Above & Beyond with Digi-Block Mathematics

A Base-10 Program for
Learners with
Significant Cognitive Disabilities

DIGI-BLOCK®
See the Math

INTRODUCTION

Finally, there is a mathematics program written specifically for students with significant cognitive disabilities. Developed in cooperation with practicing special educators, *Above & Beyond with Digi-Block Mathematics* addresses the unique learning needs of this special population. No longer will teachers need to search for appropriate instructional materials, settle for commercially modified programs originally written for students in regular education, and/or rewrite curricula designed for others. *Above & Beyond* answers the clarion call with a coherent, engaging, and mathematically sound curriculum.

At the core of *Above & Beyond* is Digi-Block, a math manipulative so ingeniously designed that it enables students to understand, at a deep level, place value concepts and skills associated with number operations. Digi-Block's set of proportional nesting blocks is a remarkably accurate physical representation of our base-10 number system. Through the innovation of "smart boxes" that hold exactly ten blocks to make one larger block, students pack and unpack blocks to see that 10 ones become one block-of-ten, 10 tens become one block-of-100, and so on. Through concrete experiences with these one-of-a-kind blocks, students unlock the mystery of place value, develop a profound understanding of number, and learn to carry out arithmetic procedures that have previously been beyond their grasp.

As teachers and students work in *Above & Beyond*, the evidence of significant learning is undeniable --- learning that takes students *above and beyond* what has erroneously been regarded as their learning limit. Their accomplishments enable them to see that they, too, can do mathematics. As one high school student proudly announced to his teacher, "I'm smart, now, aren't I, Sue!" No longer should anyone believe that cognitively disabled students "can't learn math." That myth is dispelled by *Above & Beyon!.*

Above & Beyond is appropriate for students of any age and grade with moderate and mild mental retardation, autism, language and/or sensory impairment, and traumatic brain injury. It is used successfully in a variety of classroom settings with groups as well as with students needing one-on-one assistance. At last, special educators have a research-based program with which they can teach cognitively challenged students many of the same arithmetic concepts and skills that typical students learn --- concepts and skills that empower them to function with a maximum degree of independence.

THE CURRICULUM

Above & Beyond with Digi-Block Mathematics provides a complete and thorough base-10 curriculum for developmentally disabled students in elementary, middle or high school. The content is organized into four Units that guide students through a carefully developed sequence of lessons. Beginning with the most elementary mathematical experiences in Unit 1 and continuing through Units 2, 3, and 4, students build conceptual understanding of the base-10 number system, proficiency with the four arithmetic operations, and facility with dollars and cents.

Unit 1: Ones (71 lessons)
- Block manipulation
- Counting and recognizing numerals up to 10
- None, more, and less
- Modeling and recognizing quantities on the ten-frame

Unit 2: Ten (41 lessons)
- 1 ten = 10 ones
- Relationships among numbers 0-10
- Connecting blocks and whole dollars up to $10
- Getting ready to regroup

Unit 3: Place Value for Whole Numbers (151 lessons)
- Counting, comparing, ordering, and recognizing numerals to 20, then 100, then 1000
- Modeling numbers to 1000
- Adding and subtracting two-and three-digit numbers with and without regrouping
- Multiplying by one- and two-digit numbers
- Dividing numbers up to 999
- Designating given values with combinations of $1, $5, $10, and $20 bills

Unit 4: Between Whole Numbers (22 lessons)
- Modeling decimals to hundredths
- Associating decimal blocks with dimes and pennies
- Comparing and ordering amounts of money
- Adding and subtracting dollars and cents
- Learning the relationships among pennies, nickels, dimes, quarters, and half-dollars
- Counting dollars and cents to $50.00

FEATURES AND BENEFITS

Features	Benefits
Digi-Blocks bypass language as the primary tool for teaching mathematics.	Students with language deficits are able to grasp mathematical concepts through manipulation of physical objects.
Learning is carefully sequenced so that students are never asked to do anything for which the requisite understanding has not been addressed through instruction and assessment.	Students are successful learners. They are fully prepared for new learning. Anxiety is replaced with self-assurance and pride in accomplishment.
Each Unit is meticulously developed with detailed, step-by-step instructional procedures spelled out for every lesson.	Teachers and instructional aides, most of whom have not been trained in mathematics, become highly successful math teachers. Such success breeds pride and self-confidence.
Traditional procedures for arithmetic operations are adapted to address the learning capacities of developmentally delayed students.	Students use mathematically correct, meaningful procedures to add, subtract, multiply, and divide.
Assessment that is structured around clearly stated objectives is a key component of the program. For each objective, complete assessment materials and record-keeping instruments are provided.	Teachers can pre-test and post-test each objective. They can effectively monitor each small learning step.
Initial learning always occurs through experience with blocks.	Students build a strong and enduring mental model of visual mathematics.
Math concepts and procedures are broken down into the smallest possible instructional pieces.	Learning occurs in very small, achievable increments.
The same six strands are taught in each Unit: counting, modeling (representing numbers with physical materials), addition, subtraction, multiplication, division. Instruction in money is integrated into the content of each Unit.	Students build concepts and skills incrementally from one Unit to the next.
The program is mathematically sound. There are no tricks, no gimmicks.	Students develop genuine understanding of the mathematics behind our number system.
Instruction moves progressively from concrete to pictorial to abstract.	Students extend their tactile understanding by drawing the block operations on paper and then carrying them out with numerals only --- a powerful progression toward independent thinking.
The multi-sensory approach allows students to experience mathematics kinesthetically, visually, and auditorily.	Students are able to build understanding in their strongest modality while building skills in those modalities that they would otherwise ignore.
The program is easily individualized.	Students progress at their own pace. Teachers can organize their classrooms so that different groups are working at different levels.
Creative repetition of content through games, cooperative learning, and individual and group activities provides necessary reinforcement of concepts and skills.	Students get the benefit of repetition while staying interested and engaged.

LEARNING OBJECTIVES

Unit	Chap	Objective	Lesson
1	1	Show an interest in 1-blocks.	1
		Copy a given block design.	2
		Place blocks in varied designs.	3
		Demonstrate the concepts "more," and "one more."	4-8
		Demonstrate the concept "none."	9
		Use 1-blocks to trace the drawing of a figure.	10-11
	2	Demonstrate number concepts "one, two, and three."	12-16
		Count to 10 using concrete objects.	17-27
		Read written numerals 0-10.	28-33
		Match a number name to a given quantity and visa-versa.	34-42
		Match groups having equal numbers of objects.	43-44
		Demonstrate understanding of "more" and "less."	45-49
	3	Recognize a quantity by its formation on the ten-frame.	50-56
		Model addition (sums no greater than 10) using manipulatives.	57-61
		Model subtraction (minuends no greater than 10) using manipulatives.	62-66
		Add and subtract when sums and minuends are no greater than 10.	67
		Using models of sets up to 10, complete partial sets.	68-69
		Count out requested numbers of items up to 10.	70
		Distribute items in single sets.	71
		Associate ordinal words (first, second, etc., next, last) with position.	72-75
2	1	Know that a block-of-10 contains ten 1-blocks.	1-10
		Determine the number of blocks in a holder without counting.	11-17
	2	Understand the relationship between $1 bills and $10 bills.	18-20
		Understand the various relationships among $1, $5, and $10 bills.	21-23
	3	Count backward from 10 to 0.	24-29
	4	Complete partial sets of 10.	30-32
		Subtract a number between 0 and 10 from 10.	33-335
		Structure addition and subtraction around 10 for sums and minuends 11-19.	36-41
3	1	Understand that 10, a two-digit number, means 1 block-of-10 and 0 1-blocks.	
		For 11-19, associate count, name, number symbol, and place value meaning.	3-15
		Order and compare numbers 0-19.	6-18
		Add /subtract with no regrouping when sums /minuends do not exceed 19.	19-31
		Add /subtract with regrouping when sums / minuends do not exceed 19.	32-44
		Perform single-digit multiplication.	45-53
		Divide by 1-9 when dividends do not exceed 18.	54-63
		Use combinations of bills to designate values up to $19.	64-69

	2	Count by tens from 10 to 90.	70-74
		For numbers 20-99, associate count, number name, number symbol, and place value meaning.	75-80
		Order and compare numbers 0-99.	81-87
		Construct equivalent forms of whole numbers to 99.	88-90
		Add and subtract within the set of numbers 0-99 when sums and minuends do not exceed 99.	92-101
		Multiply two-digit numbers by one-digit numbers when products do not exceed 99.	102-107
		Divide two-digit numbers by one-digit divisors when dividends do not exceed 99.	108-112
		Use combinations of bills ($1, $5, $10, $20) to designate values from $20 to $99.	114-116
	3	Model, read, and write whole numbers up to 1000.	117-122
		Compare and order numbers up to 1000.	123-126
		Construct equivalent forms of whole numbers up to 1000.	127-129
		Add and subtract within the set of numbers 0-1000.	130-140
		Multiply by two-digit numbers when products do not exceed 999.	141-147
		Divide by single-digit numbers when dividends do not exceed 999.	148-151
4		Associate number name, number symbol, and place value meaning for dimes and pennies.	1-9
		Compare and order amounts of money.	10-14
		Add and subtract dollars and cents	15-16
		Associate name, symbol, and place value meaning for nickels, quarters, and half dollars.	17-20
		Apply money concepts for amounts up to $50.	20-22

DATA

The Digi-Block system used by *Above & Beyond* as an instructional method for developmentally disabled learners is associated with three studies.

1) The **first study** was begun in December, 2003, when two high school life skills teachers decided to try using the Digi-Block system to teach number concepts and skills to their students. The teachers had experienced continual frustration at their inability to help their students "learn math" and function with money. They were hoping that somehow the blocks would offer a way to reach their students.

During the 2003 school year, the teachers experimented with Digi-Block, referring to the Digi-Block website for instructional guidance and allowing the sense-making capability of the blocks to lead the students through the learning process. They were astounded! For the very first time, their students were making sense of numbers and were learning concepts and skills that they had been unable to learn previously!

As a result of the students' progress in these two classrooms, *Above & Beyond with Digi-Block Mathematics* was written specifically for cognitively disabled students.

The table below shows the pre-program results for the 17 students (10 MOMR, 7 MIMR) who were enrolled in these two classrooms throughout the entire period from December 2003 until May 2006.

	# of students instructed	# of students showing improvement	# of students showing no change	# of students showing loss of skill	Statistical significance
COUNTING	17	16	1	0	$p = .001$
MODELING	17	13	4	0	$p = .01$
ADDITION	13	13	0	0	$p = .01$
SUBTRACTION	13	13	0	0	$p = .01$
MULTIPLICATION	9	9	0	0	$p = .01$
DIVISION	6	6	0	0	$p = .05$
MONEY	8	8	0	0	$p = .01$

2) The **second study** involved field-testing Unit 1 of the program among 103 high school life skills students while the rest of the program was being developed. Unit 1 of deals with concepts and skills related to counting, modeling, addition, and subtraction *within the set of numbers 0 to 10*.

The table below shows the learning progress of 103 students (7 SMR, 73 MOMR, 17 MIMR, and 6 with no MR classification).

	# pretesting *at or above* Unit 1 skill level	# pretesting *below* Unit 1 skill level	# instructed	# showing improvement from instruction	# showing no change after instruction	Statistical significance
COUNTING TO 10	64	39	39	20	19	$p < .001$
MODELING TO 10	25	78	78	56	22	$p < .0000001$
ADDING (sums ≤10)	54	49	12	11	1	$p < .01$
SUBTRACTING (minuends ≤ 10)	35	68	20	19	1	$p < .001$

As expected, students varied greatly in their ability to learn. With that fact in mind, we can draw some tentative conclusions from the data presented in the table.

1. 51% of students instructed in counting to 10 were successful. 49% were unsuccessful. It is at this early stage of instruction that students who may be unable to benefit from the program are identified. Some of these students may learn these skills after a longer period of instruction, but progress, if there is any, will be slow.

2. It is assumed that many students had no prior instruction in modeling (representing numbers with physical materials), so this skill was probably new to them. Of those students who were instructed in modeling to 10, 72% were successful and 28% were unsuccessful. The 28% includes students who were unable to count to 10.

3. The success rate for students who were instructed in addition and subtraction is high, 92% and 95% respectively. *Students who are able to master the basic skills of counting and modeling to 10 are likely to benefit from instruction in more complex skills.*

3) Now that *Above & Beyond* is finished, it is being used in classrooms in Arizona, Maryland, Pennsylvania, Massachusetts, Maine, Kentucky, New Hampshire, Wyoming, and Hawaii. The **third study**, current, ongoing, and long-term, is designed with randomized controlled trials (RCT). It involves eight classrooms (grades 1-8) with about 100 students with developmental disabilities and autism. Initial data will be available by summer 2008

TESTIMONIALS

"I just started my AIMS-A [alternative state test] and it reflects growth in the math area, thanks to the digi blocks. Thank you again."

--- email from DJ, teacher, Central High School

"What a surprise it was when I pretested my students this fall! They pre-tested at exactly the same place they post-tested last spring! I couldn't believe it!"

--- SG, teacher, Trevor Browne High School

"At the meeting, a teacher shared the fact that her student had IEP goals for the past four years for 'one more than' and 'one less than' and hadn't achieved them. However, about four weeks ago, she began *'Above and Beyond!'* and now her student has successfully mastered both of those goals!!!!!"

email from BK, math support teacher, Cradlerock School

"We are working on lessons at the end of Unit 2, and it looks like most of that group will be ready to move on to Unit 3. We didn't have to spend very long on some of the activities in Unit 2. We had spent so long on parts of Unit 1 that they really learned it and retained it."

--- email from PB, teacher, South Mountain High School

"I have a non verbal student, J, who is super hard to evaluate. When asked to count, he'll start moving blocks and keeps going. I am sure he can count out three blocks by himself. If he counts out too many blocks and we count together, he'll change the flip card to match the number we counted. He is in my lower group and if they can't count an amount, they put the blocks on the numbered ten frame and tell me the answer.

Well, today I really wanted to see if J would count out a correct amount over 3. GET THIS --- I made him use the unnumbered ten frame, and he got every number (1-10) correct. He just plopped them on the ten frame like nobody's business! He has never counted over 3 or 4! I thought it was a fluke, but every time I tried a number, he nailed it. Then I thought, okay let's try without a ten-frame because maybe he has just now made the connection about counting and has the ten-frame in his head. COULD THIS POSSIBLY BE? Well, when I tried, he laid his blocks out in a ten frame style! I can't believe it! I was ESTATIC. I can't wait until Monday to see if he still does it. This is a kid who has frustrated me for a long time. This probably sounds crazy to you because I can't explain it exactly, but know that his LIGHT JUST CAME ON! "

--- email from PV, teacher, Carl Hayden High School

"Before Digi-Blocks, what I taught in math didn't really have meaning to the students. Now I see real long-term progress, and the students are learning math that's meaningful, that they can retain, and that they'll use all throughout their lives. It's great for the students who are learning so much, but it's also great for the teachers who feel like they're teaching something really important."

--- MF, teacher, Trevor Browne High School

"I normally don't like being told what to do, but this really works."

--- MT, teacher, Cesar Chavez High School

"*Above & Beyond* has been a true blessing for our significantly cognitively disabled high school students. It is so difficult to find appropriate programs for this population of students, but *Above & Beyond!* has helped our students achieve so much. This program not only has taught our students math concepts which they are able to transfer to real life situations, but it has also done so much for their feelings of self-worth. The students are thrilled with what they can now accomplish. Students, parents, teachers and administrators have all been truly amazed at the power of this program."

--- KH, Content Specialist for Special Education, Phoenix Union High School District

My daughter, M, began using *Above & Beyond!* after we learned about the program at a Down syndrome learning conference. The use of the digi-blocks as a tactile and visual way of learning numbers immediately appealed to us. When we received Unit 1 of *Above & Beyond!*, we were thrilled with the break down of concepts and repetition to gain basic knowledge before moving on to new ideas."

--- LT, parent

PROFESSIONAL DEVELOPMENT

Strong professional development can make the difference between a successfully implemented program and one that falls short of its potential. Because professional development is critical to the classroom success of *Above & Beyond with Digi-Block Mathematics*, one- and two-day on-site workshops are offered and are strongly recommended. *Above & Beyond's* professional development is an exciting opportunity for teachers to experience the power of the blocks and the many aspects of the program that bring sound and meaningful mathematics to developmentally delayed students.

Above & Beyond's professional development program includes:

- On-site training
- Computer-based instruction via the *Above & Beyond 101* CD
- A&B Teachers' Network website

On-Site Training

Professional Development Objectives: Teachers will gain a working knowledge of . . .

- the Digi-Block system
- *Above & Beyond's* sequence of concepts and skills
- the alternative strategies the program uses to teach conventional algorithms
- the program manuals
- lesson preparation and instructional techniques
- pre-test and post-test preparation and assessment techniques
- the instruments that are available for data collection

- **One-day professional development** involves
  1) working with the blocks to preview the mathematics content of the entire program and the modified arithmetic strategies it uses,
  2) examining the contents of the Lesson Manuals and the Activity Sheet Manuals, and
  3) analyzing lesson and pre- and post-test formats. Although one-day training is better than none at all, time does not allow for a complete and thorough training.

- **Two-day professional development** is strongly recommended. Two-day training involves
  1) spending additional time on the most critical content pieces of one-day training, and
  2) thorough practice in lesson instruction and in pre- and post-testing.

Computer Based Instruction

Included in professional development is a professional development CD for every participant. Entitled ***Above & Beyond 101***, this complete course may be used 1) by school and district leaders as the foundation piece for group training or 2) by individual teachers to reinforce the instruction given in the one- and two-day trainings.

The CD includes 11 PowerPoint lessons, with audio, that teach every aspect of the program --- from content, to instructional approach, to assessment techniques and strategies. In addition, video clips of students working in *Above & Beyond* give a clear picture of what the program looks like in action. Included are pdf documents of materials teachers use as they progress through the PowerPoint lessons.

Once the initial training is over, teacher can get immediate and ongoing support through *Above & Beyond 101* helps provide ongoing support for teachers.

A&B Teachers' Network Website

A&B teachers can connect to A&B news, lesson updates, and lesson downloads by regularly visiting http://web.mac.com/pegakin1. They can e-converse with A&B's author through the email link and use that link to contribute ideas and classroom news which will then appear on the author's page. This site is a great help in keeping teachers in touch with A&B happenings.

ABOVE & BEYOND with DIGI-BLOCK MATHEMATICS

Materials and Prices

Effective from January 1, 2008*

Classroom sets provide materials for up to 12 students.

Item #	Unit	Materials		Price Plus 10% shipping
		Print	**Digi-Block**	
020-0930	**Curriculum and Manipulatives Set**	**Unit 1: Ones** •Lesson Manual •Activity Sheets **Unit 2: Ten** •Lesson Manual •Activity Sheets **Unit 1-2 FastTrack** •Lesson Manual (Uses Activity Sheets for Units 1 and 2) **Unit 3: Place Value for Whole Numbers** •Lesson Manual •Activity Sheets **Unit 4: Between Whole Numbers** •Lesson Manual •Activity Sheets	1 block-of-1000 6 blocks-of 100 6 number lines 0-30 6 sets of digit flip cards 6 whole number place value mats 6 student counters 6 array platforms 6 decimal place value mats 500 tenth blocks 500 hundredth blocks	$1100
020-0905	**Curriculum Set**	Full set of manuals (above) without the manipulatives		$500
020-0923	**Beginning Set A***	**Unit 1: Ones** •Lesson Manual •Activity Sheets **Unit 2: Ten** •Lesson Manual •Activity Sheets	300 1-blocks and holders 6 number lines 0-30 6 digit flip cards (3 each)	$340
020-0924	**Beginning Set B****	**Unit 1-2 FastTrack: Relationships among Numbers 0-10** •Lesson Manual •Activity Sheets	300 1-blocks and holders 6 number lines 0-30 6 digit flip cards (3 each)	$240
	***Units 1 and 2:** Units 1 and 2 teach concepts and skills within the number set 0 to 10. These units are an appropriate beginning for students who have not yet learned to count objects to 10 using one-to-one correspondence. ****Unit 1-2 FastTrack:** An adaptation of Units 1 and 2 for students who can already count objects to 10; write, understand, and recognize numerals 0 to 10; and understand the concepts "more" and "less."			
020-0925	**Intermediate Set**	**Unit 3: Place Value for Whole Numbers** •Lesson Manual •Activity Sheets **Unit 4: Between Whole Numbers** •Lesson Manual •Activity Sheets	1 block-of-1000 6 blocks-of 100 6 number lines 0-30 6 sets of digit flip cards 6 whole number place value mats 6 student counters 6 array platforms 6 decimal place value mats 500 tenth blocks 500 decimal blocks	$850

* Bundles and prices are subject to change. Check website for up-to-date information.

These sets are appropriate for home instruction and for classrooms with 1-3 students using the program.

Item #	Unit	Materials		Price Plus 10% shipping
		Books	Digi-Block	
020-0907	**Beginning Set A** (See other side)	**Unit 1: Ones** •Lesson Manual •Activity Sheets **Unit 2: Ten** •Lesson Manual •Activity Sheets	1 block-of-100 2 number lines 0-30 1 set digit flip cards	$290
020-0910	**Beginning Set B** (See other side)	**Unit 1-2 FastTrack:** **Relationships among Numbers 0-10** •Lesson Manual •Activity Sheets	1 block-of-100 2 number lines 0-30 1 set digit flip cards	$190
020-0926	**Intermediate Set**	**Unit 3: Place Value for Whole Numbers** •Lesson Manual •Activity Sheets **Unit 4: Between Whole Numbers** •Lesson Manual •Activity Sheets	1 block-of-1000 1 student counter 1 whole number place value mat 1 array platform 1 decimal place value mat 20 tenth blocks 20 hundredth blocks	$550

Professional Development

• **One-Day Training:** One-day training involves 1) working with the blocks to preview the mathematics content of the entire program and the modified arithmetic strategies it uses, 2) examining the contents of the Lesson Manuals and the Activity Sheet Manuals, and 3) practicing instruction and assessment. Price: $600 – $1000

• **Two-Day Training:** Two-day training is strongly recommended. It involves 1) spending additional time on the most critical content pieces of the one-day training, and 2) extensive practice in lesson instruction and in pre- and post-testing. Price: $1000 -$1500

• Included in professional development is one copy of **Above & Beyond 101** for each participant. Above & Beyond 101 is a CD containing a complete course in Above & Beyond content, instruction, and assessment. The CD may be used by school and district leaders as the foundation piece for an Above & Beyond professional development course or by individual teachers as a ready guide to every facet of *Above & Beyond with Digi-Block Mathematics*.

Materials a la Carte

Books, etc.			Digi-Block		
020-0911	Unit 1 (Lesson Manual and Activity Sheets)	$150	040-0122	Block-of-1000	$215
020-0912	Unit 2 (Lesson Manual and Activity Sheets)	$100	040-0117	Block-of-100	$20
020-0921	Unit 1-2 FastTrack (Lesson Manual)	$75	040-0487	0-30 Number lines (6-pack)	$48
020-0922	Unit 1-2 FastTrack (Activity Sheets)	$75	400-0471	Student counter (6-pack)	$100
020-0913	Unit 3 (Lesson Manual and Activity Sheets)	$175	040-0489	Place value mat and 3 digit cards	$15
020-0914	Unit 4 (Lesson Manual and Activity Sheets)	$75	430-0306	Array platform	$20
270-0900	Above & Beyond 101 CD (See description above)	$50	500-0011	Decimal blocks (500 each)	$90

Submit purchase order to: Digi-Block, Inc. Phone: 1-888-834-4466
P.O. Box 380247 Fax: 1-617-661-3310
Cambridge, MA 02238 Email: custserv@digi-block.com
http://www.digi-block.com
Credit card orders by phone or online

Above & Beyond!

The mission of *Above & Beyond!* is to bring the opportunity to learn significant and meaningful mathematics to all students with cognitive disabilities.

DIGI-BLOCK®

See the Math