point, one may have a wide or a constricted view of where one has been, what one has been through, and where one is going. And like a hiking path, the lifepath can take a turn that opens a new vista. When one takes or makes a lifepath turn, one is reorienting one’s thinking and perceiving oneself in a larger context that offers more choices for thoughts, feelings, and behaviors. This is the definition of a developmental experience.

It is the responsibility of all who work with young people to show them how to recognize, or create, and to handle these turns on their lifepaths so that these developmental experiences are positive. In doing so, we help them to acquire, transform, and evaluate their knowledge of themselves and their potential. This knowledge is of the strengths and skills they already possess, of situations and people that help them grow and learn, and of accomplishments that will mark their maturation into responsible, self-sustaining members of healthy communities. Developmental experiences stretch students’ future orientation, which is both a belief system and, in the words of William T. Brown, a postdoctoral fellow at the Yale Child Study Center, the ability to conceive of one’s own development.

A developmental experience—the reorientation toward oneself and the subject matter—can come in a sudden upwelling of insight, or it can be a slower or different type of development that virtually assembles itself before the student or teacher becomes consciously aware of the change. The way our schools are organized, students and teachers tend to be rewarded primarily for quick, and sometimes incomplete, responses. Opportunities for the slower (and often richer) responses are rare.

Role of Schools

Schools promote students’ development by ensuring that school activities and assignments are developmental experiences that are relevant to the students’ lives and also relevant to the math and scientific concepts that are

being taught. Teachers reinforce this when they help students to think through each activity. Such an orientation and curriculum have the added benefit of helping students to develop the habit of perceiving their failures in a new light: as opportunities to get more information about their current learning strategies. From this information they and their adult guides can tailor new, personalized strategies for successful learning, retaining, and recalling, without slipping into negative self-images and self-talk (Anderson, 1981; Dilts, 1998, 1999; O'Connor & Seymour, 1990).

An example of fashioning such a personalized strategy is the following typical scenario: The teacher and student unpackage what, specifically, the student is currently doing—and in what sequence—when starting to study for a test. Together they discover that as the student contemplates studying, he sags and says to himself, “What’s the use? I never get good grades anyway.” Then he closes his books and takes a long nap, waking up too anxious to study but too well rested to sleep. He takes the test underprepared, anxious, and fatigued.

After repeating the student’s comments in a way that lets him know he has been heard without being judged, the teacher guides the student to take a “trip into the future” to a time when the student already has had plenty of experience studying well and receiving good grades. The teacher uses postures, gestures, tones of voice, a tempo, and specific sensory words that best suit the student’s most desired feeling state in this imaginary future (“Notice how you’re standing, now that you have learned some ways to perform well on a test.” “Look at your reflection in a mirror, and see how cheerful you can let yourself look now that you’re happier with yourself for making progress.” “Notice the words of encouragement you give yourself that get your energy up and remind you to use your new strategies.”).

In order for the student to imagine this fully, his feeling state must change, for that is the nature of the connection between mind and body. In this new state, the student is more open to learning the new strategy, which is a highly visual memorization process that allows him to know for sure that he can store and retrieve the information on which he will be tested. The teacher and student practice that memorization strategy over the course of several meetings, and also reinforce the sense of the student’s movement toward that future time when being a competent, confident student is part of his self-identity. Before each test, the teacher and student exchange a signal they’ve agreed on that reminds the student that he is in the process of moving toward this better future. Not only is this hand-tailoring of a strategy helpful for achieving better grades, but it is also a developmental experience because the student is learning to assess his own movement along his lifepath and to recognize that he has the capacity to imagine a better future and develop the skills to achieve it.

Intervening in the Lifepaths of Students

The more students' current lifepaths lead them toward limited options, the more urgent is the need for adults to consciously design positive developmental experiences that:

- Include access to settings and people the students typically would not have encountered or would have encountered only on a limited basis
- Are of sufficient intensity and duration
- Promote their belonging in a group
- Are likely to stretch their sense of their orientation toward their own future and the future in general

For school staff, taking a developmental perspective means recognizing that students (and colleagues): (1) are who they are and do what they do as a result of the developmental experiences that they have had since birth, and (2) are becoming who they will be in part as a result of the experiences they are having right now under that staff person's influence.

Young people develop the motivation to achieve in school and in life through their interactions with adults as they navigate through school, home, work, and recreational activities. However, not all learning is constructive—consider Dewey's (1938) famous example of the individual who starts out on a career of burglary and through practice becomes a highly expert burglar. Hence the importance of a student's personal engagement with a positive role model, the teacher.

The teacher is the carrier of the value of academic learning. As an authority figure in the mind of the child, the teacher is able to frame the learning and reframe students' energy from negative to positive, outcome-oriented thoughts, feelings, and behavior. James Comer, our mentor at the Yale Child Study Center and founder of the Yale School Development Program, told us that once students have internalized the value of academic learning—once they have made the learning their own—they derive three rewards: personal fulfillment, a sense of achievement and competence, and knowledge that is useful in the world. Until students make learning their own, they need to be engaged with an authority figure who values learning. The relationship is important because it fosters students' emotional attachment to the knowledge.

Another way in which schools intervene in the lifepaths of the students is through using the school schedule to spark developmental experiences, which are more likely to occur when curricular units are aligned and balanced with students' developmental needs.

**TURNING THE SCHOOL SCHEDULE INTO A TOOL
TO SPARK DEVELOPMENTAL EXPERIENCES:
THE BALANCED CURRICULUM PROCESS**

Guilford County Schools in North Carolina implemented the balanced curriculum process designed by the Yale School Development Program's David Squires, one of the authors of this chapter. In 1993, three formerly independent school systems—Greensboro, High Point, and Guilford County—merged. The new school district's first superintendent, Jerry Weast, implemented the School Development Program throughout the system.

The following is a description of how a school in Guilford County school district used the School Development Program to balance the curriculum. The initial push for this came from both the superintendent and the principal, who were at first concerned about test scores. They decided that they would take a look at the math program since they had a pretty good sense about what needed to be done, and were considering a number of different options. They wanted to do an after-school program so students could receive math tutoring, and they wanted to provide a "problem a day" for everybody to work on. However, they also knew that the real problem was that the teachers had not had conversations about what is most important to teach in math. Both the superintendent and principal had examined the math textbooks and had had conversations about them. They found that in the math books the concepts were presented in half a page and the rest of the page was filled with problems. There wasn't really enough depth there, they concluded. In addition, there were so many topics that it was difficult to get the depth that was needed. The message this sent to the teachers was: We want you to cover all of these topics, but you are never going to have enough time to cover any of them in depth so that students really will understand the concepts of fractions or multiplication or measurements. The principal and the superintendent were also concerned because they knew that the standardized test did not necessarily reinforce the good teaching of math. They knew that the fill-in-the-bubble, one-out-of-four-you-could-guess method wasn't going to do the trick. Although they probably could push the teachers to do more of that, they knew it would unbalance the curriculum.

The superintendent and the principal asked, "How do we improve our existing math programs?" and decided to use the balanced curriculum process. This process is a form of staff development in which the children and their development are kept in clear focus while staff members define, re-envision, and rearrange what is taught and when it is taught so that it reinforces academic mastery and youth development. Staff also examine the standards, the textbooks, and the assessments, and use the results of

unit and standardized assessments to help improve math and science results. In middle and high schools, students may be part of the balancing process.

A balanced curriculum for a school district or school is the product of a threefold process: (1) defining, re-envisioning, and rearranging; (2) aligning and balancing; and (3) assessing.

Defining, Re-envisioning, and Rearranging the Preexisting Curriculum

Teachers and administrators in all grade levels work together to define the preexisting curriculum with an eye toward eliminating repetition and gaining more time to teach what the larger school community considers important. Teachers decide how much of their own ideas and professional expertise should be mixed with the views of other experts in the field as they discuss their perceptions of students' developmental needs, the existing curriculum and instructional program, the textbooks, national standards, district/state goals and frameworks, and the content and format of standardized tests. Then they redistribute the math and science units and rethink what to put in each unit and the amount of time the unit would take. The result of their work is a coherent, multiyear curriculum that has a wide scope and a clear sequence.

Aligning and Balancing the Curriculum with National and State Standards and with Standardized Assessments

Aligning and balancing the curriculum are necessary to address two faulty assumptions: (1) teaching the text leads to good results on tests; and (2) teachers naturally cover the content of tests in their classrooms. When the curriculum is aligned and balanced, classroom activities adhere to state standards, national professional association standards, local standards, standardized tests, state tests, local tests, and the six developmental pathways that James P. Comer has identified as critical to academic learning (physical, cognitive, psychological, language, social, and ethical).

Assessing the New Curriculum

An aligned and balanced curriculum provides the framework for considering assessment issues. A new curriculum is always something of a gamble. School communities are betting that if students successfully complete the unit activities, they will do well on unit assessments. If students do well on unit assessments, teachers are betting that they will do well on the standardized assessments for the state. To figure out whether the bet has been

won, the balanced curriculum process systematizes data-collection procedures so that schools can determine whether students' unit scores predict scores on standardized test-item clusters. Teachers and administrators come to a consensus about how data from unit assessments will be collected, reported, and aggregated.

Later, if results from standardized tests are not up to expectations, teachers and administrators can return to the grid; identify units and activities aligned with the deficient skill areas; and modify, realign, and rebalance them to strengthen instruction for the next year. The cycle ensures continuous improvement in the curriculum using data-driven decision making.

KNOWLEDGE OF YOUTH DEVELOPMENT PROMOTES SUSTAINED COMMITMENT

School communities also promote students' developmental experiences when they tailor interventions that are designed in accordance with principles of youth development. One such principle is that development is an incremental process. Because development is incremental, it is helpful to see any experience as a potential developmental experience and to see each developmental experience as part of an ongoing flow, rather than as a one-time "Eureka!" event. Thus, common sense suggests that if we intervene in the lives of middle school students, then we should continue the intervention at least until they graduate from high school. Yet, this type of sustained commitment is rare. One notable exception has been the Institute for Student Achievement (ISA), which Ben-Avie, Steinfeld, and colleagues evaluated for 3 years.

The ISA was founded in 1990 by Gerard and Lilo Leeds, cofounders of CMP Media Inc. ISA is a not-for-profit public/private venture in Manhasset, New York. Its self-described mission is "to improve the quality of education for children and youth at risk so that they can succeed in our society." Gerard Leeds has a persuasive argument to justify the expenditure necessary to attempt this: Provide integrated school-based academic and counseling support services to students identified as being at risk of dropping out of school, at a cost of \$3,000 to \$5,000 per student annually—approximately \$20,000 for a 4–6-year program—and eventually "society gets its money back every two years for the working life of each person." In Leeds's words, "When [ISA students] graduate from college, they'll be making \$30,000 to \$40,000 a year. They'll average paying \$10,000 a year in taxes. When they graduate from college, in two years they'll have paid society back in taxes" (quoted in Fischler, 1998, p. 25). Furthermore, soci-

ety saves by “avoiding the future costs of unemployment, health and welfare support and the costs of the criminal justice system” (p. 25).

ISA’s experience teaches us that if you want to make a difference in the lives of children, you can’t jump in and out of their lives. You also can’t expect major changes in the trajectories of children’s lives after only a year or so of intervention. ISA provides school-based academic enrichment and counseling support services to middle and high school students who have been identified as most likely to drop out. It provides the students with easy access to adults who help them manage their anger, resolve interpersonal conflicts with teachers and other students, and deal with other issues that may interfere with their learning. Whereas other interventions are coordinated by a single individual, ISA brings in a team to support the students. This team approach helps students to maintain a sense of continuity of relationships when individual team members are promoted or leave. ISA’s team approach carries over to the students: Students affiliate with ISA as if it were a youth group. Whereas many after-school interventions provide students with academic reinforcement and enrichment, ISA’s extended-day component is closely linked to its during-school academic enrichment component—and the same team members staff both. Whereas other interventions are designed to promote either the students’ learning or their development, ISA is a comprehensive intervention that focuses simultaneously on youth development and student learning. (Our research has demonstrated that ISA’s 93% graduation rate could not have been predicted by either chance or comparison to other groups of U.S. students who had been identified as likely to drop out of school.)

Ben-Avie, Haynes, and Steinfeld administered our Learning and Development Inventory (LDI) to 261 ISA students from Long Island and Westchester County, New York.³ The LDI is an outgrowth of 10 years of research at the Yale Child Study Center on the relationship between youth development and student learning. The high school version of LDI is a 95-item survey with a 5-point Likert response format that measures student learning and youth development. The middle school version of LDI is an abbreviated, 61-item scale. In 2002, the survey was administered to all middle and high schools in a Connecticut city. Data analysis was conducted on the responses to the survey to discern whether it met statisticians’ criteria for being a reliable survey. This was found to be the case.⁴

The responses of the ISA students to the LDI were matched with those of a similar number of non-ISA students from around the country. The students were matched on the basis of enrollment in a low-performing school, low academic achievement, age, gender, socioeconomic status, and ethnic background, and/or exhibiting the following characteristics: failed one or more subjects and/or displayed transition problems, attendance

problems, disciplinary problems, or family problems. The appendix to this chapter contains a description of the methodology that we used to provide a measure of cross-validation for our findings.

Our studies revealed several important predictors of students' academic perseverance (see Tables 1.2 and 1.3 in the appendix to this chapter), which we define as students' persistence in performing strategic behaviors that increase the likelihood of academic success, regardless of obstacles or distractions. In the order of their importance in our findings, these predictors were:

1. Students' ability to quickly recover their healthiest sense of self during and after challenging social situations (coping)
2. Students' feelings of efficacy when solving challenging problems in mathematics and science (problem solving in math and science)
3. Students' tendency to trust adults and to develop supportive relationships with them (engagement with adults)

These four themes of academic perseverance, coping, problem solving in math and science, and engagement with adults cluster throughout our findings in several major studies we have conducted.

What we learned is that as students' scores on the youth development dimension rose, so did their scores on the student learning dimension. The reverse was also true: Those students who tended to have low scores on the student learning dimension also tended to have low scores on the youth development dimension.⁵

We also learned how ISA staff members were able to shape the trajectory of the students' lifepaths—how, specifically, they were intervening. We already knew that to improve and increase cognitive engagement, ISA addressed the students' problem solving in math and science. To improve and increase behavioral engagement, ISA addressed the students' academic perseverance. To improve and increase psychological engagement, ISA addressed the students' coping skills and their engagement with adults. What we discovered when we went back to our research findings on ISA and other intervention programs was a driving force underlying all this effort: a belief system that promotes future orientation. These programs are founded on the belief that success is possible and that the way to achieve it is to insist on a graduated sequence of concrete skills that can support even somewhat abstract ideas about the long term. Thus, students who had been identified as most likely to drop out were now defying negative predictions about their future.

By seventh grade, we have found, students placed at risk of failure

typically demonstrate that their orientation toward the future already diverges from the orientation of their more-likely-to-be-successful age mates. The orientation of students placed at risk of failure is marked by magical thinking (“Somehow, the project will get done in time”), by hoping for an external intermediary (“I’ll win the lottery”), and/or by the expectation that the future will remain largely the same as the present (“I’ll always live in a dangerous neighborhood”; “I wouldn’t know how to behave in such a fancy office”). All these beliefs can support habits antithetical to academic excellence. In order for students to change, and in order for the adults who guide them to help them change, the students and adults must have and must demonstrate thoughts, feelings, and behaviors that support a positive attitude about the long-distant future and about themselves as successful learners and contributing members of society.

The relationship between potential future outcomes and present behavior for students is captured in the following passage by Lens and Moreas (1994):

People with a long future time perspective . . . will experience less immediate satisfaction and more delayed satisfaction due to goal attainment (e.g., to become a nurse in two years vs. a medical doctor in seven years). However, the self-imposed delayed gratification that is inherent in long-term goal-setting cannot be reached by waiting. One usually has to perform a longer or shorter series of instrumental actions in order to achieve one’s goals. (p. 27)

Strathman, Boninger, Gleicher, and Baker (1994) note the positive correlation found between future orientation and socioeconomic status. Students who experience pressing and, often, chronic traumatic immediate events (e.g., poverty and violence) tend not to take action to shape future outcomes. Yet ISA students showed that this does not need to be the case. The ISA staff members successfully inculcated in their formerly failing students the future orientation of successful students, and that future orientation and the self-identity that goes with it supported the students in their academic and personal growth. Whereas in students who have always been academically successful these attributes tend to predate school, it is clear that the attributes can be developed even after chronic school failure and can still promote school success. By their own self-report, in interview after interview, students chronicled their internal and external changes. The students’ measurable academic success, accompanied by self-knowledge and ease at tracking their own reorientation from the past and into the far future, is an important part of what qualifies the entire ISA intervention as a series of positive developmental experiences.

WHERE TO START: A UNIVERSITY–SCHOOL DISTRICT PARTNERSHIP

In this section, we describe a partnership initiated by Drury University to impact students' developmental trajectories. We then describe a study that our Impact Analysis and Strategies Group conducted in partnership with Drury. We offer the partnership between Drury University and Springfield Public Schools in Missouri as an example: They did not address students' developmental needs by declaring that teachers will take care of promoting the students' learning and other school staff will take care of promoting the students' development. In this partnership, they adopted the approach of identifying the students' developmental needs and then using this knowledge to inform staff development activities for school staff members. Of special note, Drury offered a free master's degree to faculty in participating schools. As the partnership unfolded, Drury's school of education renamed itself the School of Education and Child Development.

In Springfield, Missouri, the Drury University School of Education and Child Development developed several partnerships that simultaneously promoted the learning and development of both preservice teachers and elementary, middle, and high school students. Preservice teachers had been coming to their professors asking for classroom management tips. One student suggested that the school of education "compile a book of recipes" to assist preservice teachers in dealing with a variety of classroom problems and issues. Jayne White, one of the authors of this chapter, realized that what teachers really need is an understanding of child and youth development. Armed with a deep understanding of their students, teachers should be able to prevent many classroom problems from occurring and should be able to foster the development of each student.

Although Drury's preservice teachers were exposed to developmental and learning theories in college, they did not yet understand the application of those theories to real situations, even though they had worked with children during each of their four field experiences. To discern how the professors were not adequately preparing the preservice teachers, the professors had many discussions with local educational leaders, parents, other teacher educators, and preservice teachers. The professors concluded that the preservice teachers were not spending enough time with any one child to make a difference. The preservice teachers would go to school X for a total of 15 hours and then go to school Y for a total of 15 hours. Never would they be in the same school two semesters in a row. They simply dropped in and dropped out. Mostly they were a nuisance to the teachers. Relationships were not established—although many hours were being expended. The reality was that neither party was really benefiting.

The professors at Drury decided that if they want preservice teachers

to affect the lifepaths of children, then the preservice teachers must develop relationships with the children in their classrooms. This would require prolonged observation, interaction, and supervision in a school setting. There needed to be more structure and planning among the parties involved, and the college students needed to be assigned one or two children with whom they would work on a regular basis for a specified time (a semester or more). This would increase the possibility that relationships would form between youth and preservice teachers, thus increasing the likelihood that learning and development would be positively affected.

The First Phases of the Partnership

In the face of the district's desire to close Boyd/Berry, an elementary school located one block from the university and serving as a field experience site for preservice teachers, Drury proposed forming a partnership with the school. This partnership became guided by the Yale Child Study Center's School Development Program in 1997.

In 1996, Boyd/Berry was the lowest-performing school in the district, with the highest attrition rate of teachers, the highest mobility rate of students, the lowest levels of parent involvement, the greatest number of discipline problems, the highest rate of absenteeism, and the highest rate of suspensions. Since then, improvements have occurred in every area, including student achievement in math. Second-grade math scores on the Missouri Mastery and Achievement Tests increased from 250 in 1995–96 to 307 in 1999–2000. Third-grade math scores increased during this period from 290 to 334. Fifth-grade math scores increased from 280 to 349. In Missouri, student performance on standardized tests (Missouri Assessment Project) is categorized. In 2000, 27% of Boyd/Berry students achieved in the advanced and proficient category, an increase from 4.5% one year before (statewide, 38% of students performed in this category).

The partnership was expanded into Pipkin Middle School, the usual middle school of students from Boyd/Berry. At the same time, the coordinator of Drury's Student Services received funding from the Community Partnership of the Ozarks to implement an initiative known as TASK (Taking a Stand for Kids). TASK provides many opportunities for Drury students to become involved in service-oriented experiences. As a group, Drury's TASK preservice teacher students contribute about 2,000 hours a year of direct involvement with students, parents, and faculty through: (1) tutoring and mentoring at Central High School (CHS), Pipkin Middle School, and Boyd/Berry Elementary School during the school day; tutoring and mentoring after school at the Boys and Girls Club of Springfield, and Big Brothers/Big Sisters of Springfield; (2) volunteering at the Missouri Hotel,

a shelter for homeless families; (3) working with children enrolled in the Head Start Program; and (4) volunteering to work with women and children at the Family Violence Center. Drury's professors have begun teaching courses to the preservice teachers on the premises at Boyd/Berry and Pipkin.

CHS Joins the Partnership

During the 2000–01 school year, CHS engaged in planning to become a partner. CHS faculty agreed to collaborate more closely with Drury to accept preservice teachers for methods courses, practicums, and other field experiences (including student teaching). CHS also agreed to send faculty to the School Development Program national leadership academies. In return, Drury offered CHS faculty tuition remission for graduate study, and provided mentoring and other opportunities for CHS students. (Forty faculty members from the three partnership schools enrolled in a total of more than 360 credit hours of graduate coursework during the 2000–01 academic year.)

The data contained in this section are baseline data for CHS. Most of the 1,139 students at CHS are White (approximately 80%). The next largest group is African American (approximately 10%), and there are small minorities of Hispanics, Asians, and Native Americans in the school. Forty-one percent of the students receive free or reduced-price lunch, a poverty indicator. The school has a 56% mobility factor, compared with 35%, 32%, 17%, and 13% in Springfield's four other high schools. The Springfield Public Schools' Annual Report indicates a 1999 graduation rate of 43%. This improved to 52% for the class of 2000.

As part of CHS's planning year (the year prior to actual implementation of the SDP) to help decide where to focus interventions, the Learning and Development Inventory, which had been slightly revised in 2001, was administered. Our findings from its administration to 700 students at CHS once again confirm our findings about the relationship between learning and development. We observed that the relationship between the learning dimension and the development dimension was strong.⁶ The slightly revised variables were also found to be sound. These include the new future orientation variable, academic persistence (formerly academic perseverance), problem solving in math (formerly problem solving in math and science), and seeking adult guidance (formerly engagement with adults).

We also found that the most important predictors of academic and professional competencies were future orientation, academic persistence, and coping. Academic and professional competencies is the variable that measures the consistent demonstration of attributes, such as work ethic,

that contribute to high academic achievement and that employers consider desirable in new employees. Relationships between future orientation and several other variables were consistent with what we expected based on experience and prior research. (The statistics that support these statements appear in the statistical tables at the end of the appendix to this chapter.) The following variables also were found to be correlated with problem solving in math: academic and professional competencies,⁷ academic persistence,⁸ student engagement,⁹ academic focus,¹⁰ and language skills.¹¹ The relationship between future orientation and problem solving in math was observed to be statistically significant.¹² In the following section, we focus on future orientation, the ability to conceive of one's own development.

FUTURE ORIENTATION: THE MOST IMPORTANT PREDICTOR OF ACADEMIC AND PROFESSIONAL COMPETENCIES

The CHS students were asked to indicate their immediate plans for formal education after high school. A data analysis was conducted to see whether significant differences could be discerned between those planning to attend a 4-year college and those not planning to do so. On every single student learning and youth development variable, those planning to attend a 4-year college had significantly higher scores than those not planning to attend a 4-year college.

CHS teachers commented at a panel discussion and in subsequent discussions that there appears to be a discrepancy between students' self-reports on plans to attend 4-year colleges and the teachers' observations of patterns of student behavior. Consistent with the results of previous studies that we conducted on students' temporal orientation, students who had higher future orientation scores tended to indicate more often that they planned to attend 4-year colleges. This was particularly the case with students who would not be the first in their families to attend college. Moreover, students who had visited a college campus tended to have higher scores on future orientation. The comments from CHS teachers, however, suggested that many students had no serious plans for continuing their education after high school, as evidenced by their not having taken the steps to apply for college enrollment (e.g., taking the ACT test, completing financial aid forms, and visiting college campuses). Based on these comments, we conducted further analyses to generate possible explanations for this discrepancy.

Present and future orientations tend to be important influences on a person's behavior, and the two are not necessarily opposites of each other (i.e., a person can be both highly future- and present-oriented). We found

that students who indicated that they planned to attend a 4-year college and who had family members who attended college were not only more future-oriented but also less present-oriented than their peers who had other educational plans or who would be the first in their family to attend college. These results possibly explain the magical thinking that we have observed in other student populations: Students do have future aspirations for attending college but are engaged or preoccupied with present activities. One teacher stated, “It does not appear to be a byproduct of hopelessness; rather it seems to flow from an attitude of *carpe diem*. They seem to focus on living and cruising through each day to the point that thinking about or planning what they will do tomorrow or in 4 years is ridiculous.”

It is possible, indeed likely, that some students said that they planned to attend a 4-year college because of convention or wanting to look good on their survey. Regardless of the reason, they expressed aspirations for the future that included college, and the gap between their future plans and present behaviors represents an important opportunity for intervention. James P. Comer has taught us that the quality of relationships impacts students’ level of future orientation. Therefore, we conducted a further analysis using items from the survey that measure students’ social relationships with other students and items that measure student–teacher relationships. We found that students who had high-quality relationships with both peers and teachers tended to have the highest levels of future orientation. This finding supports the premise that the adults at CHS can influence their students’ future orientation and enhance their educational outcomes.

ENHANCING SUCCESS IN THE CHARACTERISTICS THAT CORRELATE WITH PROBLEM SOLVING IN MATH AND SCIENCE

During school hours, students provide us with a glimpse of who they are. Taking a youth development perspective means widening our view of students to include the student as a member of a family and community (hence the need for school/community/university partnerships). Moreover, an understanding of youth development enables us to see the student as an individual in the process of becoming—as an individual moving along a life-path. Succeeding in math is not only about understanding math, it is about the whole trajectory of a child’s life. Today algebra is a youth development issue. Because literacy in math and science opens the gateway to college and life success, the lifepaths of today’s students will be influenced by whether or not they can excel in their math and science classes.

The baseline data from CHS show that, in general, students’ time ori-

entation is focused on the present, not on the future. Students will not buy the educational utility argument (i.e., if you study hard now, it will pay off in the future). In this case, raising standards is probably the least effective solution. J. P. Comer (personal communication, 1997) told us, “You can’t challenge students if they are not willing to perform. You can challenge them and some will reach the standards—those that have a sense of well-being, a sense of hope, a belief that there is opportunity in their future—those that have been prepared and disciplined by a caring home experience, and by a caring community experience.”

We have found that ensuring that students are supported in their development is too important an issue to leave to add-on programs or to the initiative of the teacher working in isolation. Algebra must be integral to the school day, and so must youth development. School communities that promote students’ developmental experiences are those that simultaneously address students’ development and learning. Adding programs that address only one dimension or the other—or only some aspects of youth development—will only crowd an already overcrowded curriculum. Our experience has shown us the benefits of implementing a process of balancing the curriculum. Balancing the curriculum requires a partnership on the scale of the Drury University partnership.

CONCLUSION

Helping students to multiply their options and decreasing the number of students who float through the school day are youth development topics that go far beyond introducing a developmentally appropriate curriculum, raising standards, or establishing accountability measures. Creative mathematical and scientific thinking relies on the ability to create flexible internal images. Flexible thinking is more likely in children who have been exposed to many kinds of experiences, who have been encouraged to see the world metaphorically as well as concretely, who have access to their inner visions, and who have the linguistic skills to share them. When youth are developing well, they learn well.

POSTSCRIPT

In 1999, when the Third International Mathematics and Science Study—Repeat (TIMSS-R) was administered, Guilford County Schools had used our School Development Program to merge three very different school systems (see Comer, Ben-Avie, Haynes, & Joyner, 1999) and had piloted our

balanced curriculum process. The TIMSS-R results showed that their gamble had paid off: Guilford County students excelled in math and science, scoring 27 points above the international average in mathematics and 46 points higher than the international average in science. Guilford County eighth graders scored 12 points above the U.S. average in mathematics and 19 points above the U.S. average in science (Guilford County Schools, 2001). This finding is all the more thought-provoking when one considers socioeconomic factors: According to the school system's website, "The 1999 data reveal that 37 percent of Guilford County Schools' participants were from families who are eligible to receive free or reduced-price meals, classifying them as low-income. The top scoring U.S. systems had only 2–14 percent of their participants from low-income families" (Guilford County Schools, 2001).

APPENDIX: RESEARCH DESIGN AND RESULTS

The direction that our research has taken rests on previous studies that we conducted over a 10-year period at the Yale Child Study Center. The following are brief descriptions of three of these foundational studies:

- In 1995, we administered the *Behavior Assessment Schedule for Students* (Haynes, 1995) to a total of 831 students in School Development Program schools. BASS is designed to measure students' self-reported thinking and beliefs about their social interactions and problems. We also retrieved the students' achievement scores in mathematics. The relationship between students' social knowledge of themselves and others and their achievement in mathematics was found to be very strong.¹³
- We conducted a study that was designed to examine the use of specific learning and cognitive strategies as well as students' achievement motivation. Seventy-two female and 76 male tenth-grade students who attended a School Development Program urban high school in the northeastern United States participated in the study. We obtained the students' quality point averages (QPAs), which are derived from a grading system based on weighted scores for higher-track courses. The students completed the *Learning and Study Strategy Inventory* (LASSI; Weinstein, Zimmerman, & Palmer, 1988). The LASSI looks at students' methodologies for learning and processing information. The results of the study indicated that cognitive and motivational factors are significantly related to student learning and achievement.¹⁴ Motivation was the strongest variable in predicting a student's QPA.¹⁵ The next-strongest predictor was the information processing variable. Average and high-achieving students

did not significantly differ on any of the LASSI subscales. Low-achieving students, however, differed significantly from average and high-achieving students on every single LASSI subscale. We understand from the LASSI study that the action steps of math and science are the rigorous methodologies that enable us to organize information under the rubric of scientific concepts, filter out irrelevant information, analyze facts critically, share interpretations of findings with colleagues, and engage in problem solving. And these methodologies can be learned.

- In our research on academic self-concept among 146 middle school students, we found the climate of relationships within classrooms—between teachers and students as well as among students—to be significantly related to the intellectual and school-status dimension of self-concept.¹⁶ This dimension reflects children’s self-assessments of their abilities with respect to intellectual and academic tasks (see Piers, 1986). Improvements in the climate of classroom relationships may indirectly affect student achievement in math and science. For example, Emmons, Haynes, Owen, Bility, and Comer (1994) present research that shows that self-concept is a mediator of student achievement. A systematic pattern of relationships among self-concept, classroom climate, behavior, and achievement was observed. Specifically, three significant paths were found: one from classroom climate to self-concept,¹⁷ one from self-concept to behavior,¹⁸ and one from behavior to achievement.¹⁹

Definition of Survey Variables

In this chapter, we discuss youth development and student learning in terms of competencies. Table 1.1 shows the definitions of the variables that we measure in our surveys.

Methodology

We used a triangulated approach that provided a measure of cross-validation of the findings:

1. To determine the extent to which positive trends may be discerned with regard to student outcomes, we conducted a retroactive analysis on the achievement data of the first four ISA cohorts (167 students) and a cohort analysis of the ISA class of 2000 from four schools.
2. To determine the quality of program implementation at the sites, we (1) conducted 70 direct observations of regularly scheduled ISA academic enrichment and counseling class periods, and (2) adminis-

Table 1.1. Definitions of Variables

Learning and Development Inventory (LDI)	Definition
Learning subscale	
Demographic questions	Items exploring the respondent's gender, age, mobility, plans for formal education after high school, and out-of-school time
Academic and professional competencies	The consistent demonstration of attributes (e.g., work ethic) that contribute to high academic achievement and that employers consider desirable in new employees
Academic focus	Student's tendency to focus attention on academic work, especially with respect to keeping schoolwork organized
Academic persistence	Student's persistence in performing strategic behaviors that increase the likelihood of academic success, regardless of obstacles or distractions
Student engagement	Student's engagement with schooling and motivation for high academic achievement
Language skills	Degree to which student feels comfortable and effective using language in both academic and interpersonal settings
Problem solving in math	Student's feelings of efficacy when solving challenging problems in mathematics
Development subscale	
Coping	The ability to quickly recover one's healthiest sense of self during and after challenging social situations
Belonging	Feelings of connection and affiliation with the student body at the school or others in the respondent's general age group
Future orientation	The ability to conceive of one's own development—the tendency to devote attention to the future, set goals beyond the immediate time frame, and engage in behaviors designed to reach future goals
Friendship	Perceptions of intimacy with particular persons and participation in close friendships with other students
Seeking adult guidance	The tendency to seek out adults for guidance and to develop supportive relationships with them
Safety	Items exploring the respondent's sense of safety at school and on the way to and from school
Demographic questions	Items exploring the respondent's participation in extracurricular activities, ethnicity, grade point average, and other background information

tered our Staff Feedback Form to 73 ISA school-based staff members.

3. Our direct observations of ISA enrichment and counseling sessions and analysis of the assessments of the ISA faculty regarding their effectiveness helped us to interpret the students' responses to the Learning and Development Inventory.

We also conducted interviews with ISA staff members at all levels and with students throughout the 3 years of the study.

Statistical Tables

Table 1.2. Major Predictors of Academic Perseverance

Variable	R	R^2	Adjusted R^2	Beta
Coping	.569	.324	.318	.569**
Math/science	.674	.454	.444	.389**
Adults	.693	.481	.466	.190*

* $p < .05$. ** $p < .0001$.

Table 1.3. Major Predictors of Academic and Professional Competencies

Variable	R^2	Adjusted R^2	Beta
Future orientation	.390	.389	.354*
Academic persistence	.481	.480	.299*
Coping	.524	.522	.237*

* $p < .001$

NOTES

1. IASG members who are authors of this chapter are Ben-Avie, Haynes, and Steinfeld.

2. $r = .80$, $p = .04$.

3. Students from the following school districts: Roosevelt Union Free School District, Long Island; Wyandanch Union Free School District, Long Island; Enlarged City of Troy Public Schools, New York State Capitol Region; Hempstead Union Free School District, Long Island; and City of Mount Vernon Public Schools, Westchester County.

4. The internal consistency reliability for LDI was found to be in the robust high range (.947).
5. $r = .764, p < .001$.
6. $r = .650, p = .001$.
7. $r = .293, p = .001$.
8. $r = .310, p = .001$.
9. $r = .357, p = .001$.
10. $r = .368, p = .001$.
11. $r = .391, p = .001$.
12. $r = .282, p < .001$.
13. For the eighth-grade students, the strength of the relationship was found to be .80 ($p = .04$).
14. $F(20,268) = 2.6, p < .0001$.
15. $R = .45, F(1,146) = 37.8, p < .0001$, accounting for 21% ($R^2 = .205$) of the observed variance in QPA.
16. $r = .43, p < .01$.
17. .62.
18. .78.
19. .47.

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