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ABSTRACT

This document comprises the entire output for the journal for 1999. "Brain-Based Learning Longitudinal Study Reveals Solid Academic Achievement Maintenance with Accelerated Learning Practice," is a longitudinal follow-up study to an article in the preceding issue of this journal (v23 n3-4). This study further validates the effectiveness of accelerated learning practices' detailed bridge to achievement-accelerated learning (BTA-AL) in both articles. The second article, "Tactual Resources at the College Level: Toys for Adult Learning," discusses the latest thinking and resources available for teaching nontraditional students who do not like to read and may be at high risk for college failure. The third article, a book review of "Changing Consciousness" (David Bohm and Mark Edwards), is titled "Exploring the Hidden Source of the Social, Political and Environmental Crises Facing Our World." Also included are "Brain-Based Accelerated Learning and Cognitive Skills Training Using Interactive Media Expedites High Academic Achievement", and a review of David Bohm's 1994 edited seminar transcript, "Thought as a System." The first article builds upon and expands the theoretical and empirical basis for validating the effectiveness of BTA/AL methods based on case studies in previous articles (v23 n3-4 and v24 n1-2) of this journal. The second article examines David Bohm's handling of the question: Can thought be aware of itself? (KFT)

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Brain-Based Learning Longitudinal Study Reveals Solid Academic Achievement Maintenance With Accelerated Learning Practice

by Jan Juyper-Erland

ABSTRACT

This report is a longitudinal follow-up study of the JALT article, (Erland, 1998) "Cognitive Skills and Accelerated Learning Memory Training Using Interactive Media Improves Academic Performance in Reading and Math."

This pre-post combined experimental and quasi-experimental study was to determine if the effects of former successful applications of Accelerated Learning, (AL), memory, and cognitive skills interactive media training could be replicated in multiple classrooms (Erland, 1994, 1992, 1989a, 1989b). Earlier quasi-experimental 12-week studies with fifth-grade public school classes revealed gains on cognitive skills tests transferring to high gains in reading and math that lasted longitudinally (Erland, 1994, 1992). This 10-week experimental application (40 minutes daily, Mon-Fri) of training sequencing-logic skills and pattern-finding through Accelerated Learning methods is called The Bridge To Achievement (The BTA). This Brain-Based learning application is designed to serve as a supplemental enhancement curriculum for all practiced academic instruction.

The study expanded on practical applications of Erland's Hierarchy of Thinking Model (1989c), Lozanov's Suggestopedia-Accelerated Learning (AL) (1978), and Guilford's Structure of Intellect (1986, 1967). Weak cognitive skill and memory areas improved through prescriptive mental rehearsal exercise. Strong mental areas were further advanced to higher levels.

Therefore, students were trained to strengthen their visual, auditory, tactile, and kinesthetic modalities and learn successfully through several primary styles rather than being limited to only a few modalities or styles. This approach also documents that learning dysfunction, such as Attention Deficit Disorder, or ADHD, can be remediated through prescriptive teaching. Even Gifted and Talented individuals can have defective cognitive skill and memory areas which can be improved (Erland, 1995, 1989a; Meeker, 1991, 1967; Guilford, 1986).

This study demonstrated the strength and viability of Accelerated Learning practice as shown by the dimensions of implementation adherence. Even the most incomplete BTA-AL implementation integrity applications evidenced achievement test gains.

Two Midwestern parochial schools comprised this study: School 1 and School 2. School

1, with 97 students in intact year-to-year grades 4-8, formed the quasi-experimental study. School 2, with 172 students in grades 4-7, participated in the experimental study. These combined groups totaled 269 students from fourteen classrooms. Both schools had track-records of high student achievement taught by proficient teachers. The minority population for School 1 was 17%, and for School 2, 8%. Neither school had Special Needs students identified, although some low performing students received tutoring outside the classroom with trained professionals.

Both schools had control groups: School 1 had a fourth grade classroom of 23 students who received no treatment. School 2 had a fifth grade class of 26 students, and a sixth grade class of 22 students. The three classes from two schools combined 71 controls. The 5th and 6th grade control groups received an equally prescribed content and time treatment with an Alternate Media Activity (AMA) that included elements from nineteen commercially popular media and print products. Student progress and achievement were measured by continuous classroom benchmarking and by the nationally standardized achievement test, The Iowa Tests of Basic Skills (ITBS), given annually, pre- and post-treatment. Standardized cognitive skill measures were also administered and cross-analyzed. Paired samples t-test statistics of standard score differences (DSSs) of the means on the ITBS were analyzed to compare experimental BTA gains with National Norms and AMA control group gains.

The eleven experimental classrooms had 65 academic subjects that were statistically significant more than the controls and norms combined. The experimentals showed marked strengths in 90 academic subject areas that either matched the high performing controls' results, or were statistically significant over both the norms and controls. The experimentals had 23 academic subject areas that were statistically significant over the controls in reading, math, language, spelling, science, and social science.

Longitudinal ITBS data support the conclusion that BTA/AL training effects remained constant and continued to build in all academic areas, particularly in reading and math. The remaining eight experimental classrooms' tests were statistically significant over the controls in 58 academic subjects; with 30 of them in reading and math. By contrast, the control groups had two statistically significant academic subjects on the ITBS. Further analyses revealed achievement gains measuring an additional +1 1/2 to 2 1/2 years' gain beyond the +1 to 1 1/2 year gains the schools typically received when the students had completed eighth grade.

The two lower cognitive skills fourth grade classes from School 2 that fell below the National Norms in DSS point gain in academic achievement immediately following BTA/AL treatment, nonetheless, evidenced high cognitive skill growth measured by the ITBS CogAT. Subsequently, the following year, these two classes had longitudinal ITBS academic achievement gains that brought them up to their peers. Their DSS scores were fifteen to twenty points above the National Norm expectations in all academic areas when they entered the 6^{th} grade.

This study shows that with cognitive skills malleable and correctable, with all learning pathways treated to become operational, individuals do not have to settle for the limitations of nature and nurture. Moreover, Accelerated Learning, when applied prescriptively, offers the necessary bridge for the permanent maintenance of these results.

This strong evidence of longitudinal maintenance of BTA/AL treatment through media learning applications verifies that all levels of learners can access the opportunity for improved information processing leading to higher academic achievement. Further application of Accelerated Learning media training is recommended for multi populations, ages, and in a variety of settings.

The preceding JALT article (Erland, 1998), "Cognitive Skills and Accelerated Learning Memory Training Using Interactive Media Improves Academic Performance In Reading and Math," demonstrated how eleven experimental classrooms, compared to three control groups from two Midwestern parochial schools, obtained statistically significant gains in all academic achievement areas, measured by the nationally standardized The Iowa Tests of Basic Skills, (ITBS). This included Reading, Math, Spelling, Social Studies, Science, and Language Arts.

Each school had its own experimental design: School 1 was a Quasi-Experimental design, as they had intact classrooms, grades 4-8, and one non-treatment control/comparison group. School 2 was an Experimental Design with 5^{th} and 6^{th} grades control groups that received an Alternate Media Activity (AMA) for ten weeks. The experimentals (Es) were matched with ten weeks of similar instruction using The Bridge To Achievement (The BTA), non-commercialized, cognitive skills inter-active media program, but applied with Accelerated Learning (AL) techniques.

A four-tiered resultant outcome effect was analyzed according to how well the eleven experimental BTA classrooms applied the nineteen BTA executive criteria measures when coupled with daily classroom instruction. The top three classes that followed the applications correctly had an 82% success rate.

This study revealed a gradient range of significant results commencing with one classroom that followed the executive criterion at a 98% rate, experiencing statistically significant gains over the control group in fifteen out of the total sixteen ITBS academic subject areas. The executive criteria measures required ten weeks' of daily BTA/AL or AMA treatment for thirty to forty minutes.

Unfortunately, to expedite the training, some experimental classrooms cut training days, and either shortened, doubled-up, or eliminated BTA lessons and Accelerated Learning techniques, directly affecting their outcome results, and giving a circumstantial edge to the control groups.

Nevertheless, the experimental groups, who correctly applied the BTA nineteen executive criteria, had a high success rate over the control groups. The BTA treatment groups had gains equal to or greater than the robust scoring controls in ninety academic subject areas, with significant gains over both the controls and norms in sixty-five. The experimental scores were statistically significant over the controls in twenty-three academic subject areas.

The ITBS academic subjects that were most directly affected by low compliance of BTA/AL policy were the Reading, Math, and Science subtests. Therefore, these classrooms subsequently suffered lower scores in these integral achievement areas. Due to altered BTA/AL application, these students also achieved lower auditory memory gains (Erland, 1998). Reading, Math and Science require sufficiently functioning cognitive skills, which include good auditory and visual memory integration needed for conceptualization (Meeker, 1991; Erland, 1989c; Reid and Hresko, 1981; Woodcock 1978).

The BTA cognitive skills training, accompanied by Accelerated Learning techniques, is designed to make all primary learning pathways (visual, auditory, tactile, kinesthetic) operational. Additionally, the strengthening and lengthening of the memory spans (both auditory and visual) creates the agile learner by The Hierarchy of Thinking model (Erland, 1998, 1994, 1989c). The long, strong visual and auditory memory spans develop mental resiliency for learning efficiency through encoding-decoding practice (Erland, 1998, 1995, 1994, 1992, 1989a, and 1989b). This BTA/AL training in pattern-detection and sequencing skill move beyond learning facts through mere rote memory drill (Erland, 1998, 1995, 1994, 1992, 1989a). This methodology is a type of "Brain-Based Learning."

Longitudinal Results

First year subsequent longitudinal data became available from both schools, with additional second year longitudinal data submitted from School 1. Subsequent data for grade 8 of both schools were not available as students transferred to various high schools within the city.

This report answers several longitudinal maintenance questions regarding the robust gains for both the experimental and control groups from Schools 1 and 2 (Erland, 1998):

Were the longitudinal scores maintained statistically by both the experimentals (Es) and controls (Cs)? Did one group exceed the scores of the other, and if so, to what extent were they statistically significant, and in which academic subject areas? Did the two Alternate Media Activity (AMA) Groups have similar growth continuance, or was one control class score higher than the other? How did the scores of the fourth grade, conventionally taught, comparison - control group score longitudinally?

Did the high ITBS achievement scores obtained by grades four and six (4E3 and 6E3) from School 1, because they had followed BTA policy, maintain longitudinally, and if so, in which academic subjects? How did these longitudinal BTA/AL treatment scores compare to School 1's former classes of non-BTA/AL years?

How did the longitudinal two-year scores for 4E3, ensuing in grade 7, and 6E3 reaching grade 8, compare proportionately to the immediate post BTA/Al treatment standard scores of the other experimental classes?

Interestingly, School 1 had a high scoring gifted class since early primary grades. How did the BTA/AL of the high scoring 4E3 and 6E3 classes compare to this gifted class longitudinally and parametrically? In which subject areas was there a difference?

Finally, what was the longitudinal outcome of the two lagging, low auditory processing ability fourth grades (4E1 and 4E2) from School 2? Since third grade ITBS testing, these two classes hovered near, or slightly below, the National Norm (NN) expectations. Did they eventually improve?

Immediately following the BTA/AL treatment, these two classes had high cognitive skill growth as measured by the standardized ITBS-CogAT, and also by the DTLA-2 and WDJ-1 Psycho-Educational Battery. Yet, the two classes' Standard Score (DSS) Difference points still fell below the National Norm (NN) growth expectations.

Did this cognitive skill growth eventually translate to higher achievement longitudinal scores the following year? If so, to what extent was the growth, and in which academic subjects?

Longitudinal Results for School 1's 4E3, 5E3, and 6E3 Classes

Tables 1, 2, and 3 show the pre- post- longitudinal change as measured and derived from the ITBS standard scores for each of the sixteen subtests.

The 4E3 "star" class, with 98% policy compliance, had five statistically significant 1-year longitudinal post gains: Composite, Core Total, Reading Vocabulary, Math Concepts, and Math Total. However, when this 4E3 class was pooled with the other two fourth grades, 4E1 and 4E2, all academic subtests, except Math Computation, were significant at the < .01 level.

The second highest scoring classroom, 6E3, with 77% policy compliance, had eleven statistically significant academic subjects longitudinally. Nine of these eleven subtests fell at just the <.1 level. (See Table 3)

Surprisingly, the low-compliance (30%-36%) 5E3, had all fifteen out of sixteen one-year longitudinal academic subtests significant, mostly at the < .01 level following sixth grade (See Table 2).

Two-School Longitudinal Comparison, (Ten Classrooms), of the Experimentals and Controls

Table 4 depicts a statistically significant comparison of the eight experimental classrooms with the 5th and 6th grade control groups from School 2. Of the original eleven experimental classes, three eighth grades had transferred on to various high schools within the city, leaving eight classrooms to complete the study.

Experimental One-Year Longitudinal Gains: The experimental classes revealed fifty-eight academic gains within the thirteen primary subject areas. The three Language Arts subtests, capitalization, punctuation, and usage, were used for evaluation only occasionally as appropriate for Intra-analysis (See Tables 1, 2, & 3). Thirty-seven academic subjects were at the <.01 level, twelve academic subjects scored at the <.05 level, and nine academic subjects were at the <.1 level.

Control Groups' One-Year Longitudinal Gains: In contrast, the 6th grade control group had just two statistically significant gains: Reading Comprehension and Math Problem Solving. These two gains made by the 6th grade controls was due to two unusually low DSS gain scores made by the 6E1 experimental class who missed over one week of instruction mid-program. This factor established 6E1s lower 50% - 53% compliance level, and thereby affected subsequent auditory memory and academic achievement (Erland, 1998). These two unusually low scores were Reading Comprehension, 1.52 DSS (NN = 7 DSS), and Problem-Solving, 3.05 DSS, (NN = 11 DSS).

Table 1. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group for Grade 4 (4E3, N=14) on pre-test, post-test and 1-year longitudinal follow-up.

	Compos.	Read. Vocab.	Reading Compreh.	Reading Tot.	Math. Concepts	Math Problems
Pretest						
Ave.	202.57	202.50	208.71	205.57	205.43	207.00
S. D.	17.99	20.47	25.09	20.85	19.32	14.44
Posttest						
Ave.	229.43	223.14	236.86	230.07	221.93	235.93
S.D.	22.73	22.18	23.22	21.84	20.02	22.51
t:	3.47**	2.56*	3.08**	3.04**	2.22*	4.05**
Follow-up						
Ave.	246.07+	238.71*	241.93	240.36	243.07*	249.14
S.D.	25.46	15.12	17.05	15.59	29.70	24.15
t:	1.82†	2.13*	0.66	1.41	2.44*	1.50

	Math Tot.	M. Comp.	Spelling	Capital.	Punctua.
Pretest					
Ave.	206.14	191.50	191.36	199.29	200.29
S. D.	15.11	23.73	19.10	31.23	23.73
Posttest					
Ave.	228.79	221.57	222.64	236.14	237.21
S. D.	19.44	15.32	22.98	25.55	28.30
t:	3.44**	3.98**	3.93**	3.42**	3.74**
Follow-up					
Ave.	246.36+	223.14	237.07	250.14	252.00
S. D.	25.67	20.82	32.76	41.88	35.39
t:	2.04†	0.23	1.32	1.07	1.22

	Usage	Lang Tot.	CoreTot.	Soc. Stud.	Science
Pretest					
Ave.	215.07	201.50	204.29	202.29	192.64
S. D.	32.87	24.17	18.81	19.72	27.59
Posttest					
Ave.	246.00	235.43	231.50	221.86	231.50
S. D.	26.94	20.21	18.45	28.70	38.30
t:	2.72*	4.03**	3.87**	2.10*	3.08**
Follow-up					
Ave.	255.79	248.71	245.07+	238.93	248.86
S. D.	36.04	29.32	20.24	33.43	35.51
t:	0.81	1.37	1.82†	1.42	1.22

Significance levels: * p < .05, ** p < .01, † p < .1

Table 2. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group (N=25) for Grade 5 (5E3) on pre-test, post-test and 1-year follow-up with Student's t values for significant gains.

	Compos.	Reading Vocab.	Reading Compre.	Reading Tot.	Math Concepts	Math Problems
Pretest						
Ave.	218.56**	213.80	218.64	216.24**	214.24	227.16*
S. D.	18.09	20.50	25.40	21.64	19.23	26.23
Posttest						
Ave.	236.04	226.96	231.08	228.96	229.88	238.44
S.D.	19.59	18.69	21.85	19.27	19.77	25.13
t:	3.28**	2.37*	1.86†	2.19*	2.84**	1.55
Follow-up						
Ave.	256.82**	244.18**	252.23**	248.27**	256.00**	268.45**
S.D.	20.12	16.53	24.96	19.82	18.83	21.80
t:	3.70**	3.45**	3.16**	3.49**	4.78**	4.51**

	Math Tot.	M. Comp.	Spelling	Capital.	Punctua.
Pretest					
Ave.	220.60**	210.64	212.00	225.28	229.12
S. D.	20.77	19.91	26.95	32.10	32.10
Posttest					
Ave.	234.20	226.64	231.04	237.44	244.92
S. D.	20.90	17.75	34.88	41.43	36.28
t:	2.31*	3.02**	2.16*	1.16	1.63
Follow-up					
Ave.	262.32**	254.73**	259.86**	270.82**	270.64*
S. D.	19.11	17.56	31.68	37.49	37.78
t:	4.96**	5.63**	3.06**	2.99**	2.46*

	Usage	Lang.	Core Tot.	Soc. Stud.	Science
Pretest					
Ave.	230.76*	224.32**	220.32	209.80**	214.80
S. D.	35.25	26.17	19.77	17.76	21.14
Posttest					
Ave.	251.96	241.28	234.84	231.28	239.84
S. D.	43.05	34.31	21.73	22.73	27.04
t:	1.91†	1.97†	2.47*	3.72**	3.65**
Follow-up					
Ave.	271.18	268.18**	259.59**	242.91	255.68
S. D.	37.33	29.80	20.08	22.47	30.52
t:	1.69	2.96**	4.18**	1.82†	1.94†

Significance levels of t: *: $p < .05$, **: $p < .01$, †: $p < .1$

Table 3. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group Grade 6 (6E3) pre-test (N=20, includes one outlier), post-test N=20, includes one outlier) and 1 year longitudinal follow-up (N=14) with Student's t values for significant gains.

Test	Composit.	Read. Vocab.	Reading Compre.	Reading Total	Math Concepts
Pretest	245.45	240.90	244.85	242.85	236.95
S. D.	18.80	19.56	21.50	16.27	19.67
Posttest	268.90	255.30	259.05	256.70	260.15
S. D.	20.83	16.70	32.54	23.13	23.96
t:	3.74**	2.50*	1.63	2.19*	3.35**
Follow-up	282.54	268.50	281.86	275.29	275.93
S. D.	21.31	23.59	30.37	24.71	18.50
t:	1.86†	1.91†	2.07†	2.24*	2.07†

Test	Math Probs.	Tot.Math	M.Comput.	Spelling	Capital.
Pretest	253.90	245.40	221.26	229.60	251.85
S. D.	28.47	22.29	14.29	25.95	38.63
Posttest	273.05	266.40	267.78	248.15	278.40
S. D.	25.42	22.27	20.02	32.77	37.93
t:	2.24*	2.98**	8.46**	1.98†	2.19*
Follow-up	289.50	282.71	280.86	267.57	289.00
S. D.	26.54	20.68	22.95	31.31	30.93
t:	1.82†	2.16*	1.77†	1.73†	0.86

Test	Punctua.	Usage	Lang. Tot.	Core Tot.	Soc.Stud.	Science
Pretest	255.20	249.45	246.55	244.90	238.60	247.75
S. D.	37.69	29.18	28.78	19.37	18.99	23.24
Posttest	285.90	275.90	272.20	265.30	270.30	277.90
S. D.	45.73	36.82	32.21	22.41	24.13	31.36
t:	2.32*	2.52*	2.66*	3.08**	4.62**	3.45**
Follow-up	290.21	298.36	286.14	281.36	280.00	288.79
S. D.	34.51	25.79	26.53	20.85	23.23	31.18
t:	0.30	1.97†	1.33	2.12†	1.17	1.00

Significance levels of t: * $p < .05$, ** $p < .01$, † $p < .1$

ITBS 1999 Longitudinal Academic Subject Comparisons of Experimental and Control Groups Gains

Grades 4, 5, 6, & 7 Point Differences of Standard Score Means, (DSSs) Pre- to Post-test and One-Year Longitudinal
Eight Experimental Groups (<u>58</u> **sig. academic gains**) Comparisons with Two Control Groups (**<u>2 sig. gains</u>**) and ITBS National Norm Expectations

	Composite	Read Total	Vocab	Read Compr	Math Total	Math Concepts	Math Prob Solv	Math Computa	Lang Total	Spell	Core Total	Social Science	Science
CLASS	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA- NN	BTA – NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN
4th E3 5th grade N = 14	26.86 – 10 16.64 ** 7 pooled	24.50 – 9 10.29** 8 pooled	20.64 – 9 15.57** 8 pooled	28.14 – 9 5.07** 8 pooled	22.64 – 12 17.57**14 pooled	16.51 – 12 21.29**11 pooled	28.93 – 11 13.57**10 pooled	30.07 – 14 1.57 – 13	33.92 – 13 13.29**10 pooled	31.28 – 13 14.43 † 10 pooled	27.21 – 11 13.57**10 pooled	19.57 – 9 17.07**8 pooled	38.86 – 9 17.36** 7
5th E3 6th grade N = 25	17.48 – 9 20.64 – 6	12.72 – 8 20.14** 7	13.16 – 8 18.05* 7	12.44 – 8 21.95* – 7	13.60 – 14 26.45* 10	15.64 – 11 14.53* 10	11.28 – 10 29.41* 8	16.00 – 13 27.77* 11	16.96 – 10 26.05 * 8	19.04 – 10 27.00** 8	14.52 – 10 24.14** 8	22.84 – 8 10.36 † 7 pooled	25.04 – 7 15.64 – 7
6th E3 7th grade N = 19	23.84 – 8 12.67 – 4	15.00 – 7 19.61 – 7	13.10 – 7 16.23 – 7	17.84 – 7 20.62 – 8	21.78 – 10 14.23 – 8	23.26 – 10 10.23 – 9	20.68 – 8 17.77 – 7	46.47 – 11 11.62 – 10	25.57 – 8 11.85 – 8	18.36 – 8 12.67 † 8	21.05 – 8 14.77 – 8	31.31 – 7 8.69 – 7	32.47 – 7 7.46 – 8
4th E1 5th grade N = 24	13.89 – 16 22.77**11 pooled	10.62 – 14 23.36**13 pooled	10.92 – 15 16.86**14 pooled	9.83 – 14 30.05**13 pooled	16.04 – 15 19.82**14 pooled	20.37 – 15 16.32**14 pooled	11.62 – 15 23.09**15 pooled	9.16 – 15 23.50 * 15	15.41 – 16 30.50**14 pooled	15.70 – 17 18.50 † 15 pooled	13.70 – 15 24.91**14 pooled	7.91 – 15 24.45**14 pooled	22.79 – 16 18.14**14 pooled
4th E2 5th grade N = 20	13.50 – 16 24.71**11 pooled	13.85 – 14 23.35**13 pooled	16.45 – 15 23.47**14	11.15 – 14 23.24**13 pooled	11.75 – 15 24.76**14 pooled	12.95 – 15 21.41**14 pooled	10.50 – 15 28.24**15 pooled	15.35 – 15 19.06 – 15	19.20 – 16 26.12**14 pooled	20.50 – 17 18.24 † 15 pooled	14.95 – 15 24.71**14 pooled	6.45 – 15 28.06**14 pooled	15.25 – 16 22.29**14 pooled
5th E1 6th grade N = 25	21.72 – 16 16.88 – 9	17.16 –13 10.72 –12	13.72–14 8.04 – 12	20.48 – 13 13.56 † 10 pooled	23.04 – 14 16.24 – 13	18.72 – 14 15.12 – 13	27.48 – 15 17.80 – 12	33.12 – 15 12.28 – 13	35.64 – 14 16.08 – 12	23.04 – 15 7.52 – 12	25.28 – 14 14.36 * 12 pooled	18.28 – 14 22.68 † 11 pooled	16.60 – 14 22.04 – 11
6th E1 7th grade N = 21	17.04 – 14 12.90 – 7	16.04 – 12 3.43 – 12	16.28 – 12 5.52 – 11	15.71 – 10 1.52 – 10	25.90 – 13 7.71 – 11	21.66 – 13 12.33 – 11	30.14 – 12 3.05 – 11	21.09 – 13 19.19 – 12	27.38 – 12 13.19 – 11	20.95 – 12 12.14 – 10	23.14 – 12 8.09 – 11	6.71 – 11 23.52 – 10	17.14 – 11 11.52 – 10
7th E3 8th grade N = 24	11.00 – 7 10.36 * 4	7.64 – 7 9.73 – 6	7.68 – 7 10.64 † 6	7.80 – 8 8.36 – 7	7.76 – 8 15.68* 7	4.12 – 9 22.91**9	11.24 – 8 8.45 – 6	10.28 – 10 16.73 – 9	9.17 – 8 13.50 † 6	15.76 – 7 7.14 – 8	8.16 – 8 12.95 * 7	10.36 – 7 5.72 – 7	14.36 – 7 2.32 – 11
5th Contrl 6th grade N = 26	19.30 – 16 16.83 – 9	19.03 – 13 8.42 – 12	19.69 – 14 9.00 – 12	19.03 – 13 7.58 – 10	23.65 – 14 13.92 – 13	23.23 – 14 11.67 – 13	23.80 – 15 16.63 – 12	23.42 – 15 16.67 – 13	28.38 – 14 17.46 – 12	21.92 – 15 11.58 – 12	23.69 – 14 13.25 – 12	8.26 – 14 26.33 – 11	25.76 – 14 12.42 – 11
6th Contrl 7th grade N = 22	17.81 – 14 15.63 – 7	15.27 – 12 15.16 – 12	14.86 – 12 9.68 – 11	15.13 – 10 20.68*–10	16.45 – 13 16.26 – 11	14.68 – 13 14.79 – 11	18.72 – 12 17.37 † 11	25.13 – 13 12.84 – 12	26.90 – 12 7.89 – 11	23.40 – 12 1.95 – 10	19.54 – 12 13.11 – 11	15.68 – 11 19.58 – 10	22.81 – 11 15.26 – 10
# Sig. Gains	**4-8**	**4-6**	**5-6**	**5-3**	**5-5**	**5-1**	**4-2**	**2-3**	**5-7**	**5-7**	**6-7**	**5-7**	**3-3**

Note: Each figure of Standard Score Mean Pt. Differences (DSSs) is followed by the National ITBS Norm Expectations (NN) (ITBS Fall & Spring Tables). Under eacl figure is the Longitudinal Mean Pt. Difference (DSSs) and subsequent grade for comparison. Number of Sig. gains is in the final row, followed by the significant gains in original pre-post treatment. Significant gains are highlighted. ** <.01 (37 academic subjects) * <.05 (12 academic subjects) † <.1 (9 academic subjects)

14 15

The 5th grade control group did not have any statistically significant longitudinal gains.

Additionally, the 4th grade comparison groups' 1-year longitudinal data were analyzed from School 1. For longitudinal purposes, this classroom could not be considered a viable continuing control group, because the following year it entered a fifth grade, whose teacher had been trained in BTA/AL principles. Although this 5E3 teacher had not fully adopted nor fully applied the BTA/AL techniques, even some application of them would contaminate or skew the scores for longitudinal analysis.

Nevertheless, one-year longitudinal analysis was conducted for this fourth grade comparison group following their completion of the fifth grade. The scores ranged what was typical for School 1 and this teacher: the low was +11 points for Math Computation, (13 points National Norm (NN) DSS expectation) and a high +25 points for Math Concepts (11 points National Norm (NN) DSS expectation).

Averaging the fourth grade no-treatment, comparison groups' scores for the same nine primary ITBS subtests for their post-test to 1-year longitudinal, the DSS gains ranged: a low of +15 DSS pints (1), +17 DSS points (3), three academic subtests ranged +20 to 23 DSS points, and a high of +27 DSS points for Language Arts. With the National Norm (NN) expectations for 4th and 5th grades ranging 9 to 15 DSS points, four of the primary subtests were above the norm expectations. This falls into accordance with School 1s' usual +1 1/2 to 2-year annual gains above the National Norms.

Since the 5E3 class had surprisingly high continuance for having inconsistent initial BTA/AL application, with minimal achievement gain, an Intra-analysis for trending of the 5E3 class was made. This analyses compared 5E3 to the 4E3 and 6E3 classes, and also with the National Norm (NN) growth expectations (See Tables 5, 6 and 7)

<u>School 1's 4E3 class</u> (98% - 98% compliance) (Table 5)

Comparing the 4E3s two-year longitudinal post scores to the NN expectations of 6th grade mean scores, in the nine primary ITBS Reading, Math, Language Total and Core Total subtests, the differences ranged +25-39 points. The lowest DSS change was in Math Computation +25 points; the highest DSS change was with Language Total +39 points (See Table 5).

Averaging the nine primary ITBS subtests, the average gain was +34 points over the National Norm (NN) expectations. With NN yearly growth expectations,+7 to 13 points for these subtests, this shows an additional two and one-half to three years' growth in these primary subject areas.

To compare 4E3 with the fourth grade comparison/control group pre to post-test, analyses revealed that 4E3s scores had higher ranges: a low of +9 points in Reading Total, +12 DSS points in Reading Comprehension and Math Computation, to a high of +14 DSS points in the Composite. This is an additional one years' achievement growth.

Two-years longitudinally, the 4E3 class excelled an additional one-year gain over this 4th comparison group, when the second application of Accelerated Learning was received.

School 1's 5E3 class (30% - 36% compliance) (See Table 6, Table 14 in Complete.doc)

The Two-year Longitudinal DSS gain, when compared to National Norm (NN) expectations, ranged from a low of +18 points in Reading Total, to a high +45 points in Math Computation. Averaging the nine primary ITBS subtests, and comparing with the NN, was +33 point difference. With the typical National Norms gain expectation +7 to 14 points for the various primary subtests, this is + 2 1/2 to 3 1/2 times over the NN expected gain, or an additional three years' longitudinal academic growth.

School 1's 6E3 class (73% - 77% compliance) (See Table 7,Table 15 in Complete.doc) revealed similar change. The Two-year Longitudinal Standard Score Differences (DSSs) (when reaching 8th grade) compared to NN expectations, ranged with two scores at +37 DSS points (Reading Total and Math Computation), to a high +52 DSS points in Math Problem-Solving. The average point gain, compared to the National Norms, for the nine primary subtests was +44 points. With the NN expectation for sixth grade, +7 to +14 points, this is +3 1/2 times the NN expected gain, or three to four years' longitudinal academic growth.

To further evaluate this +3 1/2 to 4 years' growth, the schools' typical yearly growth had to be extrapolated. Annual school trending was analyzed for School 1. This school not only had two-year's longitudinal data, and two successfully treated classes which followed the executive criteria measures 77%-98%, but they also furnished three years of pre-BTA/AL data. School 2's two-year longitudinal data will be submitted in the year 2000.

Averages for three pre- BTA/AL training years was computed for each of the nine ITBS primary subtests: Composite, Reading (2), Math (4), Language Total, and Core Total.

School 1's 1994-1999 Trending Record

Table 8 shows a comparison between the two successful 4E3 and 6E3 classrooms, with the three low-compliance 5E3, 7E3, and 8E3 classes, and with the National Standard Score (NSS) growth expectations. Two- and three- year averages were analyzed. The 4E3, 5E3, 6E3 classes' ITBS two-year longitudinal Standard Scores (SS) were then compared against the National DSS Expectations, and also with grades six, seven, and eight averages.

Interestingly, a gifted class went through School 1 with consistently high achievement scores each year. One analysis included a gifted class (three pre-BTA/AL years), and another analysis did not include this gifted class (two pre-BTA/AL years (See Table 8). The 1997 column's grade 7 score represents this gifted classes' immediate Post BTA/AL having low compliance BTA/AL treatment. This offered a good comparison with the other more typical performing classrooms for School 1.

The low-compliance, gifted 7E3 class (25% to 30% policy compliance) had six longitudinal statistically significant longitudinal gains in achievement compared to the National Norm Expectations. Of these gains, just two are beyond the typical growth pattern of meeting the National Norms, for the 8th grade teacher. This was a +23 DSS (post to one-year longitudinal) test point gain in Math Concepts, and +16 DSS points for Math Total (See Table 4).

Then, comparing the 7E3 BTA/AL post-test nine subject average of +21 points (See Table

Table 5.

Fourth Grade Class (4E3) Pre Test and ITBS Longitudinal Data, School 1
Classroom with Complete *98% BTA Application* during BTA initial treatment
20% Multi-Ethnic, Special Needs Students Not Identified

	Pre-tests		Post-tests		Point Diff. vs. Expected Gain
Iowa Test of Basic Skills Subtests	M	SD	M	SD	Pt. Diff
COMPOSITE, 4th grade, (N=14)	202.57	17.99	229.43	22.72	**26.86 - 7**
One-year post longitudinal, 5th grade	229.43	22.72	246.07	25.46	**16.64 - 9**
Two-year post longitudinal, 6th gr. (N=13)	243.92	25.14	**261.54**	23.81	**17.62 - 7**
Nat'l Expected 6th grade mean			229.56	29.98	**20.37 Es Ave.**
Reading Compre. 4th grade, (N=14)	208.71	25.09	236.86	23.22	**28.14 - 9**
One-year post longitudinal, 5th grade	236.86	23.22	241.93	17.05	**5.07- 13**
Two-year post longitudinal, 6th grade	241.23	17.53	**263.08**	24.59	**21.84 - 9**
Nat'l Expected 6th grade mean			227.27	35.34	**18.88 Es Ave.**
Total Reading, 4th grade, (N=14)	205.57	20.85	230.07	21.84	**24.50 - 9**
One-year post longitudinal, 5th grade	230.07	21.84	240.36	15.59	**10.29 - 13**
Two-year post longitudinal, 6th gr (N=13)	239.69	16.02	**256.62**	16.02	**16.92 - 12**
Nat'l Expected 6th grade mean			226.98	29.88	**17.24 Es Ave**
Math Concepts, 4th grade, (N=14)	205.43	19.32	221.93	20.02	**16.50 - 12**
One-year post longitudinal, 5th grade	221.93	20.02	243.21	29.90	**21.29 - 14**
Two-year post longitudinal, 6th gr(N=13)	240.15	28.75	**262.62**	33.78	**22.46 - 13**
Nat'l Expected 6th grade mean			227.58	28.47	**20.08 Es Ave**
Math Problem Solving, 4th gr. (N=14)	207.00	14.44	235.93	22.51	**28.93 - 11**
One-year post longitudinal, 5th grade	235.93	22.51	249.50	23.89	**13.57 - 15**
Two-year post longitudinal, 6th grade	248.54	24.59	**266.54**	32.20	**18.00 - 12**
Nat'l Expected 6th grade mean			229.90	36.31	**20.17 Es Ave**
Total Math, 4th grade, (N=14)	206.14	15.10	228.79	19.44	**22.64 - 12**
One-year post longitudinal, 5th grade	228.79	19.44	246.36	25.67	**17.57 - 14**
Two-year post longitudinal, 6th grade	244.38	25.59	**264.62**	29.71	**20.23 - 10**
Nat'l Expected 6th grade mean			228.74	30.80	**20.15 Es Ave**
Math Computation, 4th grade, (N=14)	191.50	23.73	221.93	15.32	**30.07 - 13**
One-year post longitudinal, 5th grade	221.93	15.32	223.14	20.82	**1.57 - 15**
Two-year post longitudinal, 6th grade	221.54	20.74	**253.92**	25.92	**32.38 - 11**
Nat'l Expected 6th grade mean			228.44	29.34	**21.34 Es Ave**
Language Total, 4th grade, (N=14)	201.50	24.17	235.42	20.21	**33.92 - 12**
One-year post longitudinal, 5th grade	235.42	20.21	248.71	29.32	**13.29 - 14**
Two-year post longitudinal, 6th grade	245.85	28.40	**269.08**	24.97	**23.23 - 8**
Nat'l Expected 6th grade mean			230.96	37.21	**23.48 Es Ave**
Core Literacy Total, 4th grade, (N=14)	204.29	18.81	231.50	18.45	**27.21 - 11**
One-year post longitudinal, 5th grade	231.50	18.45	245.07	20.24	**13.57 - 14**
Two-year post longitudinal, 6th grade	243.23	19.80	**263.38**	19.52	**20.15 - 8**
Nat'l Expected 6th grade mean			228.89	29.98	**20.31 Es Ave**

Table 6.

Fifth Grade Class (5E3) Pre-Test and ITBS Longitudinal Data, School 1
which followed the Executive Criteria 30-36% due diligence
20% Multi-Ethnic, Special Needs Students Not Identified
Experimentals (N = 25)

	Pre-test		Post-test		Point Diff. vs. Expected Gain
Iowa Test of Basic Skills Subtests	M	SD	M	SD	Pt. Diff
COMPOSITE, 5th grade (N = 25)	218.56	18.09	236.04	19.59	**17.48 - 9**
One-year post longitudinal, 6th gr (N=22)	236.18	20.24	256.82	20.12	**20.64 - 6**
Two-year post longitudinal, 7th gr (N=22)	256.82	20.12	**270.18**	24.33	**13.36 - 7**
Nat'l Expected 7th grade mean			240.89	32.59	17.16 Ave.
Reading Comprehension, 5th grade	218.64	25.40	231.08	21.85	**12.44 - 13**
One-year post longitudinal, 6th gr (N=22)	230.27	21.92	252.23	24.96	**21.95 - 7**
Two-year post longitudinal, 7th gr (N=22)	252.23	24.96	**257.95**	31.57	**5.73 - 8**
Nat'l Expected 7th grade mean			238.42	38.59	13.37 Ave.
Total Reading, 5th grade, (N = 25)	216.24	21.64	228.96	21.64	**12.72 - 13**
One-year post longitudinal, 6th gr (N=22)	228.14	19.72	248.27	19.82	**20.14 - 7**
Two-year post longitudinal, 7th gr (N=22)	248.27	19.82	**256.32**	20.88	**8.04 - 7**
Nat'l Expected 7th grade mean			238.25	31.88	13.63 Ave.
Math Concepts, 5th grade, (N = 25)	214.24	19.23	229.88	19.77	**15.64 - 14**
One-year post longitudinal, 6th gr (N=22)	232.63	19.46	256.00	18.83	**23.36 - 10**
Two-year post longitudinal, 7th gr (N=22)	256.00	18.83	**275.18**	17.49	**19.18 - 9**
Nat'l Expected 7th grade mean			239.45	31.13	19.39 Ave.
Math Problem Solving, 5th grade	227.16	26.23	238.44	25.13	**11.28 - 10**
One-year post longitudinal, 6th gr (N=22)	239.05	25.54	268.45	21.80	**29.41 - 8**
Two-year post longitudinal, 7th gr (N=22)	268.45	21.80	**281.68**	30.04	**13.23 - 8**
Nat'l Expected 6th grade mean			241.33	39.52	17.97 Ave.
Total Math, 5th grade, (N = 25)	220.60	20.77	234.20	19.27	**13.60 - 14**
One-year post longitudinal, 6th gr (N=22)	235.86	21.24	262.31	19.11	**26.45 - 10**
Two-year post longitudinal, 7th gr (N=22)	262.31	19.11	**278.59**	22.16	**16.28 - 8**
Nat'l Expected 7th grade mean			240.46	31.27	18.78 Ave.
Math Computation, 5th grade, (N = 25)	210.64	19.66	226.64	17.75	**16.00 - 13**
One-year post longitudinal, 6th gr (N=22)	226.95	18.54	254.73	17.56	**27.77 - 11**
Two-year post longitudinal, 7th gr (N=22)	254.73	17.56	**285.50**	18.28	**30.77 - 10**
Nat'l Expected 7th grade mean			240.60	33.48	24.85 Ave.
Language Total, 5th grade, (N = 25)	224.32	26.17	241.28	34.31	**16.96 - 10**
One-year post longitudinal, 6th gr (N=22)	242.14	34.45	268.18	29.80	**26.04 - 8**
Two-year post longitudinal, 7th gr (N=22)	268.18	29.80	**278.50**	33.40	**10.32 - 8**
Nat'l Expected 7th grade mean			242.15	39.81	17.77 Ave.
Core Literacy Total, 5th grade, (N = 25)	220.32	19.77	234.84	21.73	**14.52 - 10**
One-year post longitudinal, 6th gr (N=22)	235.45	22.18	259.59	20.08	**24.14 - 8**
Two-year post longitudinal, 7th gr (N=22)	259.59	20.08	**271.14**	22.57	**11.55 - 8**
Nat'l Expected 7th grade mean			240.26	32.24	16.77 Ave.

Table 7. (Table 1...)

Sixth Grade Class (6E3) Pre-Test and Longitudinal Data, School 1
which followed the Executive Criteria 73%-77% due diligence
20% Multi-Ethnic, Special Needs Students Not Identified
Experimentals (N = 19; longitudinal N = 13)

Iowa Test of Basic Skills Subtests	Pre-test M	Pre-test SD	Post-test M	Post-test SD	Point Diff. vs. Expected Gain: Pt. Diff
COMPOSITE, 6th grade, (N = 19)	247.47	16.92	271.31	18.29	**23.84 - 8**
One-year post longitudinal, 7th gr. (N=13)	273.50	17.14	286.17	17.57	**12.67 - 7**
Two-year post longitudinal, 8th gr. (N=13)	282.54	21.31	**294.69**	16.54	**12.15 - 7**
Nat'l Expected 8th grade mean			250.87	34.56	16.22 Ave.
Reading Compre, 6th grade, (N = 19)	245.31	21.98	263.15	27.59	**17.84 - 7**
One-year post longitudinal, 7th gr. (N=13)	265.77	23.79	286.38	26.24	**20.62 - 8**
Two-year post longitudinal, 8th gr. (N=13)	279.23	29.91	**293.69**	29.17	**14.46 - 7**
Nat'l Expected 8th grade mean			248.89	41.40	17.64 Ave.
Total Reading, 6th grade, (N = 19)	244.15	15.59	259.16	20.91	**15.00 - 7**
One-year post longitudinal, 7th gr. (N=13)	259.54	17.86	278.77	21.84	**19.23 - 7**
Two-year post longitudinal, 8th gr. (N=13)	274.00	25.22	**285.62**	26.29	**11.62 - 6**
Nat'l Expected 8th grade mean			248.79	34.13	15.28 Ave.
Math Concepts, 6th grade, (N = 19)	239.47	16.55	262.73	21.55	**23.26 - 10**
One-year post longitudinal, 7th gr. (N=13)	269.15	20.56	279.38	13.76	**10.23 - 9**
Two-year post longitudinal, 8th gr. (N=13)	276.69	19.02	**294.08**	24.14	**17.38 - 9**
Nat'l Expected 8th grade mean			250.44	33.53	16.96 Ave.
Math Problem Solving, 6th gr (N = 19)	255.21	28.61	275.89	22.60	**20.68 - 8**
One-year post longitudinal, 7th gr. (N=13)	275.38	24.71	293.15	23.67	**17.77 - 8**
Two-year post longitudinal, 8th gr. (N=13)	289.85	27.59	**302.69**	24.19	**9.54 - 6**
Nat'l Expected 8th grade mean			250.94	42.31	16.00 Ave.
Total Math, 6th grade, (N = 19)	247.31	21.14	269.10	19.20	**21.78 - 10**
One-year post longitudinal, 7th gr. (N=13)	272.07	20.75	286.31	16.35	**14.23 - 8**
Two-year post longitudinal, 8th gr. (N=13)	283.23	21.43	**298.54**	23.28	**15.31 - 7**
Nat'l Expected 8th grade mean			250.69	36.08	17.11 Ave.
Math Computation, 6th grade, (N = 19)	221.26	12.68	267.73	20.02	**46.47 - 11**
One-year post longitudinal, 7th gr. (N=13)	272.54	13.84	284.15	20.15	**11.62 - 10**
Two-year post longitudinal, 8th gr. (N=13)	283.08	22.72	**287.77**	20.83	**4.69 - 9**
Nat'l Expected 8th grade mean			251.26	36.84	20.93 Ave.
Language Total, 6th grade, (N = 19)	249.52	26.21	275.10	30.28	**25.57 - 8**
One-year post longitudinal, 7th gr. (N=13)	276.30	28.14	288.15	26.48	**11.85 - 8**
Two-year post longitudinal, 8th gr. (N=13)	286.46	27.58	**294.00**	27.68	**7.53 - 6**
Nat'l Expected 8th grade mean			251.69	41.57	14.98 Ave.
Core Literacy Total, 6th gr, (N = 19)	246.95	17.53	268.00	19.39	**21.05 - 8**
One-year post longitudinal, 7th gr. (N=13)	269.62	17.41	284.38	18.21	**16.38 - 8**
Two-year post longitudinal, 8th gr. (N=13)	281.23	21.69	**292.54**	21.52	**11.31 - 7**
Nat'l Expected 8th grade mean			250.39	33.98	16.25 Ave.

Table 8.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

	Bold Figures Are the Gifted Class Scores									
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	4th Grade	5th Grade	6th Grade	Nat'l
	Other Classes			w/o Gifted	with Gifted		Longitudinal	Longitudinal	Longitudinal	SS
Year	1994	1995	1996	Class	Class	1997	98-'99	98-'99	98-'99	Expectat.
ITBS Subtest										
Composite										
grade 3	196.50	197.90	202.57	198.99						186.25
grade 4	**232.80**	224.00	218.56	221.28	225.12	229.43				202.72
grade 5	229.50	**252.10**	247.47	238.49	243.02	236.04	246.07			216.74
grade 6	253.80	248.00	**273.76**	250.90	258.52	271.31	261.54	256.82		229.56
grade 7	272.90	263.40	256.92	264.41		**284.76**		270.18	286.17	240.89
grade 8	276.50	287.60	279.2	281.10		271.35			294.69	250.87
Reading Compre										
grade 3	193.10	198.10	208.71	199.97						187.75
grade 4	**239.60**	229.60	218.64	224.12	229.28	236.86				202.59
grade 5	226.20	**257.70**	245.31	235.76	243.07	236.04	241.93			215.52
grade 6	250.60	241.80	**272.96**	246.20	255.12	263.15	263.08	256.82		227.27
grade 7	266.60	259.60	254.57	260.26		**280.76**		270.18	286.38	238.42
grade 8	270.80	281.40	269.50	273.90		270.14			293.69	248.89
Reading Total										
grade 3	195.00	199.40	205.57	199.99						186.35
grade 4	**231.70**	229.60	216.24	222.92	225.85	230.07				201.24
grade 5	224.20	**249.40**	244.15	234.18	239.25	228.96	240.36			214.76
grade 6	248.40	240.70	**267.68**	244.55	252.26	259.16	256.62	248.27		226.98
grade 7	263.60	256.50	253.14	257.75		**275.32**		256.32	278.77	238.42
grade 8	257.20	277.20	268.40	267.60		264.78			285.62	248.89

Table 8.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other
Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

Bold Figures Are the Gifted Class Scores										
							4th Grade	5th Grade	6th Grade	Nat'l
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	Longitudinal	Longitudinal	Longitudinal	SS
Math Concepts	1994	1995	1996	w/o Gifted	with Gifted	1997	98-'99	98-'99	98-'99	Expectat.
grade 3	192.20	188.80	205.43	195.48						185.2
grade 4	**227.80**	215.10	214.24	214.67	219.05	221.93				200.35
grade 5	225.70	**240.40**	239.47	232.59	235.19	229.88	243.21			214.61
grade 6	250.50	247.00	267.84	248.75	255.11	262.73	262.62	256.00		227.58
grade 7	275.60	254.90	**273.35**	267.95		**271.96**		275.18	279.38	239.45
grade 8	286.00	289.50	277.40	284.30		259.71			294.08	250.44
Math Prob-Solv										
grade 3	198.30	202.80	207.00	202.70						186.57
grade 4	**236.50**	215.10	227.16	221.13	226.25	235.93				202.85
grade 5	239.10	**256.80**	255.21	247.16	250.37	238.44	249.50			216.89
grade 6	259.00	250.60	**280.60**	254.80	263.40	275.89	266.54	268.45		229.90
grade 7	279.60	262.30	264.64	268.85		**291.84**		281.68	293.15	241.33
grade 8	294.00	288.60	289.50	290.70		273.78			302.69	250.94
Math Total										
grade 3	195.50	195.90	206.14	199.18						185.89
grade 4	**232.00**	221.20	220.60	201.02	224.60	228.79				201.60
grade 5	232.60	**248.70**	247.31	239.96	242.87	234.20	246.36			215.75
grade 6	254.70	248.90	**274.20**	251.80	259.27	269.10	264.62	262.61		228.74
grade 7	277.60	258.60	262.35	266.18		**281.96**		278.59	286.31	240.46
grade 8	289.90	289.30	283.50	287.57		273.42			298.54	250.69

Table 8.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

Bold Figures Are the Gifted Class Scores							4th Grade	5th Grade	6th Grade	Nat'l
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	Longitudinal	Longitudinal	Longitudinal	SS
Math Computation	**1994**	**1995**	**1996**	w/o Gifted	with Gifted	**1997**	**98-'99**	**98-'99**	**98-'99**	Expectat.
grade 3	188.40	185.10	191.50	188.33						185.36
grade 4	**119.70**	214.20	210.64	212.42	181.51	221.93				200.69
grade 5	218.00	**232.00**	221.26	219.63	223.75	226.64	223.14			215.28
grade 6	252.40	265.40	**258.88**	258.90	258.89	267.73	253.92	254.73		228.44
grade 7	270.50	263.00	255.64	263.05		**269.16**		285.50	284.15	240.60
grade 8	284.10	283.60	270.80	279.50		271.93			287.77	251.26
Language Total										
grade 3	190.70	193.10	201.50	195.10						187.50
grade 4	**234.50**	223.20	224.32	223.76	227.34	235.42				204.09
grade 5	235.80	**251.70**	249.52	242.66	245.67	241.28	248.71			218.41
grade 6	259.40	246.60	**277.88**	253.00	261.29	275.10	269.08	268.16		230.96
grade 7	277.10	267.30	262.57	268.99		**287.00**		278.50	288.15	242.15
grade 8	281.10	293.00	289.10	287.73		280.35			294.00	251.69
Core Total										
grade 3	193.80	196.90	204.29	198.33						186.58
grade 4	**232.80**	223.40	220.32	221.86	225.51	231.50				202.31
grade 5	230.80	**249.90**	246.95	238.88	242.55	234.84	245.07			216.31
grade 6	254.10	245.40	**273.28**	249.75	257.59	268.00	263.38	259.59		228.89
grade 7	272.70	267.30	259.35	266.45		**281.44**		271.14	284.38	240.26
grade 8	279.40	293.00	280.30	284.23		272.85			292.54	250.39

9), over cumulative National Norm Expectations, the noticeable gains were in Math Total and Math Problem-Solving: (each, +24 points), Language Total (+28 points), and Core Total (+34 points).

However, the BTA/AL 6E3 classes' DSS scores at the same longitudinal 8th grade point ranges were: a low +14 (Language Arts), mid-scores of +24 (Reading Comprehension and Composite), and a high of +34 (Math Concepts) points higher than the gifted class (See Table 8. Compare post 8th BTA 1997 scores with 6E3 longitudinal '98-'99 data, and against the gifted classes' scores. The gifted class' figures are in bold).

Two years' previous pre-BTA/AL data was requested from the school. Unfortunately the 1991-1993 data was not ITBS Form K, but earlier Forms G and H, having dissimilar content, and also did not include NSS scores (Frisbie, D. Iowa Testing Service, 1999). Therefore, three years of School 1's former track-record was accepted for analyses.

Intra-Analyses of Table 8 Summary Chart of the 6E3 and 4E3 classes

Table 9 is an in-depth Intra-analysis of Table 8's comparison of School 1's previous track-record before the BTA/AL intervention.

6E3 experimental class compared to the gifted class.

The gifted classes' one-year longitudinal ITBS scores following the eighth grade, ranged: +10, 17, 21, 23, 24, 28 DSS points in Reading (two subtests), Math (four subtests), Composite, Language Total and Core Total, or nine primary ITBS subtests with an average of +21 DSS points over National Norm expectations.

By comparison, when the 6E3 class entered 8th grade two years later, the Standard Score (SS) growth was compared to the NN expectations and with the other eighth grade classes. (See Table 9.) The 6E3 classes' two-years' longitudinal DSS scores were: two lows of +37, and +42, 43, 44, (2) 45, 52, and 58, (average: +44 points) This is twice what the low compliance gifted class scored (+21 points) post-BTA/AL over the NN expectations offering +2 1/2 years' growth beyond what the school normally received.

Additionally, a comparison was analyzed between NN expectations for the eighth grade and the pre-BTA/AL grade eight's two-years' average without the gifted. These DSS points ranged +19, 25, 29, 30, 34 (2), 37 (2), 40 (average: +32 DSS points). Therefore, the 2-year longitudinal post BTA/AL 6E3-class had a +12-point gain beyond the average of the schools' track-record (+44 pts. versus +32 pts. or +12 points difference).

This is approximately an additional one-years' growth for the BTA/AL treated 6E3 class. This also includes the addition of another unusually high-scoring eighth grade class in 1995 that was averaged into the Pre-BTA/AL years that would lower the gains' DSS scores. (See Table 8.).

4E3 experimental class compared to the school's track-record without the gifted class.

Table 9.

Intra-Analysis of Table 8 Summary Chart.

Table 9 is a longitudinal comparison of the successfully BTA/AL treated 4E3 and 6E3 classes' ITBS Standard Score Point Differences (DSS) with the National Norm Expectations and the schools' former track-record averages.

Academic Subject (ITBS) Point Differences	Comp	Read Comp	Read Total	Math Conc-epts	Math Probs	Math Total	Math Comp	Lang. Total	Core Total	Ave. Gain
6E3 BTA/AL 2-yr 8th Long. with Norms	44	45	37	44	52	48	37	42	43	44
Post 1997 Non-Compliant BTA/AL 8th Gifted & Norm Expectations	21	21	17	10	24	24	21	28	34	21
Pre BTA/AL 8th w/o Gifted Ave. & Norm Expectations	30	25	19	34	40	37	29	37	34	32

4E3 BTA/AL 2-yr 6th Long. and Norm Expectations	32	36	30	35	37	36	26	38	34	34
Pre BTA/Al 6th Ave. Including Gifted & Norm Expectations	29	28	25	27	33	30	31	30	29	29
Pre BTA/AL 6th Ave. w/o Gifted & Norm Expectations	21	19	18	21	25	23	31	22	21	22

Shaded 8th and 6th grade classes = BTA/AL treated classrooms, longitudinal profile.

Now, to compare the 4E3 class' 2 year longitudinal scores with the school's 6^{th} grade track-record that did not include the gifted class. The range was a low of +18 DSS points for Reading Total, and a high of +31 DSS points for Math Computation. (See Table 9) The nine primary ITBS academic subtests averaged +22 DSS.

So therefore, without the gifted class, the average was +22 points, and with the gifted class in sixth grade, the average was +29 additional DSS points, or seven extra points. Sixth grade norm DSS growth expectations range of +7 - 14 points. The BTA/AL treated 4E3 two-year longitudinal class, had +34 points, or +5 point gain (approximately one-half year's growth) over the gifted classes' average. They had +12 points average, or a full year over the no-treatment average that did not include the gifted class.

This is evaluating the averages for just the nine primary ITBS subtests. In many instances, the BTA/AL academic growth was +1 1/2 to 2 1/2 years beyond what the school routinely obtained in the ITBS academic subjects.

Additionally, in analyzing the two 4E3 and 6E3 classes longitudinally and comparing it to School 1's track-record average, it should be considered that the 4E3 and 6E3 longitudinal score compilation included the usual ensuing year's conventional teaching.

Projecting the 4E3s next two years beyond 6^{th} grade with a conservative +9-10 point per year, or +18-20 points, the scores will range similarly or even beyond the 6E3s longitudinal averages. Reviewing Table 9, (Table 17 in Complete), adding +20 points to the +26 to 37 point scores would bring the scores into the high +40s to 50s ranges over National Norm (NN) growth expectations. One subtest, Math Computation, had a lower gain during the fifth grade year.

<u>School 2's 4E1 and 4E2 One-Year Longitudinal Analyses</u>

Table 10 compares School 2's 4E1 and 4E2 low auditory, low achievement classrooms' National Standard Score (NSS) gains, pre- post to 1-year longitudinal (4^{th} to 5^{th} to 6^{th} grades) with other 6^{th} grade classrooms and the DSS expectations.

The two classrooms' WDJ pre-test Visual Speed (subtests 2 & 7 baseline was 58% for 4E1, and 57% for 4E2. The WDJ Auditory Memory baseline (subtests 3 & 10) was 55% for the 4E1 classroom, and a lower 37% for the 4E2 classroom. In this researcher's previous article (Erland, 1998), both visual and auditory memory gains were noted. On the ITBS CogAT test, there was a substantial, yet unusual, gain in the Quantitative and Nonverbal subtests (Drahozal, Riverside Publishing Co. communication).

Table 10 reveals that these two lagging classrooms which fell below the NN (DSS) entering fifth grade, now have scores closely matching gains made by other sixth grade classrooms a year later. While the 4E1 class scores ranged slightly higher than the NN in ITBS achievement, the 4E2 classroom is +20-23 points higher in many of the ITBS academic subtests (NN Expectation for 6^{th} grade is +7 - 14 points). These scores show that these two fourth grades had now

Table 10.

School 2s' 4E1 and 4E2 Low Auditory Memory Classes Pre BTA/AL Treatment and Post 1-Yr. Longitudinal NSS Comparisons To Other 6th Grade Classes In That School and The National Norm Expectations

		Lang			
		Total	Core Total	Social Studies	Science
	Usage / Exp	NSS	NSS		
3rd Gr. Pre 2 classes	179	176	179	187	184
4E1 Class					
4th Gr. Pre BTA/AL	194	194	197	201	199
5th Gr. Post BTA/AL	215	210	210	209	222
6th Gr. 1-Yr. Post BTA/AL	243	237	231	228	228
4E2 Class					
4th Gr. Pre BTA/AL	200	199	202	212	214
5th Gr. Post BTA/AL	227	218	217	218	229
6th Gr. 1-Yr. Post BTA/AL	245	242	239	243	255
Nat'l SS Fall Expecta					
3rd Gr. Pre BTA/AL	177	176	175	176	177
4th Gr. Pre BTA/AL	194	192	191	193	193
5th Gr. Post BTA/AL	209	208	207	209	209
6th Gr. 1-Yr. Post BTA/AL	223	223	221	223	223
5th Controls, AMA					
5th Gr. Pre AMA	214	210	212	223	219
6th Gr. Post AMA	238	239	237	229	245
6th Controls, AMA					
6th Gr. Pre AMA	236	236	235	239	240
6th 6E1-BTA/AL					
6th Gr. Pre BTA/AL	247	241	240	248	248

Table 10.
School 2s' 4E1 and 4E2 Low Auditory Memory Classes Pre BTA/AL Treatment and Post 1-Yr. Longitudinal NSS Comparisons To Other 6th Grade Classes In That School and The National Norm Expectations

				Reading			Math	Math			
	Composite	Reading	Reading	Total	Math		Total	Computa	Language		
		Vocab	Compreh	NSS	Concepts	Probs.	NSS		Spelling	Capitalizati	Puctuation
3rd Gr. Pre 2 classes	182	182	183	183	175	180	178	172	174	176	173
4E1 Class											
4th Gr. Pre BTA/AL	199	199	203	201	190	199	194	188	189	201	194
5th Gr. Post BTA/AL	213	210	213	212	210	211	210	198	205	208	210
6th Gr. 1-Yr. Post BTA/AL	230	220	237	229	222	230	226	219	222	239	245
4E2 Class											
4th Gr. Pre BTA/AL	206	204	208	206	197	203	200	183	190	207	199
5th Gr. Post BTA/AL	220	221	219	220	210	213	212	199	211	214	221
6th Gr. 1-Yr. Post BTA/AL	243	243	241	242	228	238	233	221	228	247	249
Nat'l SS Fall Expecta											
3rd Gr. Pre BTA/AL	176	175	177	176	173	175	174	171	174	175	177
4th Gr. Pre BTA/AL	192	191	194	192	188	192	190	187	190	192	193
5th Gr. Post BTA/AL	208	206	208	207	203	207	205	203	206	209	209
6th Gr. 1-Yr. Post BTA/AL	**222**	**220**	**220**	**220**	**217**	**221**	**219**	**217**	**221**	**223**	**223**
5th Controls, AMA											
5th Gr. Pre AMA	217	213	216	214	212	213	212	205	207	210	210
6th Gr. Post AMA	**237**	**232**	**235**	**234**	**235**	**239**	**237**	**229**	**229**	**244**	**246**
6th Controls, AMA											
6th Gr. Pre AMA	**238**	**233**	**235**	**234**	**234**	**235**	**235**	**221**	**218**	**241**	**248**
6th 6E1-BTA/AL											
6th Gr. Pre BTA/AL	**244**	**235**	**248**	**242**	**235**	**239**	**237**	**224**	**229**	**245**	**245**

caught up to their peers in academic achievement, particularly in reading and math, and were also higher than the National Norm expectations. Reading and Math Summary for 4E1 and 4E2:

Reading Total: 4E1, +9 pts above the National Norms, 4E2, +22 points above the National Norms. Math Total: 4E1, +7 points above the National Norms, 4E2, +14 points above the National Norms.

Discussion.

It was hypothesized that the BTA experimental treatment classrooms would have reading and math gains greater than the control groups' gains. The eleven Experimental classrooms had twenty-three academic subject gains statistically significant over the robust controls pre- to post-test: sixty-five were significant over the norms and controls combined. Longitudinally, the experimentals had fifty-eight statistically significant academic subjects over the two control groups. Thirty of these gains were in reading and math, thereby meeting the hypothesis.

The two schools typically obtained one to one and one-half years' growth yearly, dependent upon student and teacher variables. The BTA/AL training provided an additional +1 1/2 to 2 1/2 years' academic achievement growth beyond this, creating the three to four years' total gains as revealed by Tables 7, 8, and 9.

Earlier longitudinal studies (Erland, 1994, 1989b) reported that the previous BTA /AL robust three-year gains maintained, and continued to build in subsequent years. This study concludes that there can be as much as +three- to four-year gains in academic achievement. Extracting the schools' typical achievement record, this brings expectations down to +1 1/2 to 2 1/2 years' additional gain per year when accompanied with good classroom teaching.

It was fortuitous for the study that the strong application classrooms alternated with each of the misapplied classrooms, and that there was a continuing comparison with the gifted class. This created a contrasting effect, and exposed the treatment's working elements. With the alternate years of slower growth due to BTA/AL misapplication, it is a clear indicator that the BTA/AL cognitive skills eight- or ten-week treatment should be implemented again the following year for maximum effect and continuing growth.

This second treatment is advisable when cognitive skill pre-test measures reveal a class average of less than the 40th percentile rank in visual or auditory memory. Therefore, specific gains would not have to be extrapolated between school years, as gains would be more consistent. Lower achieving students would receive that important second session that has been shown valuable in earlier studies (Erland 1989a, 1989b).

If Accelerated Learning is applied continuously in consecutive semesters or years, consideration would also need to be made for learners with higher and lower capabilities, and should define school achievement goals for student and teacher leadership plans.

Additionally, video taping would serve as a tool for schools to duplicate the instruction successfully so their upcoming classes could continue to obtain similar positive results. Future studies should incorporate videotaping of the Accelerated Learning classroom instruction to aid instructional evaluation and teaching. Videotapes become a valuable instructional index because they serve as a training reference for teachers, administrators, and evaluators.

Peer modeling proficiency (Bandura, 1997, 1986, 1971; Kaplan, 1991) with peer interaction is an important element and can be incorporated into DVD-ROM. Two or more paired students can work at a computer terminal and verbally reinforce each other with positive affirmations. Additionally, the students' attention and concentration is better with computerized interaction, as there is less distraction. Teachers also would have less micro-management responsibilities of behavior.

School administrators and teachers determine crucial learning style factors such as seating, room temperature, extraneous noise, and lighting (Dunn & Dunn, 1988, 1987). There will be tradeoffs, as ideal conditions are difficult to replicate across classrooms.

Good auditory memory (listening) is key to learning capability, and must integrate with visual memory for conceptualization to result. Guilford (1986, 1984, 1967), Meeker (1999, 1991, 1969), Reid and Hresko (1981) and Woodcock (1989, 1978, 1977). Auditory memory scores were noticeably affected in this study when BTA application was inconsistent (Erland, 1998).

Unfortunately, the classrooms having students with the lowest auditory memory scores, (4E1, 4E2, 5E3, 7E2, 8E3) had implementation shortcomings, which affected their students' ITBS outcomes. With minimal auditory memory improvement, the achievement gains were limited. Additionally, this study confirms that what gains they initially had, did not maintain longitudinally with high achievement results.

Although the 4E1 class applied most of the Accelerated Learning strategies, several critical encoding-decoding lessons were removed or taught incorrectly. Consequently, the 4E1 class made only a small two-point auditory memory gain (Erland, 1998), resulting in a more conservative DSS gain in Reading and Math over the National Norms.

The 4E2 class, although having slightly lower executive criteria implementation adherence than the 4E1 class, nevertheless consistently applied the Accelerated Learning strategies, cut fewer of the items and lessons, and implemented only one lesson incorrectly, thereby making a more significant five-point Auditory memory gain (Erland, 1998). This translated to higher DSS point gains in Reading and Math over the National Norms than the 4E1 class.

These two low auditory memory fourth grade classrooms from School 2, applied executive criteria BTA/AL policy just 63% to 68%. Nevertheless, they obtained substantial auditory memory gains on the DTLA-2, and ITBS CogAT. Subsequently, they evidenced statistically significant academic achievement results, pre- to post-test, when pooled with the high-scoring 4E3 class from School 1 (Erland, 1998).

Longitudinally, the 4E1 class had sixteen, or all, academic achievement areas statistically significant, and 4E2 had fifteen subjects (See Table 4). This sudden growth spurt had not occurred before, as these classes met, or hovered slightly below, the National Norms since their ITBS testing in third grade.

Yet, interestingly, these two fourth grade classes were the only School 2 classes that received cognitive skill growth on the CogAT in all three psychological domains of Verbal, Quantitative and Figural (Erland, 1998). It can be speculated that the properly implemented Accelerated Learning techniques, which increased cognitive skill and memory levels, may have created this effect.

As the ITBS-CogAT is designed to do, cognitive skills testing offers schools a blueprint for measuring student aptitudes, learning requirements and prescriptive brain-based instructional methods for teachers and students. Prescriptive measurement and evaluation of cognitive skills can also offer schools an efficient way to identify and train remedial students in the regular classroom.

The other low auditory memory classes (5E3, 7E2 and 8E3) with implementation shortcomings, eliminated Accelerated Learning (AL) components, and therefore made fewer academic achievement gains.

Surprisingly, the 5E3-class, although achieving fewer statistical gains with the BTA treatment (Social Science, $p < .05$), made strong gains in Science and Social Studies, and the class later had robust longitudinal gains (See Table 4). This is because of two factors: 1) a dedicated accelerated-learning (AL) trained teacher the following year reinforced incomplete application of the BTA during the treatment year. Although as sixth graders they did not have the BTA materials to use, these 5E3 students were reinforced with Accelerated Learning methodology accompanied with good instructional teaching. 2) cognitive skill growth does not always show immediate academic achievement test gain. Many times, the mental growth builds with subsequent practice, activates, and becomes evident with achievement score gains in ensuing years (Erland, 1998, 1994, 1989b; Meeker 1991).

The following year, when the 5E3 teacher subsequently took over the high-scoring 4E3-class, they continued to maintain its longitudinal gains. The teacher had applied some Accelerated Learning techniques, but had eliminated BTA protocol. Consequently, the 5E3 teacher retained the same pattern of obtaining the expected +6 to +20 DSS point gains. Although Accelerated Learning strategies will increase scores (Schuster and Gritton, 1986), the BTA media instruction serves as a performance catalyst, as it did with 4E1, 4E2, 4E3, 5E3, and 6E3 (See Table 6).

The proficient 6E3 teacher typically attained +11 to +20 pt- gains in standard scores (See Table 7; Table 15 in Complete.doc). For the 1996-year with the gifted students, the SS point gain ranged higher, +16 to +25 points. Yet, in the year of the BTA study without the gifted, this teacher's DSS point gains ranged from +15 to +46 points with an average of +44 points over the National Norm expectations two years following the BTA/AL treatment. Nonetheless, the formerly low-compliance 5E3 class with the low auditory memory scores now had gains due to the subsequent AL booster training.

The principal and Site Supervisor expressed puzzlement over the high performing seventh grade class that had a long, continuous record of high ITBS achievement test success (See Tables 7 and 12) since the early primary grades. They did not realize that this class had high cognitive skills test scores as an aggregate group. It can be an anomaly not to have a few low cognitive skill-functioning students in a classroom.

However, even the brightest students can lose their peak performance edge when their classroom instruction lacks prescriptive instructional techniques. This study demonstrates that it is therefore possible for slower or lower cognitive level students receiving better instruction, to pass gifted students having average instruction. The lower- to-average cognitive skill students became retrained, and raised to higher learning ability levels. With the good AL instruction, they surpassed, or at the very least, matched the gifted 7E3 in ITBS DSS point gain (See Tables 8 and 9).

Consequently, the critical Accelerated Learning elements that become the catalysts for future instructional improvement, were revealed and documented by the irregular implementation factors. The executive criteria measures were prescriptively monitored and scored on classroom visitation criterion checklists (Erland, 1998). Additionally, a criterion referenced performance baseline was formed by the study. This growth index continues even when followed by teachers teaching with traditional, conventional methods (See Tables 7, 8 and 9).

Additionally, earlier studies (Erland, 1989a, 1989b) reported that The BTA/AL training had longitudinal maintenance gains by adult learners as well as with younger students.

In one published study (Erland, 1995, 1989a), a Multivariate Analysis of Covariance (MANCOVA) Using 7 Dependent Variables, revealed that the experimentals had evidenced the same amount of statistically significant cognitive skill and memory improvement for a wide range of ages (nine to adult), and ability levels (low to high).

For this study, the independent variables were group, age, and pace. Group: experimentals and controls. Age: two age groups, 10-15, versus 16 to adult. Pace: included two varying cognitive skill ability levels of low and high. There was a significant overall main effect for the experimentals, $F=26.55$, $p < .01$. There were no significant main effects for age and pace.

Accelerated Learning (AL) techniques and The Bridge To Achievement (The BTA) can offer consistent academic achievement results when taught prescriptively. Required lessons, items, and number of prescribed days should be instructed according to time and task, scope and sequence.

Furthermore, Accelerated Learning (AL) techniques should also be taught according to their author's original design (Lozanov, 1978; Schuster and Gritton, 1986). When AL methods are given piece-meal, abridged, or modified beyond recognition, solid, measurable, scientific gains become problematical.

Software applications into DVD-ROM would produce positive results because the electronic medium can effectively regulate systematic implementation of the nineteen executive criteria measures, many of them inherent to AL. Additionally, to eliminate performance problems due to teachers' varying acceptance of teaching additional curricula outside their in-place lesson plans, the instruction would be best automated. This automation would also support teachers' home review of the prescriptive teaching strategies and understanding the theories and rationale behind the instruction.

Ideal for Long Distance Learning applications and laptop computer projections, for larger instructional groups, the teacher would not be eliminated from this specialized instruction. The automated instruction could be accompanied with warm, dynamic facilitator-student coaching interaction. Yet, this instruction could also be applied to computer stations, requiring less teacher supervision, with participants working in pairs, for independent learning success.

Conclusion.

With cognitive skills malleable and correctable, with all learning pathways treatable to become optimally operational, we do not have to settle for what basic nature and nurture, our environment, gives us for information processing capability.

Erland (1989a) discovered by clinically assessing over a thousand individuals in a wide range of ages, ability levels, and walks-of- life, everyone had areas of cognitive skills or memory levels that could be enhanced. Whether individuals are gifted, of average abilities, or remedial, (as with Attention Deficit Disorder, or ADHD) cognitive skills can be further developed to enable individuals to reach higher potentials. Average or low average performance no longer interfaces with the technological age.

Then, through almost two decades of test-teach-revise-test iterations, Erland (1998, 1994, 1989a, 1989b) determined that minds are renewable and retrainable through prescriptive exercise. Furthermore, if learning problems can be alleviated or eliminated, by application of a cognitive skill - AL methodology such as the one applied in this study, the training should be available for schools to assist all students with learning. Accelerated Learning offers the necessary bridge to achieving and maintaining high academic performance.

It can therefore be concluded that if students receive Accelerated Learning methodology in early grade school years, they can synergistically carry cognitive skill, memory, and academic achievement growth forward through their formative years into adulthood (Erland, 1995, 1989b).

Additionally, if adults can improve their learning proficiency through improved information processing capability, they can maintain a vital edge in the high performance workplace (Erland, 1999, 1997). The wide range of solid results for the BTA/AL experimental classes demonstrates the strength and viability of Accelerated Learning to open avenues for instruction in a variety of settings, ages, and with multiple populations.

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Tactual Resources at the College Level: Toys for Adult Learning

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"I'm really excited about teaching at the community college level," said Bill, a career intelligence analyst for the military. "I love American history and think I'll do a good job with the content. The problem is," he confided in the nine other doctoral students enrolled in an elective course on teaching at the community college level, "I'm not certain how to work with students who don't like to read and who may be at high risk for college failure for various reasons."

Bill's concerns were well founded. The State Council of Higher Education for Virginia found that 24 percent of that state's community college and university undergraduate students require "remedial work before tackling college classes" (Morrison, 1996). Claxton and Murrell (1987, p. 1.) argued that the "need to improve educational practice is great," and college administrators point to high rates of attrition, increased diversity of student needs, and lack of preparation for college work by large numbers of entering freshmen as rationale to make changes (O'Hanlon, 1997). It is little wonder why students who leave college before completion, do so during their first semester of their freshman year (Nelson, et al., 1993). Bill's concerns reflect those statistics, because some of the students may have been enrolled in American history.

Learning Style Instruction.

Reducing academic failure of college students "requires more than traditional remedial and study-skills orientations and supportive services," argued Barbara Nelson, Assistant Vice President, St. John's University, and her colleagues (Nelson, 1993, p. 34). They found that traditional approaches to remediation were ineffective for large numbers of students-especially students who prefer to learn actively with materials they can handle and manipulate. Consequently, faculty at St. John's began teaching students based on their self-identified learning style preferences. As a result, St. John's reduced its attrition by 19 percent while students made significant academic gains.

Teaching according to how students learn was advocated as early as 1945 by Vicktor Lowenfeld (1945) who challenged the practice of testing low achieving students with paper and pencil tests. He theorized that 25 percent of college students gain most of their information through touch and movement, yet most coursework at that time was lecture-based followed by paper and pencil examinations—a practice that continues today. Subsequent research demonstrated that college students learn faster and more effectively when learning opportunities match their individual learning styles and/or when students are taught to use their learning style strengths for completing homework (Clark-Thayer, 1987; Claxton & Murrell, 1989; Cook, 1989; Dunn, Deckinger, et al., 1990; Dunn, Sklar, et al., 1990; Griggs, et. al., 1994; Lenehan, et al., 1994; Lowenfeld, 1945; Nelson et. al., 1993). For these reasons, Bill's doctoral class, EDCC 802, Community College Teaching through Learning Styles, was created.

Tactual Teaching at the College Level

It is one thing to philosophize and discuss teaching through individual learning styles and quite another thing to do it. Griggs and Griggs (1998, pp. 5-6) outlined several steps for getting started. Paraphrased they were:

1. Identify and administer a learning-style assessment instrument that is appropriate for adults and has strong reliability and validity (Curry, 1987; LaMothe, et al., 1991).

2. Provide interpretations of the results to each student, explain students' individual strengths, and provide descriptions of how best to study to take advantage of learning

style strengths (Dunn & Klavas, 1990).

3. Use a variety of instructional delivery approaches to accommodate students' varied perceptual and social preferences including lectures, small-group discussions, team learning exercises, individual activities, audio- and video tapes, case studies, mapping, and experiential activities that encourage movement.

4. Permit the use of tape recorders, variations in lighting and opportunities to stand, sit or lounge while engaged in learning.

5. Begin lessons with an overview, a content-related, human-interest or anecdotal story, or a humorous example of how the content relates to students' lives. This brings learners into the content and accommodates students who need a perspective of the whole before dealing with details.

Evidence that these techniques work was found in a meta-analysis of 36 experimental studies with a data base of 3,181 participants (Dunn, et al., 1995). This meta analysis revealed that overall academic achievement was three-fourths of a standard deviation higher for participants whose instruction matched their learning styles compared to those not accommodated. Across the 36 studies, adult learners made greater gains than elementary or secondary students when instruction matched preferences. Further, matching physiological preferences such as perceptual strengths, time of day, movement and food intake while learning had a greater impact than matched elements in other domains.

Nothing was reported in the meta-analysis about how college students used tactual materials, but it may be speculated that the benefits of tactual resources for college students were dependent upon several variables: 1) student preference for hands-on learning; 2) student willingness to use tactual resources if provided; 3) instructor willingness to provide manipulative resources; 4) physical appearance of the resources; and 5) student willingness to construct self-correcting manipulative learning aids.

An unwillingness to construct self-correcting tactual materials was illustrated in a study by Dunn, Deckinger, Withers, & Katazenstein (1990). They found that after sharing the benefits of completing homework through learning style preferences, "some students demonstrated interest in the suggestions; others were skeptical and/or noncommittal" (p. 100). Out of 47 students in their study, only ten agreed to implement the researchers' homework suggestions. Those ten achieved significantly higher scores than did either of two control groups that did not modify their homework approaches.

Posing the Question.

Doctoral students in Bill's class remained ambivalent and skeptical about using tactual resources in college classes. Then Ed forced through the doubt by saying, "It seems to me that if education is to experience any lasting reform, two things are critical. First, teachers must fundamentally change with regard to what they believe about how students learn. Second, educators across the board must seriously rethink how teachers teach."

Ed's statement provided an opportunity for the professor to suggest a class project whereby doctoral students would make tactual resources for students in an undergraduate course and determine for themselves if hands-on learning was a viable instructional option for community college teaching. Trepidation was voiced about spending time with scissors and glue, but after thoughtful discussion, students expressed interest and agreed to turn the opportunity into a mini research project. They were unaware of the fact that the professor was exploring the mini research effort as a way to investigate tactual learning in a doctoral class. Thus, they were the professor's subjects just as the undergraduates were their subjects.

The objectives of this article are to: 1) describe the class project as an exploratory effort into experiential learning at the doctoral level; 2) share insights into the use of tactual materials by undergraduates; and 3) describe how graduate and undergraduate college students assisted one another in the learning process.

Setting.

George Mason University (GMU), a state supported school in Northern Virginia, has a rich mix of ethnic groups from 49 states and 108 countries in its student population of 26,000. To address diverse student needs GMU provides alternative undergraduate and graduate programs in addition to maintaining strong traditional programs (Lockemy & Summers, 1993; Terrey, 1991; Reich, 1991). In 1996, 27 percent of the freshmen class selected one of three alternative academic programs, with nine percent enrolling in New Century College (NCC).

Students in NCC completed their freshman year in cohorts of 25 divided into five-member study teams. General education course content was integrated and taught in nine-credit units by faculty teams representing different disciplines. Students met four hours a day, four days a week for four six-week units. In addition, blocks of time were reserved for community-based service learning and one-credit experiential classes. The class participating in this study was a one credit, experiential offering.

The intention of NCC is to promote student understanding of self as learners, thinkers, and community advocates. Thus, learning-styles instruction was an integral part of the teaching strategy.

The Doctor of Arts in Community College Education (DACCE) program is equally innovative. It relies heavily upon extant coursework, since it emphasizes the teaching of a discipline. The collaborative nature of the DACCE program promotes cooperation among departments and colleges across campus and among local universities. In the fall of 1997, DACCE enrolled 215 students for study in 22 different disciplines.

Project Design.

An exploratory, embedded case study design (Yin, 1984) was selected to investigate experiential learning at the doctoral (Case Study One) and undergraduate (Case Study Two) levels. This design was appropriate, because use of tactual materials had no clear, anticipated single set of outcomes for either of the two groups. Criteria for an embedded case study were met because: 1) boundaries between what was studied and the context were not clearly evident; 2) the primary data sources were direct observation and review of class documents; 3) there was a strong reliance on student self-reporting rather than on actual subject observation; 4) student behaviors could not be manipulated for purposes of the project; and 5) project artifacts—tactual materials, response questionnaires, and reflective essays--were constructed as part of the project (Yin, 1984, pp. 23-25).

The specific study question for Case Study One was: How can authentic learning-styles instruction be incorporated in a doctoral class on teaching at-risk community college students? The major proposition was: If doctoral students construct tactual resources and observe undergraduates using them, they will be likely to use manipulative materials in subsequent teaching at the community college level.

The specific study question associated with Case Study Two was: How will undergraduate students respond to the use of tactual materials? Therefore, the major proposition was: If provided tactual resources with information specific to their course evaluation, students will willingly use the materials for study purposes. Instrumentation.

Students in both case studies completed the Productivity Environmental Preference Survey (PEPS) (Price, Dunn & Dunn, 1991)--a 100 item, self-diagnostic instrument designed to measure the learning style preferences of adults. Items on the 5-point Likert scale yield reliable and valid results as reported by Kirby (1979) and others (Buell & Buell, 1987; Clark-Thayer, 1987; Curry, 1987; Freeley, 1984) regarding personal learning preferences in five learning domains: 1) environmental (sound, light, temperature, and design); 2) emotional (motivation, persistence, responsibility, and structure); 3) sociological (working alone, in pairs, with peers or authority figures, and with various others); 4) physiological (perceptual modalities, intake, time of day preferences, and mobility); and 5) psychological (global/analytic, impulsive/reflective).

Numerous studies document significant results when matching instruction and/or study habits to learning preferences as identified by the PEPS. For example, after assessing 1,000 minority college students in remedial mathematics classes, Dunn and her colleagues (1990, May/June) revised every other chapter in the students' analytical step-by-step textbook to accommodate a global processing preference. Students studied on their own without direct teacher instruction and gained significantly higher test scores ($p < .001$) on chapters that matched, rather than mismatched their global or analytic style.

For the study reported here, students received a profile of their scores and a printed description of how to use their strengths for homework completion. Undergraduates were asked to modify their study routines to take advantage of their strengths, and doctoral students used their feedback to develop a greater understanding of self and others for instructional purposes.

Procedures for Case Study One

The objective of Case Study One was to investigate how to incorporate authentic learning-styles instruction in a doctoral class on teaching at-risk community college students. Several techniques were used to make the course both experiential and highly relevant to real-world needs. Chief among them was the development and execution of a class-directed mini research project.

The common student goal of the ten DACCE students was to develop skills and strategies for teaching students at high risk for college failure. The five women and five men ranged in age from 32 to 54 years and reflected GMU's ethnic mix. Their occupations included: vice president of insurance training, systems analyst, intelligence analyst, data administrator, community college instructor, community college administrator, software systems engineer, family therapist, public school curriculum specialist, and accountant. Their strong modality preferences were auditory (2 prefer), visual (2 reject), tactual (5 prefer), and kinesthetic (2 prefer)--two students had strong preferences on two elements and one person choose not to complete the survey. This mix demonstrates a strong adult preference for tactual learning in excess to that anticipated for a group of doctoral students with higher education teaching as a goal.

Involvement with the undergraduate exploratory case study was a semester-long endeavor and became a part of each of the 14 class sessions. None of the students realized the doctoral class was also part of the study. Classroom data sources included: 1) types and quality of tactual resources constructed; 2) group problem solving in terms of data collection and analysis; 3) observations of undergraduates using their tactual resources; 4) the professor's observational notes of doctoral students as they observed undergraduates; and 5) students' reflective essays regarding their use of tactual materials as community college professors, and their involvement in this highly experiential learning course.

In the first six-weeks of class, the doctoral students were introduced to concepts and research underlying learning styles instruction and its application to the college classroom. Students designed and made self-correcting tactual resources such as flip chutes, electroboards, and task cards for a set of questions pertaining to the undergraduate course content. As might be expected, these resources varied in size, color, complexity of design, and aesthetic appeal. Each resource was critically reviewed by two other members of the class and refined or replaced as appropriate before being used by the undergraduates.

Following this period of resource preparation, the class focused on administrative and logistical issues such as objectives of the undergraduate study, type of data to collect, development of feedback questions regarding reactions to the resources, determination of observation dates, and selection of data analysis procedures.

Observations were conducted during one of the two scheduled undergraduate class sessions in which students were asked to use and critique a total of three different tactual resources. The graduate students sat along one wall or circulated around the classroom to watch undergraduate reactions while one graduate student took photographs.

Teams of two doctoral students analyzed the undergraduate responses, and Margaret completed a spreadsheet of the quantitative data. Nora entered undergraduate PEPS scores and their final quiz scores in SPSS format and constructed graphs to note if any meaningful relationships existed between modality preferences on the PEPS and scores earned on the final quiz. The class worked collectively to summarize the results and discussed possible interpretations. Ed wrote a preliminary draft of the study, and the class reviewed it for content accuracy and offered suggestions for revision. The professor described the overall research design and developed the final draft. The class edited it for publication consideration then Ed, Bill and the professor took responsibility for submitting it for publication.

Results of Case Study One.

Data were generated from multiple sources. Each source added richness to the overall study.

Observations. In their enthusiasm to see how undergraduates responded to their individual creations, some graduates walked around to more closely observe undergraduate reactions, or to actually interact with some of the undergraduates while all of them held whispered conversations during the observation phase. Also, the group's photographer tended to arrange undergraduates for composition purposes rather than take photos as unobtrusively as possible.

Only one man voiced concern about his classmates' failure to respect the integrity of the observation process. Except for this student, doctoral observations focused on the undergraduate interactions with specific tactual resources. There was little or no articulated attention to how the observers may have influenced those observed.

E-mail Communication. Review of the e-mail communications revealed a lively interchange throughout the course. Much of it extended course inquiry beyond content discussed in class. There was a limited amount of chitchat but a tendency to 'take care of business' while on-line, sign off, and then bring their ideas and materials to class where they could share in person. Thus, e-mail interactions were effective for differing reasons.

Reflective Essays. Entries in reflective portfolios were mixed regarding reactions to: a) student use of tactual materials as community college professors, and b) their involvement in this highly experiential learning course. One woman who scored at the moderately strong level for 'rejecting' tactual learning on the PEPS wrote:

The new design of learning/teaching devices that were introduced in EDCC 802 opened new avenues for approaching certain areas in my Spanish language classes. The tactual resources required an inordinate amount of design and construction time, but the final effort was rewarding, because I used several of them in successfully teaching aspects of grammar, which are often repetitious and tiring. The students, who ranged in age from 20 to 70, were amused at first. But each one commented favorably about the interesting aspects of the tactual devices. "It puts a new slant on the verb to be," they said, jokingly.

Two women who had previously viewed themselves as visual learners were surprised when results of the PEPS revealed a strong preference for tactual learning. Liz wrote:

I did not consider myself a tactile learner, and could not see students using the tactual resources as well. However, . . , I created several resources for myself as study tools during previous classes; I just didn't identify them as tactual resources. The discussions that followed via e-mail and in class helped me realize the significance and value of tactual resources in a teaching environment. I don't think I would have had the same response had we not gone through the steps to develop, discuss, and see tactual resources in use in another class.

One man who scored as a strong tactual learner created several especially attractive and clever resources, yet they were engaging and easy to use. He wrote:

I believe that learning is enjoyable and perhaps an intoxicating experience when the experience provides an opportunity for one to indulge in his or her dreams or passions. The opportunity to design and build tactual resources was one such experience because it permitted me to indulge in my artistic desires. For the past four years, as a result of my professional and doctoral program demands on my time, I have had to restrict my indulgence in the arts. Thus, I welcomed the tactual resource activity with glee.

By contrast, one woman with a strong preference for auditory learning and a strong preference against visual learning offered the following response when asked if she would make tactual materials for her students:

No, I would not create these resources; however, I will take a more hands on approach to teaching in my subject area, I would not use these tools because of the extra time it takes to create them. However, it is definitely a good suggestion to offer to students.

Discussion of Case Study One.

During the semester, doctoral students were encouraged to use the course as a catalyst for developing specific materials for courses they taught or planned to teach. They willingly constructed materials and many developed additional resources for future use. In spite of heavy course load demands, full-time employment, and family responsibilities their efforts clearly demonstrated that construction and implementation of authentic tactual resources at the doctoral level was a viable and rewarding way to make a doctoral course highly relevant. Whether this would be true of a class where half the students are strongly auditory or visual rather than tactual remains to be explored.

Procedures for Case Study Two.

The 16 undergraduate NCC students enrolled in an intensive two-week, one-credit elective course on how the brain functions. They met five times for two hours and forty minutes, and had outside-of-class responsibility to view selected videos and read selected references. The four men and 12 women reflected GMU's ethnic mix and age range. Most were 18 but ranged in age to 45 years. The class included six freshmen, four sophomores, three juniors, and three seniors, with intended majors ranging from undecided to premed. Their strong modality preferences included: auditory (5 prefer), visual (3 prefer, 2 reject), tactual (4 prefer, 1 reject), and kinesthetic (1 prefer, 1 reject). Three students had documented learning disabilities. Students could work alone or with others for out-of-class assignments, while in-class assignments were generally completed in small groups. Each student had completed at least one experiential course or semester in the NCC curriculum.

Class sessions were a mix of mini-lectures with color slides; role playing; physical activities, and small group discussions of books, articles, and videos. In addition, the class received a lecture by an internationally known neuroimager and participated in a field trip to a brain research laboratory. On two days during class time, undergraduates used the tactual resources to study 20 questions and answers about the brain. Because of a fire alarm and two lengthy building maintenance interruptions, students had only ten to fifteen minutes to work with each of three resources rather than the intended 20 minutes each. After using each resource, students responded to a questionnaire regarding their reactions. At the end of the course students completed a quiz containing questions tactual resources and questions from other sources.

Results of Case Study Two.

The resource feedback consisted of four statements to be scored in a rating scale of 5-4-2-1, with 5 being the highest score. Following are the statements and how they were scored.

Item 1: This resource was easy to figure out and use. Eighty-five percent of the resources were rated as easy to understand and use, with 64 percent giving the resource an overall rating of 4 or 5. Generally, students rated the first resource they used lower than subsequent ones, and several students noted that the first resource helped them understand the next ones better. Five students (15%) rated all three resources as confusing and difficult. Two of these students were strong auditory learners (one with a diagnosed reading disability), two were strong visual learners (one with a strong dislike for tactual learning), and the fifth person had no strong modality preference or learning disability.

Item 2: This resource is motivating. Whether undergraduates would be interested in using tactual resources was a key question of the study. Seventy-three percent rated the resources as high (4 or 5) in motivation. Visual appeal (activity, color, and graphics) and ease of use significantly influenced the level of motivation, while other factors such as size and portability played lesser roles.

Action oriented resources such as "electroboards" with bulbs that lit to provide immediate feedback for correct answers were popular. Cartoon characters that appeared animated, resources using a golf tee, and brightly colored resources also motivated students and held their interest. Their comments ranged from: "very colorful. [It] motivates you to learn," and "It is motivating . . . but there's no color. . . . You'd think color would help the thinking process." The inclusion of pictures and drawings generated positive responses, but their absence did not have a negative influence.

Most of the resources had no accompanying instructions, because doctoral students thought they were self-explanatory. Most students understood without hesitation, but others considered them too complex. Others they thought were too juvenile. These resources were typically rated quite low, while resources needing little time or effort to understand were usually rated high even though they were often more challenging.

The motivation statement generated some of the most helpful feedback. For example, students said: "I liked the whole concept of the activity, however lack of instructions made it confusing." "It wasn't challenging enough, and not much reinforcement." "Sort of redundant after a while." and "Would work if subject [were] curious. . . [but] I don't know if it would work on a more apathetic personality."

Size was a factor only if students wanted a readily portable resource: "I really like the fact that it is one piece (easily portable for pre-test cramming)." Or, "aesthetically pleasing [and] a good size for what it is but I prefer a portable resource."

Item 3: <u>This resource helped me with other techniques I have used</u>. Sixty percent of the responses indicated that some students believed the resources to be more helpful than other learning techniques they had previously tried. The four students with a strong tactual learning preference gave the resources a mean rating of 4.2. Some comments supported these high marks such as: "When I actually interact with what I'm learning I remember faster." However, many comments seemed to contradict these high scores. "I'm pretty good at just memorizing things I read, but this kind of technique allowed me to look at everything at once and to absorb all the information." Also, "I'm curious to see if I answer correctly. Once known, I'm not inclined to memorize the answer but just accept the outcome and go onto the next question." One student was particularly critical about the self-correcting feature of all the resources. He wrote: "Because there is some way of cheating, it did not help me to remember the information."

Item 4: <u>If I were given a quiz today over the information included on the tactual resource, I would probably score</u>. Not surprisingly, responses to this item gained in strength as students responded to the second and third resource operated. The mean student rating for resources on day one was 3.0 while it rose to 3.96 with the second and third resources. Even after working with the latter two resources, student estimates of their anticipated percentage correct on a quiz ranged from 10 to 100 percent except for one auditory learner with reading disabilities who said she would remember nothing. Insufficient time to work with the resources was given as the most frequent explanation for estimates of low performance.

Item 5: <u>Would you make a tactual resource like the one you used</u>? Forty percent said they would take the time to make a tactual resource for studying purposes, "If I had serious learning to do," said one, "because it helps you to remember the information." And, "I believe I would because it was not easy for me to memorize." The simpler the resource design, the more likely students said they would make it.

<u>Observations.</u> With few exceptions, most students quickly selected a device, used it with focused attention and then selected something else. They often said things like, "Hey, look at this. I like the way the card flips over." And "I never thought I'd be playing with things like this in college, but this is fun." One of the most popular devices was Rick's competitive electroboard called 'Brain Hoopla' that required two players. It was difficult to get students to stop using this resource, so others could use it.

One man, with no identified modality preference, exclaimed as he chose Emma's colorful flip chute made from a mannequin head, "I've been looking and looking at that all through class and could hardly wait to try it out." One woman selected a flip chute but when she could not figure out how to use it, she became animated and said, "This is stupid. What the hell am I supposed to do?" After the device was demonstrated, she settled down and proceeded in a relaxed manner.

One student with a documented reading disability and a high preference for auditory input avoided using materials that were both auditory and tactual even though the professor encouraged her to do so. She preferred to walk around. When asked why, she said she couldn't read the words. When assured that all the text was available through earphones, she continued to avoid the resources.

The undergraduates expected to be observed, however, they tended to cover their writing while completing the response forms. Some voiced sensitivity to how doctoral students might respond to critical comments, especially low marks. "Do you think their feelings will be hurt?" asked one woman, "but you said to be honest," she added quickly in her defense.

<u>Course Quiz</u>. The quiz consisted of 14 questions drawn from the tactual resources and 19 questions with answers provided by e-mail. Results were compared to modality preferences, but no patterns emerged. The mean score earned on questions practiced with tactual resources was 81 percent correct, but no realistic analysis could be made with the e-mail questions since several undergraduates failed to read their e-mail messages and did not study for the athome portion of the quiz.

<u>Student Reflections</u>. Only four of the 16 students rated as strong tactual learners, yet seven of them (44%) considered the tactual resources as being beneficial. One strong tactual learner with learning disabilities wrote, "I really enjoyed the hands-on tactual materials. These materials really gave me the opportunity to through [sic] myself right into learning the functions and terms needed. I also liked the idea that they were colorful and game-like experiences. This made the materials easier for my [sic] to remember." This student made the second highest score on the final quiz.

<u>Discussion of Case Study Two</u>

The number of students involved in this exploratory case study were too few to make any generalizations about the results other than those pertaining directly to the primary research question: How will undergraduate students respond to the use of tactual materials? This question was adequately answered in terms of specific characteristics of tactual resources, observations of student involvement with the resources, and the favorable ratings the students gave for their use. Clearly, the number of students who indicated they would make and use tactual resources on their own was less than half but twice as many as the Lowenfeld study noted earlier. Whether they actually would carry through with their intention was left unanswered.

A major reaction centered on the novelty of the resources rather than the content to be learned. Students had "fun playing with the tactual resources," but there was insufficient time the first session to move them successfully from novelty to content. By the time they were working with a third resource on the second day, focus seemed to shift to content. They took less time to manipulate experimentally and moved directly to the questions and answers.

Student comments reflected interest in using the resources and an assumption that more time would assist them in learning specific information. It is important to note, however, that tactual materials constructed for this study emphasized factual questions and failed to foster insight or problem solving for decision making. Thus, subsequent case studies should present tactual resources as authentic supplements rather than as memorization aids.

The overall conclusion was that undergraduates would use tactual resources if they were provided, but they probably would not make and use them on their own unless they were quick and easy to construct or if class time and materials were made available for their construction. Further, resources designed for use by one person provided private opportunities for study, but students valued more highly those that allowed for socialization and competition.

Closing Comments.

Students experienced all the frustrations of collaboratively designing an authentic research project including coordinating doctoral and undergraduate schedules, determining how to collect data, and deciding on techniques for data analysis. All the while, they were expected to remain immersed in their own course content pertaining to learning styles instruction. Ideas were discussed freely and the focus remained on the study rather than on grades for all except one student. Problem solving exercises flowed smoothly, as one student or another offered suggestions and the entire class debated them before a decision was reached collectively.

Ed poignantly summarized the ultimate lessons of the graduate course by stating:

Whenever we commit ourselves to learn, I believe that we indulge in an opportunity for risk-taking. Depending on one's outlook, it is the risk of success or the risk of failure. Specifically, we may succeed in understanding a new concept, in gaining proficiency in a new knowledge domain, or in acquiring a new skill. On the other hand, we may fail. No matter the result, we are certain of one outcome--we would have learned from the experience. Thus, if we endeavor on a life-long commitment to learning, then we commit ourselves to make risk our business.

As a class we made risk our business, and we succeeded. To illustrate, Pat wrote in her reflective journal, "The class exceeded my expectations. I have been energized and motivated to continue learning about learning styles and perhaps to use this class as a springboard to my dissertation."

Without question, the embedded case study was an authentic learning experience for everyone involved. Would we do it again? Absolutely! We took risks, we learned from our mistakes, and we will make our next experiences stronger.

Will tactual resources help reduce college attrition and foster development of necessary academic skills? We believe they will. Learning how to construct and implement tactual learning at the college level, however, requires shifts in attitudes, hard work to learn new teaching/learning routines, and commitment to the belief that all students can learn once we develop approaches for teaching them. Without a doubt, learning styles instruction is an excellent place to begin.

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Exploring the Hidden Source of the Social, Political and Environmental Crises Facing our World

Changing Consciousness
By David Bohm Ph.D. and Mark Edwards

A book review by Elliot A. Ryan
Quantum Leap in Learning
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Changing Consciousness is a 212 page dialogue of words and images with noted physicist Dr. David Bohm, Ph.D. and Mark Edwards one of the world's foremost photographers of environmental subjects. No-less-illuminating than Bohm's book titled *Thought As A System* produced at a weekend seminar setting, *Changing Consciousness* is more engaging to the person looking into this matter for the first time. All readers will see with new eyes the common source that got us into the mess we're in, in the first place.

This book-dialogue is a tapestry of words, images and photographs woven together to insure that the reader not miss the hidden source of the social, political and environmental crises facing our world. The authors tell stories and show pictures that encounter this source time and time again.

Four stories, stunningly, point out the breadth and depth of the Bohm-Edwards exploration.

One

"Einsetin and Bohr, each accompanied by his students attend a party at the Institute for Advanced Study-Princeton University arranged by mathematician Herman Weyl. "What happened was that Einstein and his students congregated at one end of the room and Bohr and his students at the other, and they never talked." The two greatest physicists of this century had previously gotten to know each other and work together. "They had two different opinions...they were extremely serious in their wish to communicate." "Einstein said finally that 'Bohr had a tranquilizer philosophy and that he'd rested his head on this as a pillow,' Bohr finally said that 'Einstein had gone against his own revolutionary achievements.'"

Two

Mark Edwards stayed with a small tribe of Camapa Indians in the Amazon rain forest. They'd not yet invented the wheel. "The men were very skilled hunters with bows and arrows. They seemed to stay in camp, talking with each other-endless conversation and laughter. Their bank account was all around them and it was shared. They lived off the interest. By contrast, as Lloyd Timberlake has pointed out in Africa in Crisis (London: Eartscan, 1985), we are overdrawing our environmental bank account and living off the capital. But this tribe I visited wasn't destroying the balance of nature, even around their camp. The key point was their thought was different."

Three

"If the Third World caught up with our standard of living it would be the end of nature and us. For example, someone worked out that if everyone in China and India used toilet paper, every tree in the world would be gone in a year."

Four

"Desmond Morris who worked with chimpanzees, gave them paint and canvas and found that they painted all day and didn't want to stop-they weren't interested in food or sex or anything. He thought there was natural creativity there. Then he though of rewarding them for what he judged to be good paintings, and what happened was that the quality went down-they did the minimum that would get them the reward. It is a matter of abstracting. If you produce a good painting, you spontaneously get a good feeling, and that is a kind of reward. But this sort of reward is inseparable from the creative act itself." "However, once you can separate the two and abstract whatever produces a conglomerate, memory-based good feeling from the act, it then becomes possible to say that I remember that good feeling and I want to get it again."

"In order to set up society you have, of course, to have routine work, which in itself is not creative. And to get people to do it, society had to have rewards and punishment, which are psychologically extremely destructive. This meant far-reaching and pervasive change of consciousness for the worst. While technology was going up, consciousness was going down."

In chapters one, Word Crisis and Thought, and two, Technological Accent and Psychological Descent, the undeniable source for the crises we face is discovered to be "thought." Dealt within a most unlikely manner and when examined closely, though is found out to be a material process which relies almost completely on abstractions. Thought gives way, however reluctantly, to the realization that much of what we consider reality to be is abstraction. Readers are not allowed to remain vague about this so that reading *Changing Consciousness* will not be done in vain.

Bohm and Edwards show us both the useful and harmful nature of abstractions, that thought is limited, though is fragmented and that thought has the nasty trick of making assumptions, hiding them and recalling them from memory as if those assumptions were reality.

Having uncovered "thought" to be the fault, the authors are compelled at every turn to redefine terms in common usage. As anyone who has learned to mentally process the printed page at rates of 20,000+ words a minute knows, the word "read" by itself as an explanation is inadequate to describe the new process. In *Changing Consciousness* the thread of redefining terms is one of the several most illuminating threads in the tapestry. I stopped counting at thirty. Following are several words and phrases that undergo redefining: true thinking, the difference between thinking and thought, making a question but not making a problem, paying attention, looking at disorder, process of identification with ideas and the trick of exchanging an assumption for a truth.

The reader-friendly nature of this work is not only its countless stories, photographs and new definition but also its key points and challenges.

Changing Consciousness goes into the causes of deterioration-wrong functioning of thought, how to come in contact with the actual process of thought, how illusion is created and how it develops. Key points, challenges and constructive ways of dealing with thought emerge even in Part One; they flourish in Part Two. Here is a prime example as it appears in the chapter titled Dialogue and Collective Thought.

Mark Edwards:

We have been exploring the view that the only fundamental approach to the problems that we face is through the participation of people around the world prepared to give sustained attention to the process of thought. You said at the end of the last chapter that this had to be done not only individually but collectively. I think that it would be interesting at this point to see how a group of people might work together to this end.

David Bohm:

Yes. I think this is a very important aspect of our inquiry, and I want to suggest that what we need is an extension of what is generally meant by the notion of dialogue. Now as I said earlier, the derivation of a word often suggests a deeper meaning. The word dialogue has a Greek root, *dia* plus *logos*. Now *logos* means "the word," but presumably not just the word here but also the meaning. And *dia* means "thought", not "two". This suggests that the meaning is passing through or flowing between the participants. We can distinguish this from the usual sort of conversation and discussion. As I said in chapter 4, the word *discussion* has the same root as *percussion* and *concussion*. It suggests a Ping-Pong game in which we are passing the ball back and forth between us, and the purpose is to win.

In a discussion, you might occasionally accept part of another person's view in order to strengthen your own. You might say, I agree with this and disagree with that, but fundamentally you want your view to prevail...

It may be surmised that something like dialogue has been a condition of the human race for perhaps 99 percent of its existence, while people lived in small hunter-gather groups. I remember reading along time ago an article by an anthropologist that struck me very deeply. He said he went into a certain North American Indian group that was a hunter-gatherer type. We must distinguish this from agricultural groups and more highly organized tribes with a lot of people in them, where what he said may not apply. He said that they sat around in a circle at night or at any time and talked and talked. There was no visible center and no visible authority. They made no decisions, but they just stopped when they felt they had done enough talking. Yet apparently they all knew what to do, as they understood each other so well in the simple life of the group. As soon as I read that, it seemed to me tat his would be the right way to live.

....Of course, going back to an earlier Stone Age is somewhat speculative, so I don't want to make to much of a point of it; I am just saying that it is very interesting that something like this seems to have been almost certainly the general way of human like for most of our existence as a species.

Mark Edwards:

Rather than try to return to this sort of life, might we not learn by looking at such examples and go from there in a creative spirit to bring what is essential in the dialogue to our modern, complex society?

Throughout the dialogue Bohm calls for a new kind of intelligence saying "there needs to be a proper relationship of emotion and intellect. But at present emotion and intellect are not generally coherent and instead tend to be in conflict."...."Emotions provide the drive to think."

Often while reading *Changing Consciousness*, I was reminded of the Triune Brain Model Theory[1] The three brains are *R-Complex* (reptilian), the *limbic system* and the *neocortex*. The horse represents the limbic system found highly developed in the lower mammals. "Investigations of the past twenty years have shown that the lower mammalian brain (the *limbic system*) plays a fundamental role in emotional behavior...It has a greater capacity than the reptilian brain for learning new approaches and solutions to problems on the basis of immediate experience. But like the reptilian brain it does not have the ability to put feelings into words."[2] So, it was a delight to find this explanation among the closing comments in *Changing Consciousness:*

"There is an ancient images that is relevant to this whole question, which is that of the rider and the horse. The rider does not order the movement of the horse by power or force, but by very subtle means. In fact, a good rider and a good horse are almost one being. Suppose, then, that we compare intelligence to the rider and thought to the horse." Bohm elaborate on the tendency for the horse to head off in the direction of the barn when the reigns are slack and takes the analogy of the horse even further. "I would say that turning the horse is a good analogy to the operation of the subtle intelligence on thought."

It is a guarantee that you will come away from reading *Changing Consciousness*, as I did, unable to think about thought in the same manner or terms as you did before.

[1] The Brain of the Brain, Luiz Machado, pg. 151.

[2] The Brain of the Brain, Luiz Machado, pg. 152.

Sources of reference information on accelerated learning

The easiest access to published information on accelerative (-ed) learning, SALT, suggestopedia, and Super Learning is through the ERIC system available in many university and college libraries. Secondary sources are *Dissertation Abstracts* and *Psychological Abstracts* along with the periodic author and topic indices of the *Journal of Accelerative Learning and Teaching.* Chapter 3 of *Suggestive Accelerative Learning Techniques* (1986) by Schuster and Gritton [University of Toronto Press] has an extensive review of the literature then available.

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Brain-Based Accelerated Learning and Cognitive Skills Training Using Interactive Media Expedites High Academic Achievement

By Jan Kuyper-Erland

ABSTRACT

This pre-post combined experimental and quasi-experimental study was to determine if the effects of former successful applications of Accelerated Learning, (AL) memory, and cognitive skills interactive media training could be replicated in multiple classrooms (Erland, 1995, 1994, 1992, 1989). Earlier quasi-experimental 12-week studies with fifth-grade public school classes revealed gains on cognitive skills tests transferring to high gains in reading and math that lasted longitudinally (Erland, 1994, 1992). This 10-week experimental application (40 minutes daily, Mon-Fri) of training sequencing-logic skills and pattern-finding through Accelerated Learning methods is called The Bridge To Achievement (The BTA). It is designed to serve as a supplemental enhancement curriculum for all practiced academic instruction. The study expanded on practical applications of Erland's Hierarchy of Thinking (1989c), Lozanov's (1978) Suggestopedia-AL Theory, and Guilford's Structure of Intellect (1986,1967). Weak cognitive skill and memory areas improved through prescriptive mental rehearsal exercise using The BTA/AL media applications. Moreover, strong mental areas were advanced through this Brain-Based learning. Students were trained to strengthen their visual, auditory, tactile, and kinesthetic modalities and learn successfully through several primary styles rather than being limited to only a few modalities or styles. This approach further documents (Erland, 1992, 1989b) that learning dysfunction, such as Attention Deficit Disorder, or ADHD, can be remediated through prescriptive teaching. Even Gifted and Talented individuals can have defective cognitive skill and memory areas which can be improved (Erland, 1995, 1989a, 1989b; Meeker, 1991, 1969; Guilford, 1986).

This study demonstrated the strength and viability of Accelerated Learning as shown by the dimensions of implementation adherence. Even the most incomplete BTA-AL implementation integrity applications evidenced achievement test gains.

Two Midwestern parochial schools comprised this study: School 1 and School 2. School 1, with 97 students in intact year-to-year grades 4-8, formed the quasi-experimental study. School 2, with 172 students in grades 4-7, participated in the experimental study. Both schools had track-records of student high achievement taught by highly proficient teachers. The minority population for School 1 was 17%, and for School 2, 8%. Neither school had Special Needs students identified, although some lagging students received tutoring outside the classroom with trained professionals. These combined groups totaled 269 students from fourteen classrooms.

Both schools had control groups: School 1 had a fourth grade comparison classroom of 23 students who received no treatment, School 2 had a fifth grade class of 26 students, and a sixth grade class of 22 students. The three classes from two schools combined 71 controls. The 5th and 6th grade control groups received an equally prescribed content and time treatment with an Alternate Media Activity (AMA) that included elements from nineteen commercially popular media and print products. Student progress and achievement were measured by continuous classroom benchmarking and by the nationally standardized achievement test, *The Iowa Tests of Basic Skills* (*ITBS*), given annually, pre- and post-treatment. Standardized cognitive skill measures were also administered and cross-analyzed. Paired samples t-test statistics of standard score differences (DSSs) of the means on the ITBS were analyzed to compare experimental BTA gains with National Norms and AMA control group gains.

A four-tiered resultant outcome effect was analyzed according to how the eleven experimental BTA classrooms applied the nineteen BTA executive criteria measures with daily classroom instruction. This study revealed a gradient range of significant results commencing with one classroom that followed the executive criterion at a 98% rate, so had statistically significant gains over the control group in fifteen out of the total sixteen ITBS academic subject areas.

The eleven experimental classrooms had sixty-five academic subjects that were statistically significant over the controls and norms combined, with twenty-three academic subject areas that were statistically significant over just the controls. The experimentals showed marked strengths in ninety academic subject areas that either matched or were greater than the high performing controls' results. The three minimal-gain experimental classrooms applied few of the executive criteria measures, abbreviating Accelerated Learning methods. Although they implemented The BTA, they unfortunately also shortened the application days and lessons which acutely affected their results.

Longitudinal data supports the conclusion that BTA-AL training effects remained constant and continued to build in all achievement areas including reading and math. Eight experimental groups, grades 4-7, had 58 statistically significant academic gains in thirteen primary ITBS subjects. By contrast, only the 6^{th} grade control group had two maintenance gains; one gain each in reading and math. The low auditory - low achieving fourth grades from School 2 subsequently caught up to their grade expectations and peers the following year after BTA/AL training. Further analyses revealed that this BTA/AL training increased academic achievement scores longitudinally +1 1/2 to +2 1/2 years beyond what the two schools typically received when the students had completed eighth grade.

This study shows that with cognitive skills malleable and correctable, with all learning pathways treated to become operational, individuals do not have to settle for the limitations of nature and nurture. Moreover, Accelerated Learning, when applied prescriptively, offers the necessary bridge for the permanent maintenance of these results.

The strong academic achievement maintenance results demonstrated by the experimentals, direct further research toward the improvement of information processing through interactive media technology applications and Accelerated Learning for additional populations, ages, and in a variety of settings.

The role cognitive skills play in the processing of information.

Good information processing is key to successful learning and task competency (Sternberg, 1991,1985). Underlying cognitive skills and memory levels must be in place before information processes effectively to the conceptualization and higher-order thinking skill level (Erland, 1989c, Hessler, 1982; Woodcock, 1978). This process is often referred to as "Brain-Based Learning." With strengths and weaknesses within the individual's cognitive structure, it makes sense to train cognitive skills and strengthen memory levels to enhance not only the ability to learn, but to create the foundation for productive life-work skills (Sternberg, 1991; Meeker, 1991, 1969; Erland, 1995, 1989a, & 1989b; and Feuerstein, 1988).

Consideration must be given how to train cognitive skills effectively and efficiently. Bandura (1997) developed a promising new dictum on how individuals interact with his Social Cognitive Theory (SCT). Included in SCT is a person's ability to self-monitor, self-reflect, and have forethought.

Cognitive training is rapidly changing with emphasis on the use of computer-based and media presentations (Meeker 1999). One study's finding was that training effectiveness is determined not only by the training content and media presentation (Toranger, Pepin, & Talbert, 1992), but also by the individual's self efficacy and willingness to improve (Cristoph, Schoenfeld & Tansky, 1998).

Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance". Studies have indicated student performance is based upon their own perceived ability to learn and what they think they can do with the skills they possess. If a student has a low self-image and believes through constant failure that they cannot learn, they develop *learned helplessness.* A low self-image leads to a depressed psychological state, manifested from a lack of external gratification in which a "give-up attitude" is maintained. If they develop learned helplessness with low self-efficacy by the fifth grade, they will continue on to junior and senior high school functioning at low literacy levels (Jacobson & Rosenthal, 1989).

Hypothesis: In this study, it is hypothesized that weak cognitive skill and memory areas can be improved with daily thirty to forty minute sessions of a media-driven Accelerated Learning application for ten-weeks by enhancing all three primary learning modalities; visual, auditory, and tactile leading to an increased ability to conceptualize and apply critical thinking. Furthermore, the whole-brain Accelerated Learning program, The Bridge To Achievement (The BTA), will improve memory and cognitive skills, thereby creating higher reading and math achievement test scores than will a conventionally taught Alternate Media Activity (AMA), which does not include Accelerated Learning techniques.

Key Questions Addressed: Questions explored in earlier research studies (Erland, 1994, 1992) were continued in this field test. Can prescriptive cognitive retraining, designed to elevate low cognitive skills and memory by improving the underpinnings of problem solving and higher order reasoning, generalize to academic achievement in reading and math? Even if standardized testing identifies problematic cognitive skill areas, the question remains: can deficiencies such as low visual and auditory memory (listening) be addressed and improved in the classroom, thereby giving each student the personal empowerment of all learning modalities? If visual and auditory perception, sequencing, and detail are systematically improved, will it help the student integrate information easier resulting in higher achievement in reading, math, and science? With improved listening ability, will classroom instructions be more easily followed?

In the case of severe learning problems, often all three primary modalities are weak. Can these learning problems be improved, so slower students can work side by side with capable students? Can learning styles be redefined, so students are not limited in learning styles, and all primary modalities of visual, auditory, tactile, and kinesthetic are activated?

Can cognitive retraining through Accelerated Learning methodology be successfully implemented using interactive video and audio technology? Will teachers be open to Accelerated Learning practices that apply automated media technology applications? Would new technologies be easier to manage and implement in the classroom if teachers and students alike could follow directions and procedures rapidly? Would students' motivation, self-efficacy, and perceived ability to learn improve in response to cognitive retraining in their regular classroom learning environments? Finally, if there are BTA-AL achievement gains, will these gains maintain over time, and to what extent?

Definition: The Bridge To Achievement (The BTA) is non-commercialized cognitive skills and memory research-based training that combines the arts, science, and education to improve reading and mathematical skills. The interdisciplinary program trains memory and cognitive skills in twenty-four hours of consecutive daily training for eight to ten weeks (Erland, 1994). The BTA is an inter-modality whole-brain learning approach that teaches pattern-detection (Coward, 1990) and analytical skills (Gardner, 1993b). The program is based on Woodcock's 1978, Level of Processing model, and Erland's, 1989. Hierarchy of Thinking (See Figure 1). First, perceptual skills are improved, then visual and auditory memory, cognitive skills, and finally higher-order thinking skills evolve. Pre-program standardized cognitive skills testing identifies weak memory and cognitive skill areas to later develop through a specific retraining application of Accelerated Learning. The training increases the self-efficacy of individuals by improving their information processing capability and critical thinking. Prescriptive teaching includes nineteen executive criteria measures with methodology from Accelerated Learning, and Guilford's Structure of Intellect within the Sequential versus Simultaneous Dichotomy, Intelligence theory, and Learning Style models. The training was conducted in corporate, college, grade school, and junior high class settings with ages 9 to late adulthood in four nationally geographic areas (Erland, 1994, 1992, 1989a 1989b).

Literature Review

Principles from the following theories were incorporated into the procedures falling in **Bottom–Up (Behavorist Model) and Top-Down (Experiential Model) Learning Theories** (Gardner, 1985):

These models refer to the way and order the mind processes information (Meeker, 1999; Tonjes & Zintz, 1987). Both models can operate at different times, depending on the purpose and stage of the thought process (Hierarchy of Thinking, 1989).

Top-down refers to the activation and application of the established knowledge base (Schiffer and Steele, 1988). Only information previously recognized or understood can be applied.

Bottom-up refers to the processing of sequential events as in the reading process (Rumelhart and McClelland, 1986). The eye first sees the letter, then the word, moves to phrases and sentences, then on to association and reasoning.

There are three major curriculum domains: (Cawelti,1993)

1. <u>Intellectual Traditionalists (Top-Down, Experiential)</u>

Those with this orientation adhere to the ideals of Western civilization, stemming from ancient Greece. Many educators advocate this intellectual traditionalist approach, which includes pursuit of the best ideas the human mind has developed through history, known as Cultural Literacy (Hirch Jr, 1987).

2. <u>Social Behaviorist (Bottom-Up, Behavioral)</u>

This orientation emerged out of the positive notions of cognitive science and the change of behavior through specific strategy. Social Behaviorists advocate testing social efficiency as a basis for developing curricula (Bandura, 1971).

3. <u>Experientialists (Top-Down, Experiential)</u>

The Experientialism curriculum focuses on the learners' experience. It involves the philosophizing-in-action of teachers and students learning more about the world around them which follow current Intelligence theories (Gardner, 1993; Sternberg, 1985).

Elements from the following six complementary theories falling under the above three constructs were incorporated into the procedures in this study:

- Guilford's Structure of Intellect (Guilford, 1967)
- Suggestopedia, Accelerated Learning (Lozanov, 1978)
- Sensory Integration (Fisher, Murray and Bundy, 1991; Ayres, 1972; Gillingham and Stillman, 1970)

- Simultaneous vs. Sequential Dichotomy (Kaufman & Kaufman, 1983).

- Cognitive Behavior Modification, CBM (Meichenbaum, 1977, Bandura, 1971, Skinner, 1952, & Piaget, 1950).

- Intelligence Theories (Gardner, 1993b; Sternberg, 1985).

Structure of Intellect (SOI) Model (Guilford, 1967). Bottom-Up, Behavioral.

J. P. Guilford identified 156 different intellectual abilities and formed a model of working intelligence. These abilities are separated into content categories of intelligence operations. The Structure-of-Intellect Model is divided into five broad "content" areas: Visual, Auditory, Symbolic, Semantic and Behavioral. The "outcome" products are further divided into six categories: Units, Classes, Relations, Systems, Transformations, and Implications. The five "mental operations" are: Evaluation, Convergent Production, Divergent Production, Memory, and Cognition. The model was designed to bring about the transfer of interlocking mental skills to applied learning.

Dr. Guilford received a number of honorary recognitions for his model. The American Psychological Association granted him *The Distinguished Scientific Contribution Award* in 1964, and its first *Richardson Creativity Award* in 1966. Another award was *The Distinguished Scholar Award* from the National Association for Gifted Children, and *The Gold Medal* from The American Psychological Foundation in 1983.

His psychology graduate student at the University of Southern California, Mary Meeker (1969), designed a cognitive skills retraining program now widely implemented in U.S. as the *Structure of Intellect* (SOI) and *Bridges Learning* (Meeker, 1999) and Japanese public school systems (Tracey, 1992; Guilford, 1991, 1984). SOI has partnered to form *Bridges Learning* with over 200 model SOI schools that are in implementation process. Meeker's work was among the first research in intelligence improvement applied to practical learning.

Suggestopedia (Lozanov, 1978, 1971). Top-Down Experiential, and Bottom-Up Behavioral.

Suggestopedia is an Accelerated Learning pedagogy ranging from students in elementary school to adult learning (Lozanov, 1978). The comprehensive methodology using the principle of suggestion can be applied to any curriculum and be used at any grade level. Suggestopedia means: "Suggesto" (suggestion) and "pedia" (learning) (Schuster & Gritton, 1986). In this report, Suggestopedia will be used interchangeably with the term "Accelerated Learning" (AL).

The instruction, applying vocal variances of high, low, and whisper, was originally designed to intensively teach foreign languages (Alderson, 1993). Other successful AL applications include reading, math, and English instruction, typing, and high school science classes (Schuster and Gritton, 1986).

Accelerated Learning procedures include physical relaxation, mental concentration, memorization with music, rhythm, dramatization, vocal intonation, role playing, guided imagery, and suggestive principles (Schuster & Gritton, 1986). The training adds the element of pleasure and fun, as learning takes place most expediently under those conditions.

Sensory Integration Learning (Fisher, Murray and Bundy, 1991; Ayres, 1972)
Bottom-Up, Behavioral

Sensory integration is defined as learning through all the primary and secondary senses (Reid, & Hresko, 1981). We depend on the primary senses of sight, hearing, touch, and kinesthetic-balance to learn new, complex information (Cormier, 1986; Hessler, 1982). This theory's research dates back to the 1960s and 1970s.

Recent Yale University research indicates we have at least twenty distinct senses, and perhaps as many as thirty or forty (Ponte, 1993). In other words, abstract symbols, feelings, attitudes, and behaviors reach our brain through a multitude of entrances, including feeling and intuition (Dryden and Vos, 1993).

Public school field-testing reveals that most children have at least one deficient information-processing avenue (Erland, 1994, 1992; Innovative Learning Systems, Inc. 1988-1990). Usually a student is either primarily a visual, tactile, or an auditory learner, but seldom do all primary modalities operate at high performance levels (Gardner, 1991; Erland, 1989a, 1989b). Each of us has our own unique information processing mental blueprint, known as a learning style with unique strengths and weaknesses (Erland, 1989a). A learning style can be as individual as a signature (Dunn & Dunn, 1988).

However, today's teaching methods often direct instruction to select learning style(s). The student is either identified or assumed to be a visual, auditory, tactile, or kinesthetic learner, and a teaching method can be directed to a particular modality to include a variety of learning styles (Dryden & Vos, 1993). Gardner's (1997) "Eight Intelligences" move from learning style focus to areas of primary talents which can be trained through experiential learning.

Although we process information differently, learning in one modality (e.g. kinesthetic) can be bridged to another modality (e.g. verbal (Reid & Hresko, 1981). Therefore, all modalities can be developed and integrated (Gathercole, Peaker, and Pickering, 1998).

An expansion of existing methods would be an inter-modal approach incorporating visual, auditory, and kinesthetic styles of learning with equanimity (Ross-Swain, 1992). It is possible to improve and correct deficient learning modalities, whether visual, auditory, or tactile. A multisensory approach is important because perception creates the foundation for cognition (Kamhi & Catts, 1989; Struppler, & Weindl, 1987; Clark, 1986).

Training your senses and thinking abilities makes them operative. Developing short-term memory is key to this retraining process. With a tenacious short-term memory, good encoding-decoding ability develops, leading to better comprehension. When visualization imagery techniques are applied to auditory imprints, conceptualization results (Ross-Swain, 1992; Reed & Hresko, 1981; Gillingham & Stillman, 1970, 1965; Fernald, 1943).

Simultaneous versus Sequential Processing (Kaufman, A. & Kaufman, N., 1983)
Bottom-Up, Behavioral. The Bridge To Achievement's Hierarchy of Thinking Model.

Simultaneous processing involves imagery, or wholistic gestalt, right hemispheric specialization. Information is seen or heard as one entity. Sequential processing, a left hemispheric specialization, involves learning information in steps, an analytical component of reading comprehension, spelling, mathematics, grammar, following oral directions, and instructional procedures (Kaufman & Kaufman's Simultaneous vs. Sequential Processing Theory, 1983).

Sequence training is the foundation for analytical thought and conceptualization. If the brain's ability to increase sequential memory-span length, strength and resilience for automatic memory recall is exercised carefully, whole-brain thinking improvement can be achieved (Erland, 1989a).

In general, researchers have found that students often perform poorly on sequencing ability tests (Erland, 1989b; Kaufman & Kaufman, 1983). Teachers echo this concern about their students' inability to follow in-class verbal directions (Baker, 1991), which usually are given in an auditory, step-by-step (sequential) format (Baker, & Leland, 1967, 1935).

The Hierarchy of Thinking model was applied to this study (Erland, 1989), which applies Right-Brain, Left-Brain, and Whole-Brain Approaches.

The Hierarchy of Thinking, depicting how sequential memory levels play an important part in learning, was based upon Woodcock's 1978, Bottom-Up processing model (Woodcock, 1978) (See Figure 1).

Unfortunately, higher-order thinking skills depend on lower level perceptual skills, which include spatial relationships, visual and auditory memory, visual and auditory closure, and other cognitive abilities (Guilford. 1984, 1967; Woodcock, 1978). The *Hierarchy of Thinking* (Erland, 1989), central to The Bridge To Achievement training (See Figure 2A, 2B and 2C), shows that specialized cognitive training should be a three-stage process beginning with the Left-Brain Model, Moving to the Right-Brain Model, and finally progressing to the Whole-Brain Model:

First, perceptual skills at the bottom level need to be developed, leading to improved memory and information processing capability (Baddeley, 1993). Rote levels of learning constitute the bottom level on the hierarchy (Jackendoff, 1992; McDaniel, & Lawrence, 1990; Baddeley, 1989). Research has shown that integrating auditory with visual skills is necessary for reading comprehension, written expression, and math and science acquisition (Woodcock, 1978; Kaufman & Kaufman, 1983; Kirk & Chalfant, 1984).

Secondly, visual and listening memory sequencing requirements need to be strengthened to create the agile mind (the middle hierarchy level), a requirement for higher-order thinking skill improvement (top hierarchy level) (Erland, 1989a, Klahr, & Kotovsky, (eds.), 1989). Activating encoding-decoding ability through drilling practice incorporates this metacognitive process (Halpern, 1998; Erland 1989a) (See Figures 2 & 4).

With students' visual and listening memory levels remaining in a static position, encoding-decoding ability suffers (Redier, 1996; Kamhi, & Catts, 1989). This is also evident with students locked into a Right-Brain mode. They see "the big picture", but do not sequence, organize, or integrate information quickly. Therefore, critical thinking does not result, and test-taking ability

Figure 1

LEVEL OF PROCESSING	SUCCESSIVE	SIMULTANEOUS
Conceptual		
	TCS Test of Cognitive Skills Battery	
	DTLA #3 Oral Directions	DTLA #3 Oral Directions
Symbolic	WJ #10 Number Reversals	WJ #10 Number Reversals
	DTLA #11 Letter Sequences	DTLA #11 Letter Sequences
	WJ #3 Memory for Sentences	
Memory	DTLA #4 Word Series, Nouns	DTLA #4 Word Series, Nouns
		WJ #2 Spatial Relations
		WJ #7 Visual Matching
Perceptual		DTLA #10 Word Fragments

TCS = Test Cognitive Skills, Sullivan, Clark, and Tiegs, 1981
Based upon the California Maturity Scales
DTLA-2 = Detroit Tests of Learning Aptitude, Hammill, 1985
WJ = Woodcock Johnson Psycho-Educational Cognitive Skills Battery, Woodcock and Johnson, 1978, 1989

Based upon Johnson & Myklebust's information processing hierarchy theory (1967), and adapted from Woodcock's level of processing theory (1978).

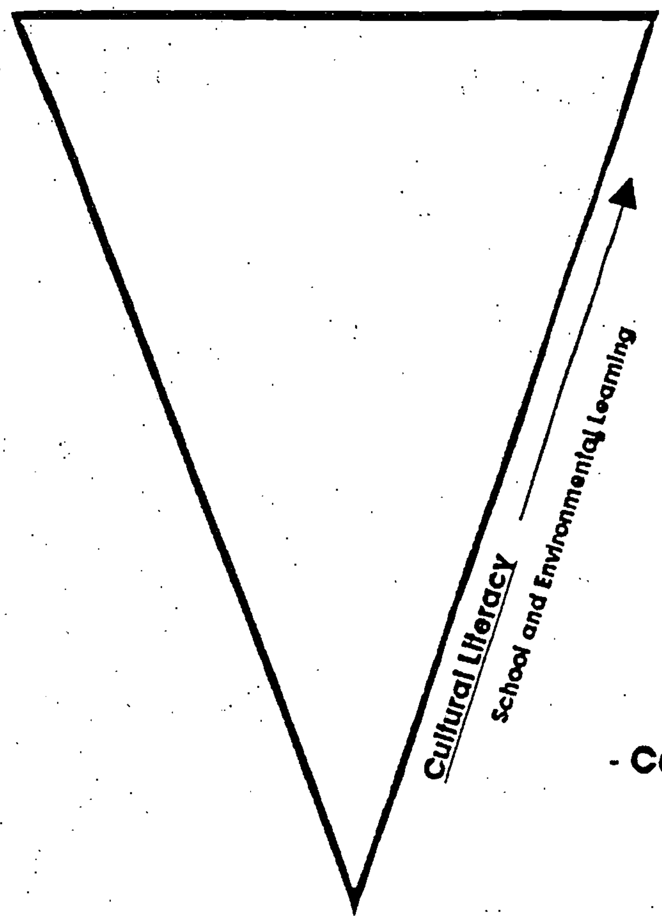
Figure 2A

Hierarchy of Thinking

Left-Brain Model

Specialized Training for All Hierarchy Levels

Critical Thinking Ability



- **Abstract Problem-Solving**

- **Automatic Thinking**
  - ***Parallel Thinking of Several Related or Nonrelated Thoughts***

- **Integrating Multiple Relationships**
  - ***Short-Term Sequential Memory Training***
  - ***Short-Long-Term Memory Retention***

- **Controlled Thinking**
  - ***Rote Short-Term Memory for Details***
  - ***Concrete Learning***

Patterns - Environmental Sensory Input

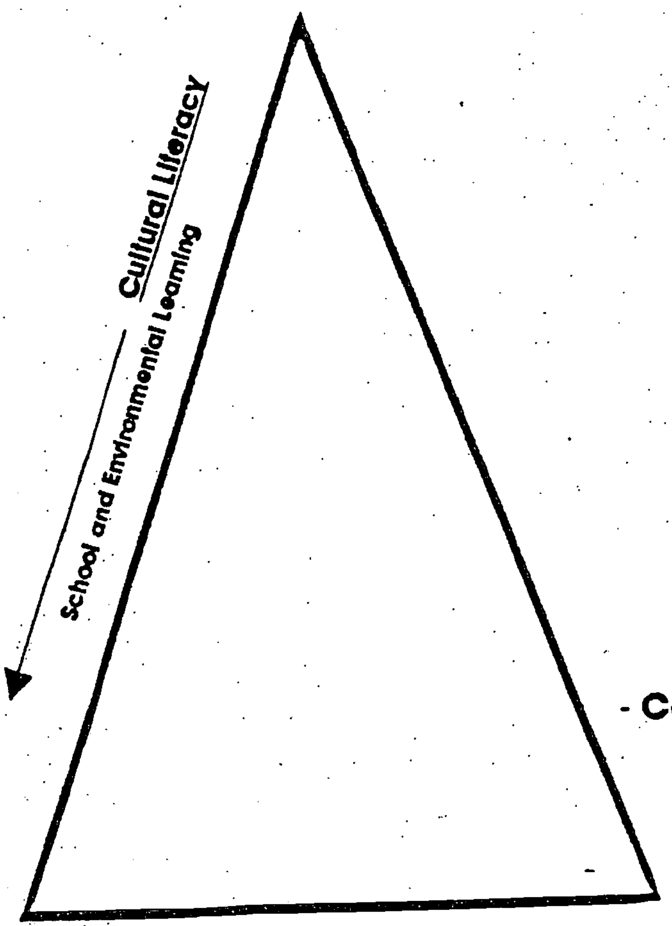
Hierarchy of Thinking

Right-Brain Model

Specialized Training for All Hierarchy Levels

Critical Thinking Ability

Patterns - Environmental Sensory Input



- Abstract Problem-Solving

- Automatic Thinking
- ***Parallel Thinking of Several Related or Nonrelated Thoughts***

- Integrating Multiple Relationships
- ***Short-Term Sequential Memory Training***
- ***Short-Long-Term Memory Retention***

- Controlled Thinking
- ***Rote Short-Term Memory for Details***
- ***Concrete Learning***

Figure 2C

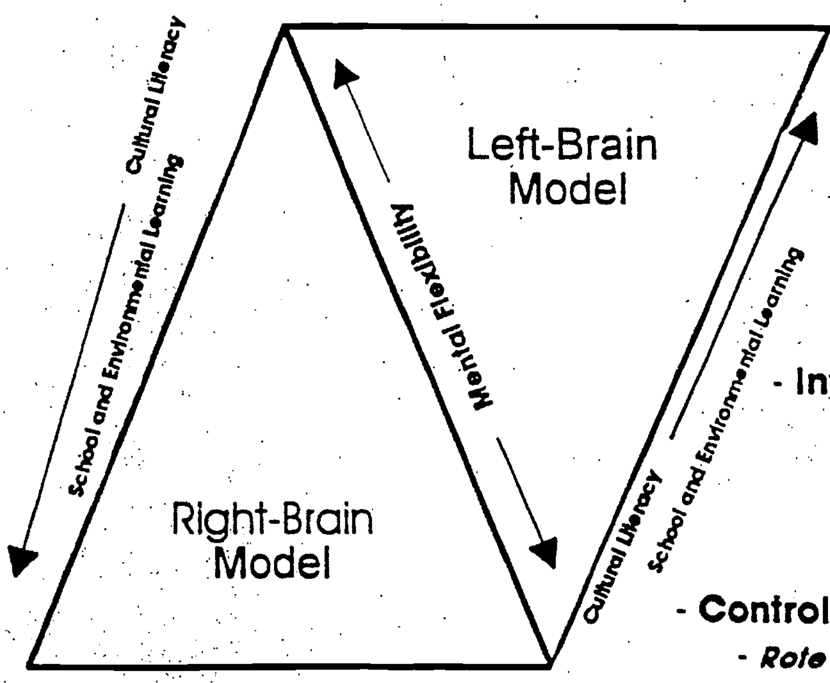
Hierarchy of Thinking

Whole-Brain Model

Specialized Training for All Hierarchy Levels

Critical Thinking Ability

Patterns - Environmental Sensory Input



- **Abstract Problem-Solving**
- **Automatic Thinking**
  - ***Parallel Thinking of Several Related or Nonrelated Thoughts***
- **Integrating Multiple Relationships**
  - ***Short-Term Sequential Memory Training***
  - ***Short-Long-Term Memory Retention***
- **Controlled Thinking**
  - ***Rote Short-Term Memory for Details***
  - ***Concrete Learning***

Patterns - Environmental Sensory Input

does not improve (Kaufman & Kaufman 1983).

When underlying sequential memory components become "deeply learned" in a short-term memory drilling format, an encoding-decoding bridge is formed between the perceptual level and reasoning (Metcalfe and Shimamura, 1994). Improved short-term memory and decoding-encoding ability creates mental fluidity with multiple relationships, and leads to the ability to think critically (Erland, 1994; Paul, 1992; Klahr, & Kotovsky, 1989; Guilford, 1984).

Using all modalities creates auditory-visual integration of the senses, directing critical thinking skills which are necessary for reading comprehension, scientific reasoning, technical skills, following procedures, and problem solving.

Finally, in stage three, when these cognitive skill levels are elevated to insure whole-brain learning capability for basic reading and math skill proficiency, then complex science, technological, and other higher-order skills can be taught incrementally (Wright-Patterson Air Force Base Staff, 1992; Berger, & Pezdek, 1987; Marrett, 1986). These higher-order thinking skills are essential in fields such as medicine, business, physics, law, and philosophy (See Figure 2A).

The Bridge To Achievement (BTA) lessons build upon these prominent six theories using *The Hierarchy of Thinking* (Erland, 1989) and Levels of Processing rationales (Woodcock, 1978). This process creates The Integrated Learning Plan for all students (Clark, 1986).

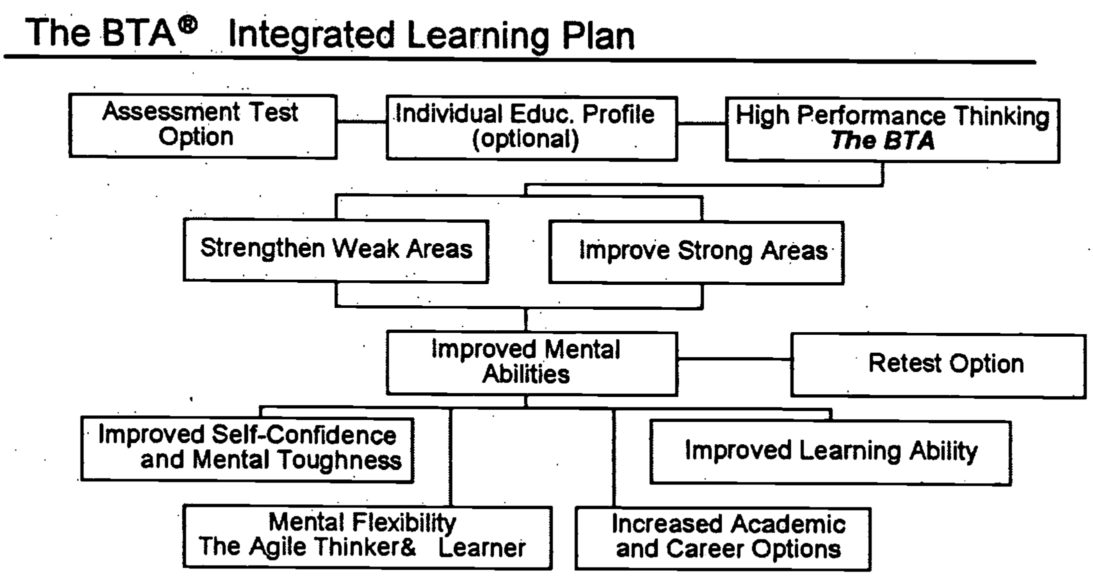
The Hierarchy of Thinking Applied: First, perceptual training is implemented developing twenty-four primary learning abilities (Massi, 1993; Meeker, 1991; Guilford, 1967). Secondly, visual, listening, tactile-kinesthetic memory strengthening with encoding-decoding training is applied (Erland, 1989a). Finally, higher-order thinking skill lessons in following series of complex directions and problem solving are taught (Erland, 1981) in a rehearsal format (Baddeley, 1993). This uppermost critical thinking level has the base of the strengthened visual and auditory encoding-decoding memory levels.

Without strong sensory integration (Ayres, 1972), new information is learned slowly, may not be retained in its entirety, and advanced material is not synthesized. Students are left at a simplified rote memory learning level, with the ability only to memorize a few facts, look for one answer to a problem, and not think critically (Reid, & Hresko, 1981).

The key to whole-brain learning efficiency is applying creative Right-Brain methods (such as Pattern - Detection) with Analysis Skill, or known as Patterns and Systems Training. Visual imagery (simultaneous processing) and verbalization (successive processing) are crucial components of thinking (Gathercole, Peaker, and Pickering, 1998). Paivio (1986) states that a dual-processing system, comprised of nonverbal imagery and oral symbolic processes (Stevenson, 1993; Schiffer, & Steele, 1988), is the underlying foundation for memory and thinking.

The Integrated Learning Plan (Figure 3.) strengthens weak cognitive skill areas, and expands strong areas (Erland 1989a) to sharpen the ability to learn new information (Meeker, 1999).

Figure 3



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The BTA lessons also reinforce the ITBS-CogAT, Form 5, three psychological domain sections: Verbal, Quantitative and Nonverbal (Riverside 2000 Technical Summary 1). BTA lessons work with inductive and deductive reasoning with flexibility and fluency in working with language, and are directed toward training these following CogAT domains:

The CogAT Verbal tests:	The CogAT Quantitative tests:	The CogAT Nonverbal tests:
Verbal Classification Sentence Completion Verbal Analogies	Quantitative Relations Number Series Equation Building	Figure Classification Figure Analogies Figure Analysis

Cognitive Behavior Modification (CBM) (D. Michenbaum, 1991, 1977). Bottom-Up, Behavioral Learning.

Today, there is continued debate on the efficacy of behavior modification elements (Hughes, 1989; Decker, 1985) applied in the classroom. Cognitive Behavior Modification theory waxes and wanes in acceptance levels.

Cognitive Behavior Modification was developed with the theoretical input of several prominent psychologists. In 1977, Donald Meichenbaum combined the theories of Jean Piaget's *Theory of Intelligence*, (1950), B. F. Skinner's *Theory of Behavior Modification*, (1953), and Albert Bandura's *Social Learning Theory* (1971) into a working model.

Cognitive training includes modeling (Kaplan, 1991) and self-instructional, self-monitoring techniques with covert speech rehearsal (Manning, 1996). This instruction is based upon the interactive, reciprocal nature of the thoughts, feelings and behaviors of one's own thought processes (Bandura, 1997; McDaniel, & Lawrence, 1990; Meichenbaum, 1991).

Intelligence Theory (Gardner, H., 1997; Sternberg, R. J., 1988; McDaniel, E., & Lawrence, C., 1990; Kamhi, A. G., & Catts, H. W., 1989). Top-Down, Experiential Learning.

Intelligence is modifiable (Sternberg, 1992; Gardner, 1997, 1985; Guilford, 1986). Learning weaknesses can be identified and improved (Feuerstein, 1988, 1980; Meeker 1991; 1969). Information-processing skills can be trained to increase fundamental perceptual skills and intelligence.

However, Bottom-Up information processing theory advocates such as J. P Guilford, have long argued with Top-Down Conceptualization and Experiential advocates, which include Gardner's Eight Multiple Intelligences model (Gardner, 1997) and Sternberg's (1991) Three Intelligences of Contextual, Experiential and Internal. Sternberg's Three, and Gardner's Eight Intelligences/competencies differ greatly from the 156-units cognitive model and learning styles of Guilford (1986) and Feuerstein (1988).

Gardner's (1997) Eight Multiple Intelligences encompass different broad aptitudes and talents, although which can be inherent, can also be trained. The Eight Multiple Intelligences are: The Naturalist, Linguistic, Musical, Logical-Mathematical, Spatial, Bodily-Kinesthetic, and Intra- and Inter-Personal Intelligences. This popular Intelligence set gave teachers a simplified construct of understanding intelligence and how to apply it in the classroom.

Martin (1999) discussed how Gardner (1999) had recently adapted his model to include information processing. Spatial Ability and Music Ability were substituted with Visual and Auditory memory processing, creating nine revised Intelligences. Gardner also added philosophical/ethical Intelligence, or the ability to derive meaning from life experiences. Not surprisingly, this new construct leans toward the Bottom-Up model

Furthermore, to argue for the Bottom-Up model, when students lack an adequate perceptual foundation of cognitive skills, teaching higher-order thinking skills is more difficult (Massi, 1993). This is because certain mental prerequisites are not in place (McDaniel, & Lawrence, 1990; Erland, 1989a; Baddeley, 1989; Woodcock, 1978; Meeker, 1969) (See *The Hierarchy of Thinking,* Figures 2A, 2B, and 2C).

<u>How Other Cognitive Skills Programs Differ From The BTA</u>

Many other whole-brain-thinking programs (Dryden and Voss, 1993; Wonder and Donoven, 1984) offer insight, and practical right- and Left-Brain suggestions. Neuro-linguistic programming teaches how to read people's language and behavior processes to communicate more effectively. Although these methods are helpful and informative, they do not retrain the cognitive and memory levels of the brain.

Some educators teach the basics with Right-Brain learning methods to enhance faster learning. Although this Right-Brain training is necessary, combining it with analytical skill training is crucial, and can not be overlooked. We can not ignore or leave undeveloped Left-Brain analytical ability. This integrated, multi-media training which applies five historical animated characters is not available elsewhere (See Figure 4). Although all four cognitive training programs have the same objective of achieving higher-order thinking skill, the aforementioned programs are predominately *visual applications* with dominant focus on *visual memory* and less on *auditory sequential memory* practice.

The Feuerstein and Meeker programs differ from The BTA in that they rely on visual print and software instruction, rather than predominately auditory Accelerated Learning instructional program applications. They take longer than twenty-four hours of consecutive training to obtain measurable results. The Structure of Intellect (SOI) and Instrumental Enrichment (IE) works were among the first research in intelligence improvement applied to practical learning. Both of these programs require teacher training and certification (Feuerstein, 1999; Skylight Training and Publishing, 1999; Meeker, 1999, Structure of Intellect, Bridges Learning).

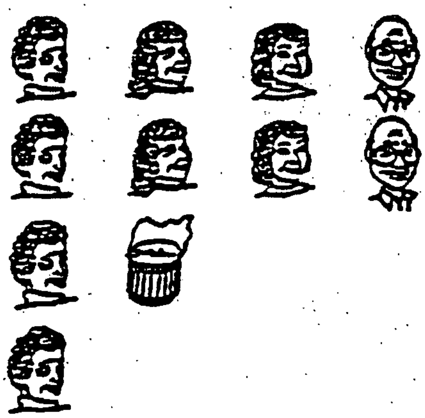
The Meeker program uses visual manuals with computer software applications for seven months in two forty minute sessions in lab work weekly. The Feuerstein program applies visual workbook lessons for an intensive three to five hours per week for an unspecified amount of time (Tracey, 1992). The Bridge To Achievement builds upon this instruction by adding auditory vocal

Figure 4

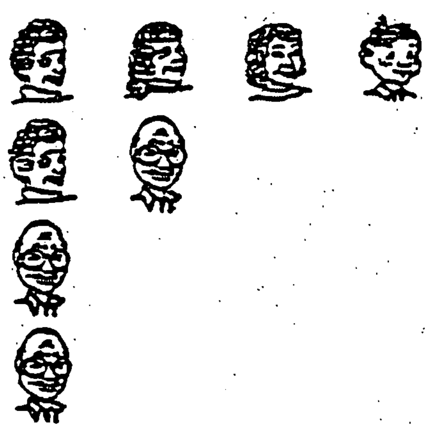
These characters do the speaking in each lesson:

WAYNE — Low pitch
MADELINE — Raspy quality
LILY — High pitch
BUTCH — Soft dynamics
PROFESSOR — Loud dynamics
INSTRUCTOR

TYPICAL CHARACTER REPETITION ORDER



- repetition 1 (Wayne, Madeline, Lily, Professor)
- repetition 2 (Wayne, Madeline, Lily, Professor)
- repetition 3 (Wayne, drum)
- repetition 4 (Wayne)



- repetition 1 (directions) (Wayne, Madeline, Lily, Butch)
- repetition 2 (encoding) (Wayne, Professor)
- repetition 3 (code) (Professor)
- repetition 4 (code) (Professor)

- repetition 1 (Madeline)
- repetition 2 (Wayne)
- repetition 3 (Lily)

sound sequencing and visual facial images, forming an interactive multi-media technology. Interactive encoding-decoding drills on video- and audio-tapes, and computer programs with manuals, lead to higher-order thinking capability three hours weekly in eight to ten weeks' time (Erland, 1994, 1992).

Although organized differently, with some abilities overlapping, both the BTA and SOI models apply twenty-four to twenty-six primary learning abilities selected from the Guilford model (1967) to their cognitive training sessions. These twenty-four abilities are included within the twelve-paired abilities, which follow.

Abilities and Academic Content.

Abilities Content

Twenty-four primary cognitive thinking ability functions, within twelve-paired, were incorporated into the study's exercise rehearsal. Each drill consisted of six to nine steps. Each step shifted back and forth from spatial to linear, synthesis to analysis, encoding to decoding, visual to auditory closure patterns, and inductive to deductive reasoning (See Figure 1, Woodcock, 1978; and Figure 5, Erland 1989a). Every exercise drill incorporated the following cognitive thinking functions (shifting between simultaneous and successive processing, or Right-Brain and Left-Brain (Gazzaniga, M. S., 1988; Kaufman & Kaufman 1983):

1. Spatial and Linear Relationships, Right-Brain and Left-Brain

Spatial skills, crucial in learning the concept of place value with digits, comparison of sets, rational counting, and general mathematical calculating, were also coupled with linear placement (Meeker, 1991, 1969; Margolis, 1987; Hessler, 1982). Spatial conservation, directionality, and constancy of objects in space are correlated with geometry, decimals, and algebra success, handwriting, and in the career fields of engineering, architecture, photo-journalism, and art and design. Pellegrino (l985) concludes that training and practice of cognitive abilities that include spatial skills often lead to substantial thinking ability improvement by gains in standardized tests.

Linear cognitive thinking comprises visual and auditory sequential memory, which is the foundation for analysis or analytical thinking, including reading, mathematics, spelling, and written composition (Simpson, 1991). Following series of oral and written directions depends upon good auditory and visual sequencing ability and attention to detail (Hessler, 1982).

2. Synthesis and Analysis, Right-Brain and Left-Brain

Synthesis and Analysis are a higher level of cognitive functioning. Students must reach this level of processing in order for reasoning to commence (Woodcock, 1978; Hessler, 1982). Reasoning ability is achieved through the ability to identify patterns, absorb symbolic information, and sequence information. Detailed exercise drilling of sequential information leads to rapid analytical ability (Sternberg, 1992). The synergistic shift from synthesis (parts to whole processing) to analysis (whole to parts processing) creates different interpretations of the same presented material (Kaufman & Kaufman, 1983). Identifying similarities, differences, and relationships are additional components (Guilford, 1967; Piaget, 1950). Analysis and Synthesis are also the foundation for speech and language (Cole & Jakimik, 1980).

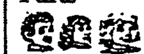
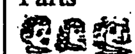
Figure 5

CONTENT TITLE: Series of Unrelated Words

OBJECTIVE: To remember facts and names

MATERIALS NEEDED: Instruction Sheets

MEMORY RETAINER/BTA LESSON: 6, 7, 8

Rep. #	Directions	Time	Purpose And Modality To Improve	TV Mode	Brain Hemisphere
1.	Orally read series in the worksheet to form an imprint on the mind.	8 Min.	Visual-Sequential Memory		RB-LB
2.	Look at word series on the monitor. Lightly repeat overtly with the faces. Focus on each chunk, who said what. Do not scan forward.		Wholistic Gestalt (faces). Speech-language Area Synthesis Encoding Visualization	Parts 	RB-LB
4.	Focus on each segment, memorizing each component. Class repeats in unison, imitating the three voices.		Analysis Decode Auditory - Visual Integration	Parts 	RB-LB
5.	Continue to covertly repeat, absorbing rhythmic beat of segments. Pull into a whole.		Synthesis Auditory-verbal Memory, Auditory Closure	Wayne drum 	RB LB
6.	Repeat covertly and memorize the series.		Analysis Auditory-Sequential Memory	Wayne alone 	LB
7.	All repeat sequence in union without the tape		Synthesis Auditory - Sequential Memory	Place monitor on pause	RB-LB
8.	Write the series on paper, repeating covertly to self. Students check their work and repeat a self - affirmation.		Visual-Auditory - Motor Integration		RB-LB

3. Visual and Auditory Memory Encoding and Decoding, Right-Brain and Left-Brain

The ability to decode words phonetically is crucial to reading comprehension (Kamhi & Catts,1989). The objective of reading is to become aware of the thought units on a page without being aware of the individual letters and words (Rumelhart & McClelland, 1986). Written symbols must be decoded (as in phonics learning) before they can be encoded into meaning. The ability to decode and encode is crucial to reading and learning a foreign language (Hoffman & Palermo, 1991; Dinsmore, 1991; Meeker, 1991, 1969), and according to Aristotle, for mathematical reasoning (Sternberg, l985). Encoding is also a component of process execution, (Schiffer & Steele, 1988), which is the underlying foundation for mathematics, and for understanding analogies, an important component of many college examinations.

4. Visual and Auditory Attention, Closure, and Discrimination; Right-Brain and Left-Brain

Exercises in attention, discrimination, and closure are important foundational abilities for reading and oral communication (Meeker 1991, Guilford, 1967). Visual content includes three types: Figural (pictures, graphics), Symbolic (notational - symbols, letters, numbers, signs), and Semantic (verbal and the meaning of words).

According to Kirk & Chalfant (1984), closure may be defined as the recognition of a whole gestalt when one or more parts of the whole are missing. Students with poor auditory closure often have difficulty with reading, and oral communication. The inability to close in on sounds leads to the omission of words, confused word order, and substitution of words and word meaning. Students with poor visual discrimination and closure have difficulty with word detail interpretation, which can be reflected in reading and written language difficulties (Meeker, 1991; Rumelhart, & McClelland, 1986).

5. Inductive and Deductive Reasoning, Right-Brain and Left-Brain

Deductive reasoning is applied through exercises in logic and reasoning. Sternberg (l992) discusses a three-part reasoning plan which begins with understanding the problem, then devising a plan which consists of serial ordering, then executing the plan without error, and finally considering alternative methods that may exist. Verbal Comprehension and Implications are part of Deductive Reasoning. This includes working with abstract information (Meeker, 1991). Piaget, (l950) well known for his earlier work in mental logic and deduction, stresses the ability to draw valid conclusions. Inductive reasoning has been a central part of theories of intelligence, of which Thurstone (l938) was a forerunner. According to Sternberg (l985), all inductive reasoning has the same basic property, which is selecting and interpreting an appropriate continuation of a pattern presented to an individual. Inductive reasoning extends into creativity with things, words, and ideas.

6. Visual Imagery and Verbalization, Right-Brain and Left-Brain

Visual imagery (simultaneous processing) and verbalization (successive processing) are crucial components of thinking (Gathercole, Peaker, and Pickering, 1998). Paivio (1986) states that a dual-processing system, comprised of nonverbal imagery and oral symbolic processes (Stevenson, 1993; Schiffer & Steele, 1988), is the underlying foundation for memory and thinking.

Each exercise drill in this study incorporated shifting from visualizing to verbalizing of the information. These two processes share common and distinct cognitive mechanisms (Gathercole, Peaker, and Pickering, 1998). This is an important component of Cognitive Behavior Modification (Meichenbaum, I977). Additionally, thinking in images is faster than thinking in words, and this ability can be taught through visualization techniques. Locating patterns of information can be taught (Paivio, 1986).

Academic Content

The video- and audio-tapes included sequenced instruction from *The Bridge To Achievement* (Mem-ExSpan, 1981, 1985, 1986, 1988) in the following areas:

1. Sight Words and Reading Comprehension (See Figure 5).

A series of unrelated sight words was drilled daily according to memory-span length (Collins, 1994; Garner, 1987; Miller, 1956). Sets of two can be gradually extended to sets of ten. Sight words were presented both visually and auditorially by reciting (Blakely and Spence 1990). This drilling procedure helped automatic short-term memory recall bridge to long-term memory recall (Spear, 1978). Kamhi & Catts (1989) indicated that rehearsal of unrelated sight words improved speed of word recognition, and also reading comprehension of remedial 7th grade students (Deschant, 1991; Cairney, 1990). Guilford (1967) and Meeker (1991) list Cognition, Memory, and Evaluation as the primary processing operations for learning how to read, with figural units, similarities and differences, classifications, and semantics which also include the following, as measured by Hammill's (1985) DTLA-2:

a. encoding and decoding
b. visual attention and closure
c. visual symbolic and figural details
d. visual and auditory sequential memory
e. visual-auditory integration
f. auditory attention and closure
g. auditory details
h. classifying information
i. visualization

There is a positive relationship between auditory memory, visual memory, and visual-auditory integration as important perceptual skills that are linked to reading achievement (Kavale, 1981). Good short-term auditory memory processing is a determinant of reading speed (Rumelhart & McClelland,1986).

Howard (1983) suggests three major processing differences between good and poor readers: (1) the use of phonemic coding in working memory, (2) the capacity of working memory, and (3) the speed of encoding letters.

Each of the drills in the study incorporated these functions of visualization, encoding-decoding of information, and the practice of encoding alphabet letters through sky-writing with mental visual imagery (Gillingham, A., 1970; Fernald, G., 1943).

Unrelated Letter Sequences were drilled as part of the Spelling, Language, Reading Speed and Comprehension instruction, beginning with spans of six and progressing to spans of ten (Rumelhart, l986; Howard, 1983).

The early stages of letter processing occur simultaneously, and the late stages of processing are successive (Hatta, 1980; Coles, 1987). This underlying feature level therefore requires rapid cognitive shifting from simultaneous to successive during reading. This inability to rapidly shift letters is a reading processing dysfunction associated with dyslexia (Thomson, 1984; Coles, 1987).

2. Vocabulary and Latin Root Words

Individual words from reading content were taught according to meaning inference, both in and out of context. Latin root-word derivatives were also drilled and learned. Reading comprehension and vocabulary skills depend upon the ability to recognize Latin roots (Gardner, 1993b; Sternberg, 1985; Devine, 1982). A lack of vocabulary skill creates "word holes" in sentences for the reader (Meeker 1991).

3. Spelling

Procedures for learning new spelling words, taught within the regular class language curriculum, were taught according to scope and sequence, or difficulty level progression (Downing, Lima & Noonan, 1992). Emphasis was placed on attack, rehearsal, and long-term memory techniques. Although specific spelling words were not applied within this study, although they are part of The BTA curriculum, alphabet letter rehearsal was drilled (Manning, 1996). This was designed to enhance visualization and placement value of the feature level components (Rumelhart & McClelland, 1986) plus strengthen auditory and visual sequential memory (Erland 1989a, Deschant, 1991; and Hierarchy of Thinking (Erland, 1989c).

4. Math Facts

Developmental learning weaknesses found in arithmetic and mathematical skills are: (1) problem solving, (2) concept formation, (3) language, (4) auditory and visual integration & association, (5) auditory and visual memory, (6) auditory and visual discrimination and closure, and (7) auditory and visual attention (Kirk & Chalfant, l984).

Individuals lacking place value skills have difficulty with mathematical calculating (Gardner, 1993b; Sternberg, 1985; Piaget, 1950a). Therefore, these areas were addressed in BTA math lessons (Jackendoff, 1992; Schiffer & Steele, 1988; Meeker, 1991, 1969).

5. Numerical Digits and Mathematical Reasoning

Numerical digits were drilled starting with sequence spans of two and moving to spans of ten. Students learned concentration, attention, and mental manipulation of numerical placement by reciting the spans. This mental agility aids math calculation speed and accuracy (Erland, 1994, 1992, 1989a). Kirk and Chalfant (1984) state that slow learners have difficulty shifting from one concept to the next. Meeker (1991) and Sternberg (1985) list the following as necessary components for math instruction:

decoding symbolic and figural units or sets

encoding figural and semantic transformations
understanding symbolic systems/inferences
understanding abstract relationships with fluency
understanding semantic implications/conceptualization
application of facts in different situations
judgment of the correctness of facts and problem solving
the ability to make notational progressions
spatial conservation, directionality, and constancy of objects in space

6. Handwriting

Motoric output emphasizing hand-eye coordination was used using Bandura's (1971) modeling framework within his Social Learning Theory. This included spatial versus linear flow construction or simultaneous versus successive processing (Kaufman & Kaufman, 1983). Pre- and posttest writing samples of the Word Fragments subtest of the Detroit Tests of Learning Aptitude-2 offered criterion referenced change comparisons as benchmarks for each learner.

7. Following Oral Directions, Problem solving, Verbal Analogies, and Study Skills

The ability to follow oral instructions is an integral skill for classroom learning. The objective was to follow difficult sequences of procedural information (Stridher, 1988) by accurately and rapidly integrating both visual and listening details (Simpson, 1991; Hammill, 1998, 1985; Erway, 1984; Devine,1982). This activity requires attention, mental organization and remembering. The ability to follow a series directions and complete Verbal Analogies encompasses four psychological domains: linguistic, cognitive, attentional, and motoric (Hammill, 1985).

8. Following Figural Sequences and Analogies

The left hemisphere sequential training is combined with the interpretation and visualization of right hemisphere pictorial figures (Dinsmore, 1991). The elements of these two mental processing styles train language comprehension (Kaufman and Kaufman, 1983). Examples of complex visual sequences are: floor plans, bridge and airplane construction, basketball and football plays, airplane piloting maneuvers, and flight paths. It is part of the ITBS-CogAT Psychological domain.

9. Following Symbolic Processes (notational - symbols, letters, numbers, signs, and musical notes)

Encoding and decoding of symbols is fundamental to reading, spelling, handwriting, math, and reading music (Meeker 1991, Guilford 1967). Encoding, a Right-Brain function, recognizes the symbolic code, and Decoding, a Left-Brain activity, interprets the code, such as through phonics (Kamhi & Catts, 1989).

10. Listening to Poetry Repetition

Reciting poetry encompasses listening for details, visualization, and ordering (Anderson, 1993). Auditory and Visual Sequencing is a fundamental component of language skill (Meeker, 1999; Simpson, 1991; Stridher, 1988). It is important to train the mind to focus on long phrases of thought (Chomsky, 1988; Shiffer and Steele, 1988), also known as Extended Verbal Comprehension (Meeker, 1991).

Method

Overview

This study was conducted with two schools; each with their own design. School 1 was a pre-post quasi-experimental design. School 2 was a pre-post experimental design. The effects of cognitive skills and memory training applying Accelerated Learning methodology were analyzed. The study was to determine if skilled classroom instruction, combined with Accelerated Learning cognitive skills training, would improve academic achievement in reading and math. Dependent variables were criterion referenced benchmarking, achievement, and cognitive skills tests. The Iowa Test of Basic Skills was routinely administered yearly by both schools as the nationally standardized achievement test measure (Hieronymus, & Lindquist, 1990, 1974).

Pre- and posttest cognitive skills were measured by four subtests on the Detroit Tests of Learning Aptitude-2 (Hammill, 1985). Additionally, four subtests measuring visual and auditory memory were pre-tested with the Woodcock Johnson Psycho-Educational Battery to create a base-line for each classroom. Training of verbal and visualization elements of simultaneous and sequential memory expansion, encoding and decoding practice, modeling and self-monitoring were fundamental components of the Accelerated Learning interactive media application.

Eleven experimental elementary parochial school classrooms, grades 4-8, were compared with three control groups: a fourth, a fifth, and a sixth grade. The fourth grade control group had no-treatment, and the fifth and sixth grades received a comparable Alternate Media Activity (AMA).

The ten-week field test was conducted during the fall semester, as there are fewer absences due to illness, and was to be concluded by mid December, or before the Christmas holiday recess. Any lessons not completed were to be concluded in January, the first two weeks of classes. The prescriptive Experimental Design entailed 48 days of continuous treatment, 30-40 minutes daily, Monday through Thursday, using The Bridge To Achievement (BTA) curriculum. The experimental and control environments were designed to determine how analytical skill and pattern detection cognitive skills/memory training through media-led instruction affect students' learning progress.

Subjects

The combined two school pre-post experimental and quasi-experimental design study was for students in grades 4 - 8 including all learning levels. Two Midwestern parochial schools, referred to as School 1 and School 2, volunteered to serve in this pilot study.

School 1, a Pre K-8 school, had 97 participating students, grades four to grade eight, and were in intact classrooms, one class per grade level, moving forward each year. School 1 formed the quasi-experimental study.

School 2, a K-8 school, had 172 participating students, grades four to eighth grade with two classrooms per grade. A combined total of 269 participating students represented both schools. Since the schools volunteered to participate in the study before school began, students were randomly assigned following the teacher inservice training. School 2 became an experimental study.

Control groups: There were three control groups. School 1 had a fourth grade no-treatment control/comparison class of twenty-three students. School 2 had two classrooms (a fifth and sixth grade) serving as Alternate Media Activity (AMA) control groups. The fifth and sixth grade AMA control groups had twenty-six and twenty-two students respectively. The three classrooms from the two schools totaled 71 controls.

The students resided in a Midwestern light industrial mid-size city (pop.150,000). They came from mostly Caucasian, middle-class, college-educated parents. Many of the households owned computers.

Demographics:

School #1:

97 of 118 students participated in the study.
Unchurched - 18%
Christian (all denominations) - 82%
Economically disadvantaged - 19%
Minority - 17% (Asian, Afro-American, Hispanic, and other)

School #2:

172 of 190 students participated in the study.
Unchurched: None
Christian – 100%
All denominations accepted; not exclusive
Economically disadvantaged - 8%
Minority - 7% (Asian, Hispanic, and other)

Assessment Instruments and Teaching Materials Used

Cognitive areas addressed:
Focus cognitive areas were (Meeker, 1991, 1969; Sternberg, 1985; Hammill, 1985; Kirk & Chalfant, 1984; Rumelhart, 1986)

visual sequential memory
auditory sequential memory
semantic – verbal memory
visual and auditory closure for details
spatial relations and conservation
symbolic and figural content

auditory and visual memory for details and words
classifying information and relationships
encoding and decoding information
inductive and deductive reasoning

Cognitive Skill Tests.

Eight standardized cognitive subtests from two different batteries were selected to measure each student's abilities. Four subtests were selected from the Detroit Tests of Learning Aptitude - Revised 2 (DTLA-2), (Hammill, 1985), and four subtests were chosen from the Woodcock Johnson Psycho-Educational Battery-1 (WDJ-1) (Woodcock, & Johnson, 1977). Five subtests were selected to measure successive processing, and three subtests were chosen to measure simultaneous processing (Kaufman & Kaufman, 1983). Earlier versions of these standardized tests were used to maintain an accurate longitudinal data base begun in 1982, and revised with the addition of the Woodcock Johnson Psycho-Educational Battery in 1985.

The WDJ-1 tests were administered as pretests only to obtain a visual and listening memory baseline for each classroom. These instruments were designed to measure perceptual processing in visual and auditory sequential memory and visual simultaneous memory.

Successive processing is the ability to handle stimuli in sequential or stepwise fashion. Simultaneous processing is the input of stimuli and its synthesis into a wholistic pattern. The five subtests measuring successive processing were: DTLA-2 No. 04, Memory for Unrelated Word Sequences; and WDJ No. 03, Memory for Sentences, Auditory Memory For Sentences; WDJ No. 10 Number Reversals; DTLA-2 No. 11 Memory For Letter Sequences; and DTLA-2 No. 03 Following Oral Directions.

The three subtests measuring simultaneous processing were: DTLA-2 No. 10 Visual Closure Word Fragments; WDJ No. 07 Visual Speed Number Match; and WDJ No. 02 Visual Memory For Spatial Designs.

With time and resources constraints, it was clearly more logical to wait until the posttest cognitive skills scores were obtained, and then compile the pre- and posttests simultaneously, thus eliminating double data entry work. It had been initially planned to score each student's cognitive skill pretests and pair low with high auditory and visual learners. This modeling strategy has proven to be valuable for accelerating learning in earlier studies (Erland 1994, 1993, 1989).

At the conclusion of the ten-week treatment period, the same cognitive DTLA-1 tests were re-administered to the students. Post-testing procedures, identical to the pretreatment testing, were administered and scored by the classroom teacher. One DTLA-1 subtest, Auditory Memory for Words, was administered individually. DTLA-2 subtests Nos. 3, 10, and 11 were administered as group tests. See Figure 1, The Level of Processing, for the names of these tests, and why they were selected to measure Simultaneous and Successive Processing.

Woodcock-Johnson Psycho-Educational Battery (1977, 1978), Cognitive tests Part I, based upon Woodcock's Level of Processing, 1978 (See Figure 1)has two subtest clusters:

2 & 7 Visual Speed. Reliability .91 with over 4000 subjects
3 & 10 Auditory Memory. Reliability .90 with over 4000 subjects

The Detroit Tests of Learning Aptitude-2, (Hammill 1985), subtests:

	Reliability	Validity, Ages
3 Oral Directions	86	74
4 Unrelated Word Series	90	66
10 Word Fragments	97	53
11 Letter Sequences	92	63

The Iowa Tests of Basic Skills (ITBS) offers an optional, auxiliary measurement for cognitive skills called the ITBS-CogAT. This combination test is designed to predict student cognitive skill aptitude and offers a method to identify problems and form a prescriptive treatment. Although School 2 applied the CogAT the year of the study, School 1 has not elected to use it. The CogAT was used to cross-verify the DTLA-2 cognitive skills results.

Achievement Tests.

The thirteen classrooms applied annual student achievement measurement with The Iowa Test of Basic Skills (ITBS), Form K (Hieronymus, & Lindquist, 1990, 1974). Standard score means on thirteen/fifteen primary subtests were analyzed: Composite, Reading Comprehension, Vocabulary, Reading Total, Math Concepts, Math Problem solving, Math Total, Math Computation, Language Total, Spelling, Core Total (Reading, Math, Spelling and Language composite), Social Science, & Science.

ITBS Subtests not included in the analyses: Sources of Information/References subtests, and Language subtests of Capitalization, Punctuation and Usage – Expression. The Language Total subtest would reflect these later scores.

School 1 administered the ITBS in the Spring. School 2 administered the ITBS in the early Fall semester. Previous years' 1996 ITBS test scores were used for comparison pre-posttest with 1997 tests.

Criterion Reference Measures

The data set, large, rich, and complex, consists of the following Criterion Referenced Measures:

- Pre-implementation teacher workshop instruction and supervision of initial cognitive skill pretests.
- 52 site visit observations of each of the thirteen classrooms (four site visits per classroom during the semester-long study).
- 52 target teacher telephone conferences (four per teacher).
- Post-implementation written surveys by thirteen teachers and two site supervisors.
- Pre and Post program interviews with the two principals.
- Ten site supervisor conferences, four with each school, pre, during, and post implementation. to review desired modifications and record monitoring.

- Ten telephone interviews with state department of education administrators in four states, three geographical areas.
- Teacher and investigator analyses of student progress by examining daily work, handwriting, and test samples.
- Cognitive skills posttests given by the classroom teachers and evaluated by the investigator.
- Ten written documentation reports: Five to each school to report site visit progress, to the principals and representative school board presidents.
- Ten telephone conferences with the school board presidents, post implementation (five conferences each school).

	Formative	Summative (post-training follow-up)	Longitudinal
Quantity Measurement (Statistical Data)			
Attendance monitoring		X	X
Classroom observations on task with ***BTA***	X	X	X
Checking completed work samples		X	X
Keeping data folders of work	X	X	
Continuous progress assessment of daily work in student folders		X	X
Pre-post training handwriting samples	X	X	X
Achievement test results	X	X	X
teacher turnover			X
Quality Assurance	X	X	X
case studies	X	X	X
video taping	X		
teacher satisfaction		X	X
student satisfaction	X	X	
parent satisfaction	X	X	
administrative satisfaction		X	X
principal satisfaction		X	X

Teacher Training and Student Time Requirements

The two-day teacher training workshop was conducted for the thirteen regular classroom teachers in subject areas, and also included the school psychologists, librarians and counselors. School 2's Principal, serving as Site Supervisor, also attended the session. The principal of School 1 selected a part-time Life Skills teacher to serve as its supervisor.

Instructor training was conducted in two sessions (approximately six hours daily, Friday and Saturday), preceding the first semester's implementation of the program. Subsequent on-going training was available to the schools, with continuous on-site monitoring.

Teachers were instructed in the theories of Brain-Based Accelerated Learning, the Social-Behaviorist Model, and the interactive media methodology of The Bridge To Achievement. The first training day focused on brain-based learning, and the social-behaviorist model with elements of behavior modification, cognitive skills training, and inter-sensory learning.

INSTRUCTOR TIME (IN-CLASS)
The Bridge To Achievement training
* Ten- weeks, five consecutive days
* Daily lessons and set-up time
* Reviewing the teacher's guide for daily lesson
* Group in-class testing assistance

(OUTSIDE-OF-CLASS)

*Teacher in-service (2 days 1st semester);
* Home theory review

STUDENT TIME (IN-CLASS)

* *BTA* training for ten- weeks, five consecutive days a week,

* Pre- and post-group testing (45 minutes each classroom)

(OUTSIDE-OF-CLASS)

* Pre- and post-individual cognitive skills testing (30 minutes per student)

Hardware Requirements for Interactive Learning for both the Experimental and Control Groups

1. Video monitor and VCR, one per classroom
2. Auditory tape players, one per classroom
3. Overhead projector, on per classroom

Materials for the Experimental Group: The Bridge To Achievement Curriculum (BTA)

1. A teacher training manual that includes lesson theory, objectives, rationale (both theoretical and practical), with "How To" instructions and lesson transparencies.
2. Daily instructional lessons manual with lesson transparencies
3. Four auditory instructional lesson tapes.
4. Five video-tapes depicting five life-size puppets - cartoon characters.

The BTA Interactive Media Application Content:

The Bridge To Achievement (BTA) curriculum (Erland, 1994, 1991) is a derivative of the formerly used Memory Retainer Mental Exercise Review Book (Erland, 1994, 1992, 1989a, 1986). The BTA had been newly revised and systematized for multi-classroom practice.

The media-driven interactive lessons consisted of thirty brain building lessons taught in scope and sequence. Four upper level lessons instructed how to follow written and oral directions. These lessons' strategies led to the ability to think critically and problem-solve. The instruction required thirty to forty minutes of daily classroom instruction divided time-wise among various subjects.

The student daily lesson was printed on one or two worksheet pages. It consisted of two to five practice items in each of the three lesson sections, and sequenced in a progression of difficulty. Beginning memory spans began with two spans and moved up to ten memory spans.

Training videos were made available not only for initial instructional purposes, but also for follow-up, in school daily use as needed. This training video system reduced site visit requirements. Furthermore, former field studies indicated that teachers adapted quickly to the BTA media system. An accompanying DOS computer software reading program was not used in this

Materials for The Control Group: Alternate Media Activity (AMA) Media List

Name of Product	Author	Company	Video/ Book	Description
Thinkertoys	Michael Michkalko	Ten Speed Press 1991	Book 335 pp.	Thinking skills activities
Crackers & Crumbs	Ed Heinemann, & Sonja Dunn	1990	Video - 2 days 91 Minutes. Also, in paperback ISBN: 043508528X	Chants for Whole Lang./ 91 min video for teachers
Writing Words		AIT 1991,Poem & Puzzle, documentary about S.E. Hinton, writer	Video 15 Minutes	Intermediate Wordscape Series, Phonetics, Vocabulary
Writing for Results		Cambridge, 1991. Gathering and selecting topics, filing, recording infor, and organizing the paper.	Video 30 Min	For Junior-Senior High School
Study Skills, Getting The Best Results		Distributor: Alfred Higgins 1987	Video 20 Min	Vocabulary, organizational tools, proofreading
Math: Subtraction		Phoenix/BFA 1996	Video 66 Min	Totally Cool Math, Primary, Intermediate
Math: Addition		Phoenix/BFA 1996	Video 101 Min	Totally Cool Mathematics, Elementary
Math - Multiplication		Phoenix/BFA 1996	Video 97 Min	Elementary Mathematics
Critical Thinking: Seeing is Believing		Distributor: Alfred Higgins,1989	Video, 18 Minutes	Drawing correct conclusions, based on facts
Learning to Learn Gr 4-12		1990 Duplica Masters	Worksheets	
Cognetics: Thinking Skills Activities Gr. 3-12	Judith Burr, T. Gourley, R. McDonnel	Critical Thinking Technology	Book	Research for better schools
ALP Active Listening Program Gr. 5-12		Thinking Pub. 1986	Manual and cards	Exercises for better listeningskill
Listening Kit Gr. K-5		Lingui-Systems 1992	Book, games	Games
Patterns for Hands-on Learning Gr. K-6, Gr. 9-adult		National Reading Styles Institute1993	Book	Teacher information on how to detect patterns
Aids To Memory: Note Taking Skills		Guidance Associates, 1986	Video, 40 Min	Chronology, cause & effect, important details organize lists
Effective Study Strategy	Ed Reddak	Academic Resources Corp	Video 58 min, 2 days	Study Skills
Encyclopedia Set		Distributor, The Learning Co. Ambrose Video Publishing 1994	set 23 videos each 30 min	Vocabulary lessons in cultural literacy literature
Thinking Your Way to Better SAT Scores		PBS Video 1989	Video 2 hrs, 4 days	Study Skills, SAT Prep
Films for Humanities and Literature		1988 William Wordsworth poem, "The Daffodils"	15 min Video	Poetry Reading

study because of time constraints and hardware equipment limitations.

The Alternate Media Activity (AMA) Reviewed

To match the content of *The BTA*, nineteen media and visual print activities were selected by the researcher and rented from the library of a local Area Educational Agency. There were thirteen different video products including a set of 23-encyclopedia knowledge and vocabulary building videos (Editorial Staff, Ambrose, 1994). These products included reading, vocabulary building, reading information, mathematical computational practice, problem solving, study skills, learning techniques, listening activities, writing, language building, critical thinking, memory aids, and pattern-detection activities, all presented in non-BTA Accelerated Learning fashion.

School 2s principal and site supervisor ordered this large selection of video and print materials from the local Area Educational Agency (AEA) rental library. A video-tape was played each day. Short timed tapes were to have accompanying study skills, math, patterning and sequencing instruction for that instructional period. The direct implementation focus was on the 23-encyclopedia knowledge and vocabulary building videos, because they were automated and self-taught. The students passively viewed these videos in a darkened room with their heads on their desks. Occasionally they interacted by writing or speaking. These were applied daily for 23 of the 48 days, with many lessons repeated.

The lessons in listening, study skills, problem solving, and mathematical calculation were tied into the regular math and language arts curricula, and taught during those academic subject periods.

Parental Involvement

Parents were involved with this study both before and following the sessions. It was recommended that parents be invited to attend the classroom sessions during the BTA training, but administration observed that visitations might interrupt classroom procedures. Earlier studies had several successful in process BTA-AL training demonstrations for parents. The advantage of a mid-program demonstration creates parent support and enthusiasm for the potential achievement results. Parents liked the spoken drills led by puppets on video. They saw that it built confidence in the students.

There was a "Kick-Off" parent night in which parents reviewed The BTA-AL and Alternate Media Activity materials: books, videos, worksheets, and lessons. Parents then had the choice of participating. Those that wanted to participate signed testing and treatment permission slips. Classes had one to three students who did not participate.

Although School 2 did not have a final parent's night, School 1 had a post-training parents' presentation. Students gave a program enacting the characters and performed the drills. Parents enthusiastically received their students' progress and were receptive to the creative AL teaching application.

Some classrooms featured bulletin boards of the puppet characters that the children drew. Parents who visited the classes informally, positively commented on the art displays that created thematic cross-academic instruction.

Both schools' teachers and students reported that in many cases the parents were practicing the drills themselves at home. Although they did not have the media or software applications, they practiced reciting the various spans with their children as entertainment and family fun.

- applies rhythm and vocal intonation, including -
  slowing the speech rate in presentation of unfamiliar content
  synchronizing speech patterns to rhythms
  speaking in short phrases
- utilizes imagery and visualization
- addresses the physical environment
- uses motivational exercises
- applies positive affirmations
- addresses barriers to learning and review
- orchestrates playful multi-modal learning
- uses active presentation in learning
- stresses compatibility with how the brain works
- employs creativity
- accommodates diverse learning styles
- empowers, respects, and supports learners and teachers
- emphasizes relationships and systems thinking
- maximizes utilization of training time
- applies methods of relaxation

Prescriptive BTA Instruction

Task Analysis: The thirty brain building lessons began at simple levels and progressed to higher levels of memory and cognitive difficulty (Frye and Zelazo 1998; Flower, 1987). Visual and listening memories are activated, bridging to critical thinking (Erland, 1989).

The BTA curriculum had been newly reformatted for clarity and purpose, with the objective of making the teaching easier to facilitate. Each lesson had easy-to-follow step-by-step teacher and student instructions designed to simplify the teaching process. Videos of each lesson showing facilitator instruction were also made available for instructional review as needed (Erland, 1994, 1991).

Metacognition and Modeling: Student self-monitoring of rehearsal practice was integral to the daily lessons. Private speech rehearsal builds cognition and memory (Manning, 1996; Redier,1996). Students modeled after their peer partner (Alexander and Manion, 1997), and self-monitored their "think-say-do" encoding-decoding practice (Gillingham and Stillman, 1970; Fernald, 1943).

Whole-Brain, Sensory Integration Training

This creative thinking process aids internal processing. The brain power games are specifically designed to switch back and forth between simultaneous (Right-Brain) and successive (Left-Brain) processing (Erland, 1989a). The purpose was to encompass the entire thinking process and to include all cognitive thinking abilities (Meeker, 1991). Therefore, students favoring one style of processing over the other soon engage both cognitive styles comfortably. Each drill included several sequential and simultaneous properties. These activate a synergistic mental cognitive shift creating multi-sensory integration. If an individual can integrate information across modalities, academic skills improve (Kirk & Chalfant, 1984).

Imaginative Character Identities Make Learning Enjoyable/Edutainment:

Students recited with the celebrity identity voices to dramatize and apply vocal intonation (Lozanov, 1978). Self-talk monitoring and practice is a Cognitive Behavior Modification guideline (Meichenbaum, 1991). The students recited the sequence twice with the rotating clusters. The student recitations were spoken slowly and deliberately to match the vocal intonations of the characters on video and audio-tape (See Figures 4 and 5).

Dramatization and Choral Speaking With Positive Self Affirmations

Interactive media technology was led by five puppet personalities to activate the learning process (See Figure 4). The students began stating a self-affirmation, then orally read each line in unison without the accompanying tape. The purpose of this initial practice was to preview the overall content.

Rhythm and Vocal Intonation with the Exercises (Lozanov, 1978).

Vocal intonation through the application of puppetry was applied to the rehearsal sessions expanded on the earlier work of Lozanov (1978). Additional sounds were included (Erland, 1989a) spoken by the puppets: High, low, raspy, soft, and loud (See Figure 4). This was part of the executive criteria measures, but varied greatly according to the teacher's commitment to the BTA implementation procedures. The 7th and 8th grades applied these vocal rehearsal techniques minimally.

Drill and Practice Defined

Traditionally, drill and practice consist of repeated output trials by the student (Erland, 1989a). It forms rote learning through speaking or writing. In former years, students would routinely learn spelling words and math facts through drilling practice, and often, the training did not last.

The BTA is not merely rote memory drill of simple facts. The program builds on how to encode and decode sequential and simultaneous information and improving memory and cognitive skills through visualization of the material. This Accelerated Learning application creates the agile thinker (Grotzer and Perkins, 1997). Through short term memory expansion, patterning and sequencing of information becomes automatic. This leads to critical thinking capability (See Figure 2, Hierarchy of Thinking, Erland, 1989).

According to Fisher, Murray and Bundy (1991), any activity that produces systematic thought flow reliably helps people to focus attention and to establish a feeling of control.

Programmed Clustering Action, Defining Segments

Each lesson was divided and sequenced into progressive sections. Then, each lesson began with a series of three items and progressed to ten items.

The objective was to enhance students' encoding and decoding processes. Memory strengthening also assists the following of complicated systematic procedures. Learning strategies were taught on how to follow complex directions easily.

The Inter-Modality BTA Training System (The Concordant How-To Directions):

Left-Brain Sequential Memory Training: The BTA lessons should be taught in parallel with good academic instruction and serve as the catalyst for learning proficiency (Kaufman and Kaufman, 1983).

To become familiar with the lesson instructions, the students orally read and recited in unison a lesson item once without the media. Then, the video-tape was turned on. The students viewed, listened, and spoke, memorizing each section. Additionally, accompanying auditory tapes offered the same lessons for independent practice review at learning stations where students work in duo or triad partners. Although the BTA is a highly structured drill and practice of "raising the bar," extra paired informal practice is applicable (Erland, 1989). Following the exercises, students felt motivated and more confident in their ability to learn and respond to their partner(s).

Right-Brain Visualization Training (Chiarello, 1988): The students mentally visualized, or pictured, the information as they viewed the visual images on the monitor and recited the items.

Left-Brain Analysis: The students quickly wrote the correct sequence on paper and repeated the sequence silently to themselves in accordance with Bandura's (1971) Social Learning Theory.

Benchmarking: In-Class Program Criterion-Referenced Measurement and Evaluation: At the end of the 30-40 minute lessons, students checked their partner's work, and placed the worksheet in their personal folder, dated, with the errors carefully tabulated. At the end of each week, the students reviewed their folders, noting personal performance gains for their own positive reinforcement. Teachers monitored this progress and reinforced learning by showing the improvements to the students.

This particular design increased short-term memory span capacity and resilience (Erland, 1989a). As the segments increased in length, the students automatically integrated the additional visual and listening information. Facilitator-instructed learning strategies complimented the memory improvement.

Positive Self Affirmations: Students repeated a positive self-affirmation to their partner before and following each lesson (Manning, 1996). Each partner repeated the affirmation independently with a positive, pleasant demeanor. The following self-affirmations may be used:

Self- Affirmations For a Sense of well-being and Accomplishment

Learning is fun.
I like to have accomplishments.
I can meet a challenge.
I can do it.
I can complete tasks.
I am learning and growing.
I am doing well with my work.
I believe in myself and my abilities.
I am a winner.
I am alert, yet calm and relaxed.
I feel good when my work is done.
I like to work hard.

Seating Arrangements: Students sat in pairs or triads. To build self-esteem, pairing with a peer role model is encouraged. With some exercises, such as the letters, mental math, opposite operations, the students stood facing one another. Desks were in paired units, horizontal rows, squared, or small circles. Students requiring special assistance sat with tutorial teaching assistants at a table, although this separation was discouraged unless necessary.

Experimental Group Seating: Grades six, seven, and eight in both schools were seated in traditional rows facing the front. Grades four and five were in rows (4E3 and 5E3) desks arranged in a square (5E1 and 4E1) or in paired clusters (4E2 with the students rotated from front to back every two days). They were assigned to work as partners or triads for recitation, positive reinforcement, and work cross checking.

Control Group Seating. The fifth grade control group was seated with desks in a square formation. The sixth grade control group had the desks in traditional rows.

Classroom Environment Directed to Learning Styles: Room Lighting:

Grades six through eight in School 1 had the lights on with the monitor in front. Grade 6E3 had the monitor in the front corner of the room with only fair visibility due to the small size of the room. Classrooms 6E1, 4E3 & 5E3 had darkened rooms when the monitor was on, and lighted the remaining time. Grades 4E1, 4E2, and 5E1 had lighted rooms. The control groups alternated activities between lighted and darkened rooms.

Time of Day:

All classrooms taught the BTA or AMA in the morning. The time allocation was varied between various academic subjects for the 30-40 minute training session. The training was alternated between reading, math, spelling, and language arts periods. The BTA

Nineteen Executive Criteria Measures.

1. All lessons to be taught according to scope and sequence for 48 consecutive days (24 total hours of training, Monday through Thursday or Friday), according to time and task.

2. Student attendance and active participation were to be mandatory. Students absent more than seven days were to be removed from the study. Students should not be removed from the class for other Special Services instruction or tutoring during the training.
3. Trained substitute teachers were to be used when teachers are absent.
4. All lessons, and lesson items, should be taught in proper sequence, without skipping or doubling any lessons.
5. Recitation applied according to self-rehearsal with metacognitive private speech requirements.
6. Vocal Intonation and role-playing applied by the students.
7. All lessons taught according to instructional lesson plan and procedure.
8. Students to work in partners or triads.
9. The BTA instructional lesson plan concordance system applied according to policy.
10. Pattern detection instruction applied.
11. Visualization techniques applied.
12. Peer models engaged.
13. Rhythm, kinesthetic motion, and dramatization applied.
14. Maintain students' rapt attention and engagement in the activity.
15. Latin Roots lesson rehearsal applied.
16. Positive self-affirmations consistently applied.
17. The teacher giving positive examples of rationale with each activity.
18. Seating rotated so the video monitor was in close proximity for all students in varying schemas.
19. Room lighting consistent, with the monitor visible. Room heating at a comfortable setting.

<u>Policy Adherence Requirements for Curriculum Implementation</u>

The state where the study took place has pushed instructional policy in the direction of Site-Based Educational Management and deregulation. Site-based instruction empowers classroom teachers, and takes decision-making out of the hands of the educational administrative hierarchy. The increased discretion given to on-site administrators, teachers, and support services creates a barrier to high performance improvement implementation, known nationally in workforce settings as HPI. Therefore, measuring compliance with curriculum policy requirements of research studies becomes fuzzy.

According to implementation policy, each school was to select a certified lead teacher, preferably at the masters' educational level, to conduct daily classroom site support. Accountability was to be documented in regular written and verbal monthly site visit reports.

School 1 selected an uncertified part-time Life Skills teacher to serve as supervisor and substitute instructor for the 7E3-class. This teacher had attended an area BTA promotional presentation for educational psychologists, and in recommending it to her school's principal, was asked to administrate the program.

School 2's first-year principal, with additional administrative pressures, elected to serve as Site Supervisor. Attempts were made to modify the two schools' selections and to give additional site support by the investigator.

The following policy adherence issues were evidenced by the experimental classrooms in site visit documentation:

Due to time constraints, the site supervisors for each school submitted primarily verbal documentation reports although both verbal and written notations were requested for continuous benchmarking.

The BTA was taught for 48 consecutive days in only two of the eleven classrooms, 4E3, and 4E2. The other nine experimental classrooms taught the BTA for shortened 36-42 days.

Furthermore, typically teachers have the decision-making authority of "what to use, not to use, or how to use materials" when applying commercial products. This sense of autonomy becomes ingrained in using any product, although in this instance, they were instructed to use a prescriptive executive criteria lesson plan according to scope and sequence, time and task.

Eager to complete the cognitive skills-AL training with facility, critical BTA curriculum lessons often were eliminated while others were doubled. Some days were not taught due to extracurricular activities. When items were cut from lessons, the daily training sessions were shortened. However, the Alternate Media Activity (AMA) instruction was taught as prescribed with a daily video lesson for 48 consecutive days (Erland, 1998).

Student work samples were collected and evaluated during site visitations, so important improvement tracking was nevertheless carefully benchmarked.

The 7E3 and 8E3 classes eliminated Accelerated Learning methods except those that were automated within the BTA. It was recommended in mid-program documentation letters to the administration, that the lagging 7E3- and 8E3-classes be combined and taught either with the 6E3 class, which was being taught AL prescriptively, or combined and taught as a unit with two additional support co-teachers.

Substitute teachers were not garnered for teacher absences in School 2. At least one teacher, 6E1, had a one-week mid-program loss of BTA treatment due to her absence, affecting potential auditory memory gains (listening and comprehension). Moreover, a lack of auditory gain would lead to incomplete training transfer and longitudinal achievement score maintenance. Furthermore, this teacher also began the first few weeks instructing only three out of the prescribed five days, not realizing she was in error.

An experimental eighth grade teacher in School 2 took a leave of absence due to illness and was replaced with an untrained Accelerated Learning instructor. Therefore, this class was removed from the study. Two other eighth grade classes were eliminated because the ITBS posttests were not available when the students advanced to a parochial high school.

These irregularities became apparent during site visits and in telephone review sessions with the classroom teachers during and following implementation. To ensure completion of the study, and reveal the effects of the executive criteria measures, training was prescriptively monitored with monthly documentation reports to the administration.

Other Accelerated Learning research indicates that there can be positive results even if the teachers implement the Accelerated Learning methods 50% of the time or more (Schuster & Gritton, 1986). Outcome results in this study were weighted according to degree of compliance. Evaluation to measure compliance with the nineteen executive criteria was made on teacher checklists through site observations and telephone review sessions.

Results

School 2s 172 participating students were randomly assigned (grades 4-8), as experimentals (Es) and controls (Cs), before school began in the fall, and following the teacher training. This formed an experimental design. Two control groups, receiving an alternate media activity, were also randomly assigned in grades 5 and 6. Control group classes were limited in this school to two classrooms, because the junior high classes in School 2 had complex rotation scheduling, making it difficult to assign control groups.

School 1 (97 participating students) formed a quasi-experimental study. It had a control/ comparison group because a set of data from a subsequent fourth grade class became available. This control group received no treatment, and did not have program site visitations. This teacher did not have the Accelerated Learning training, so accidental contamination was not possible.

Achievement Tests. ITBS standard score means on each of thirteen out of a total sixteen primary subtests were analyzed for comparisons with the fifth- and sixth-grade control groups. The standard score means of the following primary subtests were included: Composite, Reading Comprehension, Vocabulary, Reading Total, Math Concepts, Math Problem Solving, Math Total, Math Computation, Language Total, Spelling, Core Total (Reading, Math, and Language composite), Social Science, and Science. The three Language subtests of Punctuation, Capitalization, and Usage subtests were analyzed only when the added information was applicable.

Since the seventh and eighth grades did not have control groups, the national norms standard scores (SS) were used for these grades. Standard scores for each of the subtests were derived from the raw scores (ITBS Technical Summary, Riverside 2000, 1994). Appropriate standard scores were used from the technical manuals (Hoover, H. D., et al, 1993). Standard Score point differences (DSSs) were calculated for each class and each academic subject as recommended by the Iowa City Testing Service (Frisbie, 1999), who develops the ITBS for Riverside publishing.

These standard scores were based on what time of the year each school gave the ITBS. School 1 gave the ITBS tests in the spring. For this school, the National Norms were computed fall to spring, as that was inclusive of when the treatment was conducted, fall to early spring.

School 2 gave their ITBS tests in the fall. The students were tested with the ITBS before the onset of the BTA /AMA Fall treatments, and then re-tested the following fall. Therefore, fall to following fall ITBS norms were used for this school.

The ITBS Spring Median DSSs from the Riverside 2000 Technical Summary are shown below for School 1 (p.70):

Grade	Median	Typical DSS Point Gain
4	200	7-13
5	214	7-14
6	227	7-14
7	239	7-11
8	250	6-15

Thirteen academic subject tables were created, one for each of the thirteen primary ITBS subtests, out of the total of sixteen (Erland, 1999, 1998). Each table listed corresponding numbers of students, standard scores, standard score point differences, (DSSs) and standard deviations (S.D.) for the experimental groups, the ITBS norms, and the control groups (See Table 1).

Classrooms were labeled experimentals and controls, E & C, and by school. School 1 was experimental 3, or E3. School 2, with two classrooms per grade, were labeled experimental 1 & 2, or E1, and E2. The control groups were labeled as 5th and 6th grade controls. In labeling, the grade year precedes the treatment number E1, E2, and E3. Therefore, the fourth grades were listed as 4E1, 4E2, and 4E3.

Standard scores means were computed by SPSS a statistical computer software program. T-tests on gains were calculated both manually and with software programs for each grade for each subtest, with significance levels of .1, .05, and .01 (Winer, 1971).

Due to the inconsistent implementation procedures and policy adherence among the classrooms, t-tests would show the degree of internal results outcome specific to each classroom. With the wide variance in teacher application adherence, a Multiple Analysis of Covariance (MANCOVA) analyses was therefore inappropriate for inter-classroom comparisons.

A table of Norms was created (See Table 2) to depict how the classroom standard score point differences compared to the norms. The standardized Norms table compares the treatment and controls to the National Norms. The Norms figure is the second number on the table under NN (National Norms). These NN figures vary within the same grades because the schools conducted the testing at opposite times, fall and spring.

The two fourth grade classes in School 2 fell below the National Norms (See Table 2). However, when pooled with the strong 4E3-classroom, and compared to the National Norms, these three fourth grade classes trended some significant gains in the Composite, Reading Total, Vocabulary, Reading Comprehension, Math Total, Language Total, Core Total, and Spelling subtests at the .01 and .05 levels. Math Concepts, Math Problem Solving, and Math Computation were most directly affected by misapplication.

Table 2 reveals that the controls' solid gains beat the norms in all but one instance, the 5th grade control group in Social Science. The 8.26 score is below the comparative 5E1 Norm of 14. The eleven experimental classrooms had gains 79% greater than the norms (See Table 1).

Table 3 reveals the eleven experimental classrooms' and two control groups pre- to posttest

Table 1.

ITBS Composite

One of Thirteen Academic Subject Tables
Depicting the Standard Score Point Differences (DSSs) for Each Classroom (experimentals and controls)
Grades 5 & 6 were compared against same grade control groups and without pooling of the grades
At the time of this analysis, a 4th grade control/comparison group did not exist.
Grades 4, 7, and 8 are analyzed with the standardized norms (1000 students)

	Nat'l Fall to Fall Norms	SD	Pt. Diff	Controls			E1			E2			Nat'l Fall to Spring Norms	SD	Pt. Diff	E3		
	Mean V/Q/NV			Mean	SD	PT Diff	Mean	SD	Pt Diff	Mean	SD	PT Diff				Mean	SD	PT Diff
							N = 24 df = 23	10.29	t=1.25	N = 20 df = 19	11.45	t=1.07		22.33		N = 14 df = 13	10.19	t=3.47**
4th Pre	175.94	16.46		None			199.16	20.29		206.40	22.61		192.12	21.15		202.57	17.99	
4th Post	192.12	21.15	16				213.04	24.01	13.89	219.19	26.64	13.50	202.72	22.86	10	229.43	22.72	26.86
				N = 26 df = 25	12.09		N = 25 df = 24	9.41	t=0.79							N = 25 df = 24	7.88	t=0.63
5th Pre	192.12	21.15		219.73	20.20		224.88	23.96					207.75	24.63		218.56	18.09	
5th Post	207.75	24.63	16	239.03	24.58	19.30	246.60	23.74	21.72				216.94	26.51	9	236.04	19.54	17.48
				N = 22 df = 21	8.02		N = 21 df = 20	9.03	t=0.29							N = 19 df = 18	5.16	t=2.81**
6th Pre	207.75	24.63		237.45	22.51		243.90	25.57					221.72	28.92		247.47	16.92	
6th Post	221.72	28.92	14	255.47	23.88	17.81	260.95	24.25	17.04				229.56	29.98	7.8	271.31	18.29	23.84
				None			N = 20 df = 19	21.94	t = 0.78	N = 19 df = 18	11.12	t=2.03*				N = 25 df = 24	9.20	t=2.27*
7th Pre	221.72	28.92					266.60	16.17		255.26	22.81		233.37	31.56		273.76	15.65	
7th Post	233.37	31.56	12				280.95	23.64	14.35	270.36	23.44	15.10	240.89	32.59	7	284.76	18.44	11.00
				None												N = 14 df = 13	12.30	t= 1.36
8th Pre	233.37	31.56											243.93	33.90		256.92	29.27	
8th Post	243.93	33.90	10										250.87	34.56	7	271.35	26.88	

† Sig. $p < .1$ * Sig. $p < .05$ ** Sig. $p < .01$

Table 2.

ITBS Academic Subject Comparisons of BTA
Pre- to Posttest Point Standard Score Differences (SSDs)

Compared to National Norm Expectations; BTA Gains 79% Greater than the National Norms

Eleven Experimental Groups with Two Control Groups

CLASS	Composite	Read Total	Vocab	Read Compr	Math Total	Math Concepts	Math Prob Solv	Math Computa	Lang Total	Spell	Core Total	Social Science	Science
	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA- NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN
4th E3	26.86 - 7	24.50 - 9	20.64 - 9	28.14 - 9	22.64 - 12	16.51 - 12	28.93 - 11	30.07 - 13	33.92 - 12	31.28 - 13	27.21 - 11	19.57 - 9	38.86 - 9
6th E3	23.84 - 4	15.00 - 7	13.10 - 7	17.84 - 7	21.78 - 10	23.26 - 10	20.68 - 8	46.47 - 11	25.57 - 8	18.36 - 8	21.05 - 8	31.31 - 7	32.47 - 7
5th E1	21.72 - 9	17.16 – 13	13.72 - 14	20.48 - 13	23.04 - 14	18.72 - 14	27.48 - 15	33.12 - 15	35.64 - 14	23.04 - 15	25.28 - 14	18.28 - 14	16.60 - 14
6th E1	17.04 - 7	16.04 - 12	16.28 - 12	15.71 - 10	25.90 - 13	21.66 - 13	30.14 - 12	21.09 - 13	27.38 - 12	20.95 - 12	23.14 - 12	6.71 - 11	17.14 - 11
8th E3	14.42 - 3	11.64 - 6	7.71 - 6	15.87 - 7	11.07 - 7	13.64 - 9	9.14 - 6	16.28 - 9	17.78 - 6	22.78 - 8	13.50 - 7	12.35 - 7	19.07 - 11
4th E1	13.89 - 11	10.62 - 14	10.92 - 15	9.83 - 14	16.04 - 15	20.37 - 15	11.62 - 15	9.16 - 15	15.41 - 16	15.70 - 17	13.70 - 15	7.91 - 15	22.79 - 16
4th E2	13.50 - 11	13.85 - 14	16.45 - 15	11.15 - 14	11.75 - 15	12.95 - 15	10.50 - 15	15.35 - 15	19.20 - 16	20.50 - 17	14.95 - 15	6.45 - 15	15.25 - 16
7th E2	15.10 - 6	14.73 - 12	19.00 - 11	8.63 - 10	11.84 - 11	12.57 - 11	11.47 - 11	5.89 - 12	17.57-11	28.27 - 10	14.78 - 11	20.26 - 10	7.10 - 10
7th E1	13.60 - 6	17.13 - 12	19.40 - 11	14.93 - 10	10.40 - 11	12.00 - 11	8.80 - 11	17.80 - 12	13.20 - 11	15.40 - 10	13.46 - 11	16.73 - 10	12.40 - 10
5th E3	17.48 - 6	12.72 - 8	13.16 - 8	12.44 - 8	13.60 - 14	15.64 - 11	11.28 - 10	16.00 - 13	16.96 - 10	19.04 - 10	14.52 - 10	22.84 - 8	25.04 - 7
7th E3	11.00 - 4	7.64 - 7	7.68 - 7	7.80 - 8	7.76 - 8	4.12 - 9	11.24 - 8	10.28 - 10	9.17 - 8	15.76 - 7	8.16 - 8	10.36 - 7	14.36 - 7
6th Contrl	17.81	15.27	14.86	15.13	16.45	14.68	18.72	25.13	26.90	23.40	19.54	15.68	22.81
5th Contrl	19.30	19.03	19.69	19.03	23.65	23.23	23.80	23.42	28.38	21.92	23.69	8.26	25.76

The right figure in each cell is the norm, which was rounded up to a whole number for readability.

(dotted shading)	**BTA Pt. Differ Scores GREATER than the Norms**
(horizontal lines)	**BTA Pt. Differ Scores MATCHING the Norms**
(black)	**BTA Pt. Differ Scores BELOW the Norms**

Table 3.

ITBS Academic Subject Comparisons of Experimental Gains: Classrooms are in rows
Point Differences of Standard Score Means, (DSSs) and ITBS National Norm Expectations
Eleven Experimental Groups Comparisons with Two Alternate Media Activity Control Groups

	Composite	Read Total	Vocab	Read Compr	Math Total	Math Concepts	Math Prob Solv	Math Computa	Lang Total	Spell	Core Total	Social Science	Science
CLASS	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA- NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN
4th E3 N = 14	26.86 - 7	24.50 - 9	20.64 - 9	28.14 - 9	22.64 - 12	16.51 - 12	28.93 - 11	30.07 - 13	33.92 - 12	31.28 - 13	27.21 - 11	19.57 - 9	38.86 - 9
6th E3 N = 19	23.84 - 4	15.00 - 7	13.10 - 7	17.84 - 7	21.78 - 10	23.26 - 10	20.68 - 8	46.47 - 11	25.57 - 8	18.36 - 8	21.05 - 8	31.31 - 7	32.47 - 7
5th E1 N = 25	21.72 - 9	17.16 –13	13.72-14	20.48 - 13	23.04 - 14	18.72 - 14	27.48 - 15	33.12 - 15	35.64 - 14	23.04 - 15	25.28 - 14	18.28 - 14	16.60 - 14
4th E1 N = 24	13.89 - 11	10.62 - 14	10.92 - 15	9.83 - 14	16.04 - 15	20.37 - 15	11.62 - 15	9.16 - 15	15.41 - 16	15.70 - 17	13.70 - 15	7.91 - 15	22.79 - 16
4th E2 N = 20	13.50 - 11	13.85 - 14	16.45 - 15	11.15 - 14	11.75 - 15	12.95 - 15	10.50 - 15	15.35 - 15	19.20 - 16	20.50 - 17	14.95 - 15	6.45 - 15	15.25 - 16
6th E1 N = 21	17.04 - 7	16.04 - 12	16.28 - 12	15.71 - 10	25.90 - 13	21.66 - 13	30.14 - 12	21.09 - 13	27.38 - 12	20.95 - 12	23.14 - 12	6.71 - 11	17.14 - 11
7th E2 N = 19	15.10 - 6	14.73 - 12	19.00 - 11	8.63 - 10	11.84 - 11	12.57 - 11	11.47 - 11	5.89 - 12	17.57 - 11	28.27 - 10	14.78 - 11	20.26 - 10	7.10 - 10
7th E1 N = 15	13.60 - 6	17.13 - 12	19.40 - 11	14.93 - 10	10.40 - 11	12.00 - 11	8.80 - 11	17.80 - 12	13.20 - 11	15.40 - 10	13.46 - 11	16.73 - 10	12.40 - 10
8th E3 N = 14	14.42 - 3	11.64 - 6	7.71 - 6	15.87 - 7	11.07 - 7	13.64 - 9	9.14 - 6	16.28 - 9	17.78 - 6	22.78 - 8	13.50 - 7	12.35 - 7	19.07 - 11
5th E3 N = 25	17.48 - 6	12.72 - 8	13.16 - 8	12.44 - 8	13.60 - 14	15.64 - 11	11.28 - 10	16.00 - 13	16.96 - 10	19.04 - 10	14.52 - 10	22.84 - 8	25.04 - 7
7th E3 N = 24	11.00 - 4	7.64 - 7	7.68 - 7	7.80 - 8	7.76 - 8	4.12 - 9	11.24 - 8	10.28 - 10	9.17 - 8	15.76 - 7	8.16 - 8	10.36 - 7	14.36 - 7
6b Contrl N = 22	**17.81 - 7**	**15.27 - 12**	**14.86 - 12**	**15.13 - 10**	**16.45 - 13**	**14.68 - 13**	**18.72 - 12**	**25.13 - 13**	**26.90 - 12**	**23.40 - 12**	**19.54 - 12**	**15.68 - 11**	**22.81 - 11**
5th Contrl N = 26	**19.30 - 9**	**19.03 - 13**	**19.69 - 14**	**19.03 - 13**	**23.65 - 14**	**23.23 - 14**	**23.80 - 15**	**23.42 - 15**	**28.38 - 14**	**21.92 - 15**	**23.69 - 14**	**8.26 - 14**	**25.76 - 14**
# Sig. Gains	8	6	6	3	5	1	2	3	7	7	7	7	3

Note: Each figure of Standard Score Mean Pt. Differences (DSSs) is followed by the National ITBS Norm (ITBS Fall & Spring Tables). Expectations
The experimental classrooms show significant gains in 65 academic subjects over the controls / norms.
Number of Sig. gains is in the final row (See Table 4).

mean point difference scores as compared to the national norm expectations. The mean score point difference is the left figure, and the right figure is the national norms gain expectations. The fourth-grade control group class is not on the table as ITBS pretest scores were not available, so therefore DSS scores could not be calculated.

The experimental classrooms had strengths in 90 subtest areas, either matching or greater than the robust controls (or norms for grades 4, 7, and 8), and scored statistically significantly higher in 65 academic subtests. Both the experimental and the control groups evidenced solid gains. Although Table 3 shows the vocabulary subtest with fewer classrooms with point difference score gains than the tabulated significant results indicate, this is because of the pooling of grades four and six against the norms. The shaded areas on the tables indicate DSS score gains that were greater than the norms or the control groups. The statistically significant tallies for each subject appear at the bottom of the table, although they do not apply to the shaded areas of growth in each column.

Table 4 shows pre to posttest collective statistically significant gains of the experimental classes versus the control groups. Additionally, the mean point differences on the ITBS for the academic subjects that matched the controls' gains are shown in comparison to the National Norms (NN). The experimental classes' statistically significant gains are indicated for each academic subtest.

The results are layered according to policy adherence of the executive criterion measures. The bottom row tallies the number of academic subjects that matched the robust control group gains, with the number of statistically significant gains on the right.

This study demonstrated a four-tiered result outcome effect, depending on implementation practices that ranged from ideal to poor. It demonstrated how teacher commitment, follow-through, and methodological knowledge affect the quality of performance.

The four levels are described as follows: (See Table 4).

Ideal Conditions include a committed teacher achieving outstanding results in small, carefully controlled group settings by applying all of the criteria most of the time daily for thirty to forty minutes. Former highly successful studies by this researcher and other committed teachers serve as the baseline for observing ideal scientific conditions (Erland, 1998, 1994, 1992, 1989a 1989b).

Good Conditions include good classroom teachers who followed most of the Nineteen Executive Criteria, followed the Accelerated Learning strategies, and successfully obtained some positive results (Erland, 1998, 1994, 1992).

Fair Conditions include classroom teachers who followed some of the Nineteen Executive Criteria receiving minimal results. A baseline of fair conditions required only that 50% of the criteria be applied for two to three months.

Poor Conditions include classroom teachers and site supervisors who typically cut too many lessons, items, and days, shortened some BTA lessons and Accelerated Learning strategies, and thereby obtained limited results (Erland, 1998).

The classrooms' site visitation checklists were analyzed according to implementation factors of the executive criterion measures. They were 1) assigned a percentage reflecting compliance with the equally weighted 19 in-classroom criterion measures (1/19 or 5.3 points for each criterion), and 2) assigned a percentage reflecting criterion measures weighted according to their qualitative influence on ITBS score outcomes.

The 4E3 experimental classroom of fourteen students (N=14) was also compared to the 4th grade control group of 23 students. Two reading and two math areas were significant: Reading Total, $p < .05$, and Reading Comprehension, $p < .01$; Math Concepts and Math Computation, $p < .1$ level.

Additional analysis was made to look at treatment trending. Using the exact binomial probability test as given by McNemar (1962), when pooled collectively, the experimentals had averages higher than the controls on ten out of eleven remaining dependent variables after excluding the five Total subtests (Reading, Math, Core, Language, and Composite) (See Table 4). Furthermore, when the 4E3 five total subgroups were analyzed independently against the norms, they all reached significance at the .01 level. The Reading Total subtest was significant against both the norms and controls, and also when pooled.

These ten dependent variables were significant at $p < .01$, with the exception of Math Concepts, $p < .1$. Individually, two out of the three language subtests, Punctuation and Usage, were also statistically significant $p < .01$. Only one Language subtest of the sixteen, Capitalization, was reversed, $t = -0.03$ (McNamar, 1962). (See Table 5).

The classroom with the second strongest gains, 6E3, complied with the criteria measures 73%-77%. This class had four significant subtests: Composite $p < .05$, Math Computation $p < .01$, Math Total $p < .1$ (pooled against the controls) and Social Science $p < .01$.

These top two classrooms (4E3 and 6E3) collectively had strengths in 23/26 academic subject areas for an 88% success rate, with 65% (17/26) of the academic subjects statistically significant. The top three classrooms (4E3, 6E3, and 5E1) collectively had strengths in 32/39 academic subject areas for an 82% success rate. The top four classrooms (4E3, 6E1, 5E1, and 4E1) collectively had 42 strengths out of 52 academic areas for an 81% success rate. These top four classrooms followed the executive criteria measures 63%-98% successfully.

The top seven classrooms that followed the executive criteria measures at least 50% of the time had a 47% success rate. These figures clearly indicate a strong positive correlation between following the criteria measures and Accelerated Learning resultant outcomes. These success rate percentage figures are implicit in Table 4.

With the ITBS Composite subtest, eight of the eleven experimental classrooms had significant gains over the controls or norms. Additionally, the three seventh grade classes were significant at $p < .01$, $p < .05$, and $p < .1$ levels in comparison with the national norms and the

Table 4.

ITBS Academic Subject and Classroom Comparisons

The degree by which the teachers followed the 19 Executive Criteria Measures – Four Success Levels – Ideal, Good, Fair, to Poor
Shaded areas = Classrooms are in horizontal rows with 90 academic subject gains matching or greater than the controls and norms, 65 academic subjects are statistically significant for the experimental groups / norms and controls

Class-room	Followed Executive Criteria 1/19 & Differential Weights	Composite	Read Total	Vocab	Read Compr	Math Total	Math Concepts	Math Prob Solv	Math Computa	Lang Total	Spell	Core Total	Social Science	Science
4th E3	98%-98%	* * collectively	* * →	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
6th E3	77%-73%	* *	15.00 - 7		17.84 - 7	† Pooled	23.26 - 10	20.68 - 8	**			21.05 - 8	**	32.47 - 7
5th E1	70%-70%	21.72 - 9			20.48 - 13	23.04 - 14		27.48 - 15	*	35.64 - 14	23.04 - 15	25.28 - 14	†	
4th E1	63%-68%	*	**	Pooled * ↔	**	*	20.37 - 15			**	**	**	Pooled ↔	**
4th E2	54%-63%	*	**	Pooled * ↔	**	*				**	**	**	Pooled ↔	**
8th E3	50%-54%	*			15.87 - 7				16.28 - 9	**	**	*	12.35 - 7	19.07 - 11
6th E1	50%-53%		16.04 - 12	16.28 - 12	15.71 - 10	*	21.66 - 13	†		27.38 - 12		23.14 - 12		
7th E2	43%-50%	*	**	Pooled ** ↔						*	**	Pooled ** ↔	**	
7th E1	40%-43%	* *	Pooled ** ↔	**						*	**	Pooled ** ↔	**	
5th E3	30%-36%												*	25.04 - 7
7th E3	25%-30%	*	Pooled ** ↔	**						Pooled * ↔	*	Pooled ** ↔	**	
6th Contrl		17.81	15.27	14.86	15.13	16.45	14.68	18.72	25.13	26.90	23.40	19.54	15.68	22.81
5th Contrl		19.30	19.03	19.69	19.03	23.65	23.23	23.80	23.42	28.38	21.92	23.69	8.26	25.76
# of Gains		9- 8	8- 6	7 - 6	7 - 3	6 - 5	4 - 1	4 - 2	4 - 3	9- 7	8 - 7	10 - 7	8 - 7	6- 3

Note: The academic subjects matching the controls show the pre- to post-test standard score point differences (DSSs), followed by the national norms expectations. The final tally row includes academic totals of subjects, which closely matched the controls followed by the number of academic subjects that were statistically significant over both norms and controls.

† Sig. $p < .1$ * Sig. $p < .05$ ** Sig. $p < .01$

Table 5. Grade 4 (4E3) immediate posttest standard score data, Experimentals (N=14) vs. Controls (N=23)

	Composite	Reading Vocab.	Reading Compre.	Read. Total	Math Concep.	Math Problems
Experimentals						
Ave.	229.43	223.14	236.86	230.07	221.93	235.93
S.D.	22.73	22.18	23.22	21.84	20.02	22.51
Controls						
Ave.	220.30	213.17	220.35	216.78	210.91	231.04
S.D.	16.98	20.20	17.59	17.64	16.92	27.47
t:	1.39	1.40	2.45**	2.03*	1.79+	0.56

	Math. Tot.NSS	Math. Comput.	Spelling	Capital.	Punctua.
Experimentals					
Ave.	228.79	221.57	222.64	236.14	237.21
SD.	19.44	15.32	22.98	25.55	28.30
Controls					
Ave.	220.87	210.39	217.39	236.48	229.09
S.D.	20.54	20.41	26.32	34.44	34.59
t:	1.16	1.77+	0.62	-0.03	0.74

	Usage	Lang.Tot.	Core Tot.	Soc.Stud.	Science
Experimentals					
Ave.	246.00	235.43	231.50	221.86	231.50
S.D.	26.94	20.21	18.45	28.70	38.30
Controls					
Ave.	236.74	230.00	222.57	210.35	222.91
S.D.	26.42	26.10	18.25	15.09	25.70
t:	1.03	0.67	1.44	1.60	0.82

Significant levels of * $p < .05$, **: $p < .01$, † $p < 0.1$, 5E3 class was significant at the $p < .05$ level. Therefore, even the most incomplete BTA-AL applications evidenced gains. Table 4 reveals that the academic subjects acutely affected by program misapplication were reading comprehension, the math subtests, and science.

Benchmarking: Criterion Referenced Measures.

Observation checklists documented the teacher's instructional actions, behaviors, and attention in following the training prescription during site monitoring visits. That is, the observation checklists revealed how closely teachers followed the lesson plans with their accompanying teaching style and behaviors. Analysis of the variations in classroom applications of the executive criteria and the corresponding ITBS score outcomes led to the final criteria weighting.

Student - teacher behaviors and attitudes, partnering-modeling activities, and learning progress were also monitored and benchmarked accordingly on checklists. These observation checklists served as on-going criterion referenced documentation of teacher and student progress.

The experimental student outcomes in this study were analyzed against both the national norms and controls. Seventh and eighth grade classrooms were compared with the norms. Data from the fourth and seventh grade classrooms were pooled by grade and compared against the norms. The fourth grade from School 1, and the fifth and sixth grade experimentals were then compared as individual classrooms against their corresponding control groups, and they were also pooled and compared against the norms.

Gains Summary:

The hypothesis was met in that of the six of eleven experimental classrooms had significant gains in reading and math. (See Tables 4 and 6). Seven classrooms had statistically significant Core Total scores ($p < .05$ and $p < .01$), which includes Reading, Math, and Language. Only one classroom of the eleven, 8E3, lacked significant reading and math gains. Yet this 8E3 class had a significant gain in Core Total, which includes reading and math. The experimental classrooms evidenced the following gains statistically significant over the norms, and equal to or greater than the robust control groups:

Core Total: (ten/eleven classrooms with large gains, seven statistically significant, $p < .01$ (6), $p < .05$, (1)
Reading Comprehension: (seven/eleven classrooms with large gains; three statistically significant, $p < .01$)
Vocabulary: (seven/eleven classrooms with large gains, six statistically significant, $p < .01$ (4), $p < .05$, (2)
Reading Total:, (eight/eleven classrooms with large gains, six statistically significant, $p < .01$)
Problem Solving: (four classrooms with large gains; two statistically significant, $p < .1$, $p < .01$)
Math Concepts: (four classrooms with large gains; one statistically significant, $p < .01$)
Math Computation: (four classrooms with large gains; three statistically significant, $p < .01$ (2), $p < .05$ (1)
Math Total: (six classrooms with large gains, five statistically significant at $p < .1$ (1), $p < .01$ (1), $p < .05$ (3) (See Tables 4 and 6).

Cognitive Skills Analysis. The experimental BTA treatment focused on the foundational cognitive skill components within reading and math (Meeker, 1991; Guilford, 1967). The BTA training exercises were based on Accelerated Learning principles with the Hierarchy of Thinking (Erland, 1989c), and on formerly successful training applications (Erland, 1994, 1992, 1989a) of Accelerated Learning (Lozanov, 1978).

Reading and math gains consistent with those measured earlier by Science Research Associates Tests (SRA, 1985) were predicted for this study. The BTA training group was expected to evidence achievement gains in reading and math beyond the gains made by the Alternate Media Activity (AMA) group.

Four subtests of the Detroit Tests of Learning Aptitude-2 were applied (Hammill, 1985): visual closure word fragments, visual memory for letter sequences, auditory word series, and following oral directions. These analyses were based on raw scores, derived from the four subtests giving a composite IQ score.

Consistent with predictions, experimental multimedia trained BTA students evidenced greater improvement than did control AMA students on all DTLA-2 cognitive skill tests as verified by the ITBS-CogAT. Cognitive skill results were also compared with former studies (Erland, 1994, 1992, 1989a, 19989b). To test this hypothesis, cognitive skills subtests analyses of the experimental and control groups were reported. See Figure 6.

The Woodcock Johnson (1978) visual perceptual speed and auditory memory subtests were also given as pretest measures to form a baseline indicator for each classroom. These baseline scores were reported as percentiles.

The raw score mean Intelligence Quotient (IQ) pre to posttest gain for the eleven classrooms was eighteen points, with sixteen points as a median score (See Table 9). A former fifth grade study, 5E Linc, (Erland, 1994) reported a mean IQ gain of twenty-four points. By contrast, the fifth grade controls from School 2 had a six point average IQ gain, and a fifth grade former control group had a two point mean IQ gain.

Word Fragments, a visual closure test, showed perceptual improvement gains by all classrooms. The DTLA-2 (Hammill, 1985) Word Fragments, visual closure subtest No. 10, showed a mean of +4.64 raw score point gain compared to the fifth-grade control group of - 1.38 point gain and a former study's control groups mean score of +1.20 raw score point change. The 4E3-class which conducted the study correctly, had a +8.06 mean raw score point improvement. The two fourth-grades (4E1 and 4E2 classes) which fell below the norms on the ITBS achievement test, had good visual closure improvement: the 4E1-class with a mean of +5.13 raw score point gain, and the 4E2-class with a mean of +7.50 raw score point gain. The Visual Closure-Word Fragments pre- to posttests showed marked growth change, and these results are compiled in the study's ancillary documents.

However, these two fourth grade classrooms that fell below the norms in achievement also had the lowest pretest baseline percentiles in visual memory speed (4E1-58%, and 4E2-57%) and auditory memory (4E1-55%, 4E2-37%). Five classrooms had lower pretest baseline

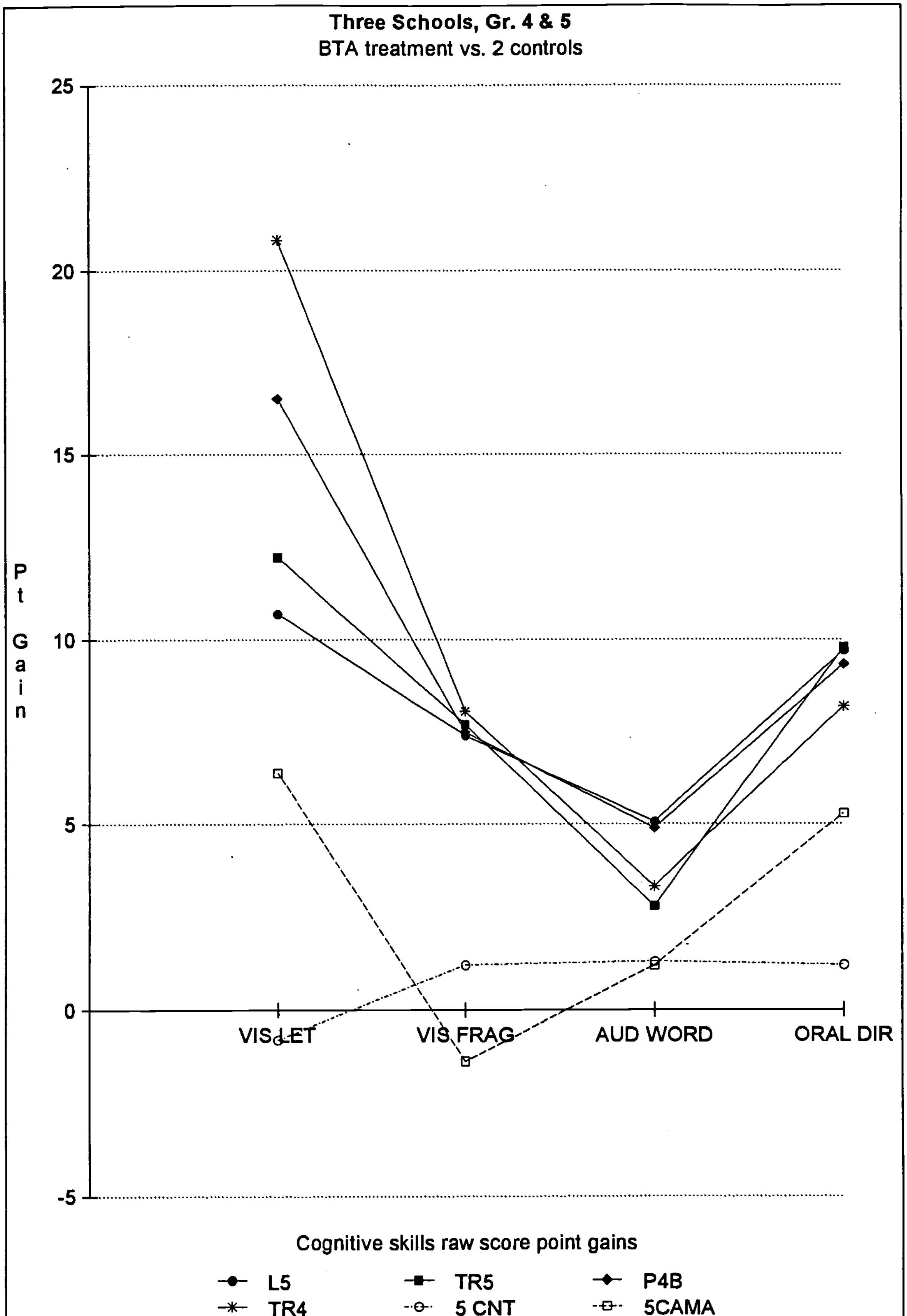
Table 6. Summary Chart of Statistically Significant Gains for Grades 4-8.

Classrooms are by grade and school, grades 4-8.		E & C, 11 subtests analyzed collectively, and 16 subtests analyzed independently	E & Norms, 13 subtests analyzed	Pooled by Grade, E & C, 9 primary subtests	Pooled by Grade, E & National Norms Analyzed: 3-Reading subtests,, 4-Math subtests, Composite & Core Total
Grade 4E3,	14	Collectively with Controls: V, ** RC, ** MCT, ** MPS,** MC,** S,** Cp** U, ** P, ** SS, ** SC** Independently: RC,** RT, * MCT,† MC,† LT**	Com,** V,* RT,* * RC,** MPS, * MC,* LT, ** SS,† CT,** S**	Not Analyzed Controls for E3 school only	Com,** CT ** V,* RC,* RT,** MT,* LT,** S,** SC **
Grade 4E1,	24	No Controls	No Significant Results	No Controls	Com, ** CT ** V,* RC,* RT,** LT,** S,** SC **
Grade 4E2,	20	No Controls	No Significant Results	No Controls	Com, ** CT ** V,* RC,* RT,** LT,** S,** SC **
Grade 5E1,	25	MC,* SS,†	Not Analyzed	SS*	Com,** RC,** RT,** CT, * MC,** MP,** MT,† MCT, ** LT, ** SS,** S**
Grade 5E3,	25	Com, ** SS,** CT,*	Com,** V,* RT,* MCT,† S,** LT,** CT,** SS,** SC**	SS*	Com,** RC,** RT,** CT, * MC,** MP,** MT,† MCT, ** LT, ** SS,** S**
Grade 6 E1,	21	MT,* MPS,†	MCT,** MPS,** MT,** MC,*	MT,†	Com,** V,** RT, † RC,** CT,** MC,** MPS,** MCT,** MT,** LT** SC,** S**
Grade 6 E3,	19	Com,* MC,** SS,**	Com, ** V,* RC,* RT,* MCT,** MPS,* MT,** CT,** MC,** S,* LT,** SS,** SC **	MT,†	Com,** V,** RT, † RC,** CT,** MC,** MPS,** MCT,** MT,** LT** SC,**S**
Grade 7E1,	20	No Controls	No Sig. Gains	No Controls	Com, ** V, ** RT,** CT,** SS,** LT,* S,** SC**
Grade 7 E2,	19	No Controls	Com *	No Controls	Com, ** V, ** RT,** CT,** SS,** LT,* S,** SC**
Grade 7 E3,	25	No Controls	Com,* S*	No Controls	Com, ** V, ** RT,** CT,** SS,**LT,* S** SC**
Grade 8E3,	14	No Controls	Com, * LT,** CT,* S**	No Controls	Pooling data not available

† Sig. p < .1. ** Sig. p < .01 E = Experimentals
* Sig. p < .05 *** Sig. p < .02 C = Controls

Subjects listed as: Com = Composite, V = Vocabulary, RC = Reading Compre, RT = Reading Total, MCT = Math Concepts, MPS = Math Problem-Solving, MT = Math Total, MC = Math Computation, LT = Language Total, U = Usage, P = Punctuation, Cp = Capital., S = Spelling, CT = Core Total, SS = Social Science, and SC= Science

Figure 6.


Three Schools, Gr. 4 & 5
BTA treatment vs. 2 controls
25
20
15
10
5
0
-5
P t G a i n
VIS LET
VIS FRAG
AUD WORD
ORAL DIR
Cognitive skills raw score point gains
L5
TR5
P4B
TR4
5 CNT
5CAMA

composites in auditory memory. Beside the two fourth grade classrooms, the other three with lower auditory memory pretest baselines were 5E3 and 8E3 at 52%, and 7E2 at 46% (See Table 9). Although the two fourth grade classes made some gain in the standardized Cognitive Skills subtest, Auditory Memory for Words, and on the CogAT, math achievement was affected and fell below the norms (see tables 4 and 7). Reading achievement gains were evidenced only when pooled.

The 6E1-class, which missed a week's BTA instruction mid program due to the teacher's absence, also received the lowest auditory (listening) .96 mean raw score point gain. The 7E3-class with minimal statistical gains also had lower cognitive skills gains on all four DTLA-2 subtests. The 5E1- and 5E3-classes also missed several days of BTA instruction preparing for a holiday program. Auditory Memory for Words subtest was affected (1.63 and 2.78 pt. gains, respectively). (See Tables 7 & 8).

The ITBS-CogAT combined test is designed to predict student cognitive skill aptitude. The CogAT scores can help educators identify strong and weak areas of cognitive functioning for each student. Therefore, instruction can be directed toward students' weak skill areas expediently.

School 1 does not apply the ITBS- CogAT. School 2 began the ITBS-CogAT the year of the study. Therefore, only the 1996-1997 pre-posttest percentile scores are available at this time (See Table 10). It is noted that the two partially treated fifth and sixth grade experimental classes that are combined with the corresponding control groups for Building Averages, show no cognitive skill growth on the CogAT. The experimental 5E1 and 6E1 classes complied with the executive criterion measures 50% - 70% of the time (See Table 4). Grades 7E1 and 7E2 were also lower on the compliance scale, 40% to 50%, and showed some decline on cognitive skills as measured by the DTLA-2 (See Table 7).

Table 8

Cognitive skill percentile scores on ITBS-CogAT by grade (two classrooms combined per grade) for School 2.

Building Averages Fall testing	N	Verbal Percentile Pre	Verbal Percentile Post	Quantitative Percentile Pre	Quantitative Percentile Post	Nonverbal Percentile Pre	Nonverbal Percentile Post
Grade 4	51	65	67	58	71 *	59	72 *
Grade 5	56	76	75	77	76	83	81
Grade 6	41	77	72	73	72	81	76
Grade 7	46	84	84	74	74	72	73

* Denotes change. Grades 5 and 6 include the two control groups.

Table 7. Raw score average gains for 15 classrooms for BTA and control groups pre- to posttest point averages on DTLA-2 cognitive skills tests

Compared to an earlier 1994 field study

	N	IQ Pre-test DTLA-2	IQ Post-test DTLA-2	IQ Point Gain	Baseline WDJ 2 & 7 Visual Speed Pre-test % Entry Level	Baseline WDJ 3 & 10 Auditory Memory Pre-test % Entry Level
4,E3	16	95	120	25	64%	67%
5,E3	27	95	116	21	65%	52%
6,E3	24	110	123	13	66%	73%
7,E3	23	117	130	13	79%	72%
8,E3	18	110	122	12	67%	52%
4,E1	23	98	115	17	58%	55%
4,E2	20	92	119	27	57%	37%
5,E1	25	105	121	16	74%	57%
6,E1	21	107	121	14	NA	NA
7,E1	21	105	125	20	64%	60%
7,E2	23	103	119	16	64%	46%
MEAN				18		
Median Average		105	121	16		
	A Previous Study - 1994					
5,E Linc	20	106	130	24	51%	44%
5 Control	26	101	107	6	71%	57%
6 Control	22	Data Not Available				
	A Previous Study - 1994					
5 Control	10	98	100	2	81%	70%

4E3 & 6E3 Scores are Larger Font, as they are Top Two Classes Following the Executive Criterion
6E1 WDJ data not available

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	LETTERS 16 Ave Gain Max Pts 67	WORD FRAGMENTS 10 Ave Gain Max Pts 39	AUDITORY WORDS 6 Ave Gain Max Pts 30	ORAL DIRECTIONS 18 Ave. Gain Max Pts 55
4,E3	20.81	8.06	3.31	8.19
5,E3	12.22	7.70	2.78	9.78
6,E3	2.88	5.13	3.75	5.79
7,E3	6.22	3.52	3.78	2.83
8,E3	8.00	4.00	4.28	2.83
4,E1	12.70	5.13	2.17	7.04
4,E2	16.50	7.50	4.88	9.33
5,E1	14.56	2.48	1.63	7.81
6,E1	8.26	2.83	0.96	7.78
7,E1	16.10	3.48	3.52	5.52
7,E2	9.13	1.26	3.26	5.65
MEAN	11.58	4.64	3.12	6.60
A Previous Study - 1994				
5, E Linc	10.70	7.40	5.05	9.70
5th Control	6.38	-1.38	1.19	5.27
6th Contr	Tests Not Admininstered Correctly: Data Eliminated			
A Previous Study - 1994				
5th Control	-0.80	1.20	1.70	1.20

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Longitudinal Results

First year subsequent longitudinal data became available from both schools, with additional second year longitudinal data submitted from School 1. Subsequent data for grade 8 of both schools were not available as students transferred to various high schools within the city.

This report answers several longitudinal maintenance questions regarding the robust gains for both the experimental and control groups from Schools 1 and 2 (Erland, 1998):

Were the longitudinal scores maintained statistically by both the experimentals (Es) and controls (Cs)? Did one group exceed the scores of the other, and if so, to what extent were they statistically significant, and in which academic subject areas? Did the two Alternate Media Activity (AMA) Groups have similar growth continuance, or was one control class score higher than the other? How did the scores of the fourth grade, conventionally taught, comparison - control group score longitudinally?

Did the high ITBS achievement scores obtained by grades four and six (4E3 and 6E3) from School 1, because they had followed BTA policy, maintain longitudinally, and if so, in which academic subjects? How did these longitudinal BTA/AL treatment scores compare to School 1's former classes of non-BTA/AL years?

How did the longitudinal two-year scores for 4E3, ensuing in grade 7, and 6E3 reaching grade 8, compare proportionately to the immediate post BTA/AI treatment standard scores of the other experimental classes?

Interestingly, School 1 had a high scoring gifted class since early primary grades. How did the BTA/AL of the high scoring 4E3 and 6E3 classes compare to this gifted class longitudinally and parametrically? In which subject areas was there a difference?

Finally, what was the longitudinal outcome of the two lagging, low auditory processing ability fourth grades (4E1 and 4E2) from School 2? Since third grade ITBS testing, these two classes hovered near, or slightly below, the National Norm (NN) expectations. Did they eventually improve?

Immediately following the BTA/AL treatment, these two classes had high cognitive skill growth as measured by the standardized ITBS-CogAT, and also by the DTLA-2 and WDJ-1 Psycho-Educational Battery. Yet, the two classes' Standard Score (DSS) Difference points still fell below the National Norm (NN) growth expectations.

Did this cognitive skill growth eventually translate to higher achievement longitudinal scores the following year? If so, to what extent was the growth, and in which academic subjects?

<u>Longitudinal Results for School 1's 4E3, 5E3, and 6E3 Classes</u>

Tables 9,10, and 11 show the pre- post- longitudinal change as measured and derived from the ITBS standard scores for each of the sixteen subtests.

The 4E3 "star" class, with 98% policy compliance, had five statistically significant 1-year longitudinal post gains: Composite, Core Total, Reading Vocabulary, Math Concepts, and Math Total. However, when this 4E3 class was pooled with the other two fourth grades, 4E1 and 4E2, all academic subtests, except Math Computation, were significant at the < .01 level.(See Table 9)

The second highest scoring classroom, 6E3, with 77% policy compliance, had eleven statistically significant academic subjects longitudinally. Nine of these eleven subtests fell at just the <.1 level. (See Table 11).

Surprisingly, the low-compliance (30%-36%) 5E3, had all fifteen out of sixteen one-year longitudinal academic subtests significant, mostly at the < .01 level following sixth grade (See Table 10).

Two-School Longitudinal Comparison, (Ten Classrooms), of the Experimentals and Controls

Table 12 depicts a statistically significant comparison of the eight experimental classrooms with the 5th and 6th grade control groups from School 2. Of the original eleven experimental classes, three eighth grades had transferred on to various high schools within the city, leaving eight classrooms to complete the study.

Experimental One-Year Longitudinal Gains: The experimental classes revealed fifty-eight academic gains within the thirteen primary subject areas. The three Language Arts subtests, capitalization, punctuation, and usage, were used for evaluation only occasionally as appropriate for Intra-analysis. (See Table 12). Thirty-seven academic subjects were at the <.01 level, twelve academic subjects scored at the <.05 level, and nine academic subjects were at the <.1 level.

Control Groups' One-Year Longitudinal Gains: In contrast, the 6th grade control group had just two statistically significant gains: Reading Comprehension and Math Problem Solving. These two gains made by the 6th grade controls was due to two unusually low DSS gain scores made by the 6E1 experimental class who missed over one week of instruction mid-program. This factor established 6E1s lower 50% - 53% compliance level, and thereby affected subsequent auditory memory and academic achievement (Erland, 1998). These two unusually low scores were Reading Comprehension, 1.52 DSS (NN = 7 DSS), and Problem-Solving, 3.05 DSS, (NN = 11 DSS).

The 5th grade control group did not have any statistically significant longitudinal gains.

Additionally, the 4th grade comparison groups' 1-year longitudinal data were analyzed from School 1. For longitudinal purposes, this classroom could not be considered a viable continuing control group, because the following year it entered a fifth grade, whose teacher had been trained in BTA/AL principles. Although this 5E3 teacher had not fully adopted nor fully applied the BTA/AL techniques, even some application of them would contaminate or skew the scores for longitudinal analysis.

Table 9. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group for Grade 4 (4E3, N=14) on pre-test, post-test and 1-year longitudinal follow-up.

	Compos.	Read. Vocab.	Reading Compreh.	Reading Tot.	Math. Concepts	Math Problems
Pretest						
Ave.	202.57	202.50	208.71	205.57	205.43	207.00
S. D.	17.99	20.47	25.09	20.85	19.32	14.44
Posttest						
Ave.	229.43	223.14	236.86	230.07	221.93	235.93
S.D.	22.73	22.18	23.22	21.84	20.02	22.51
t:	3.47**	2.56*	3.08**	3.04**	2.22*	4.05**
Follow-up						
Ave.	246.07+	238.71*	241.93	240.36	243.07*	249.14
S.D.	25.46	15.12	17.05	15.59	29.70	24.15
t:	1.82†	2.13*	0.66	1.41	2.44*	1.50

	Math Tot.	M. Comp.	Spelling	Capital.	Punctua.
Pretest					
Ave.	206.14	191.50	191.36	199.29	200.29
S. D.	15.11	23.73	19.10	31.23	23.73
Posttest					
Ave.	228.79	221.57	222.64	236.14	237.21
S. D.	19.44	15.32	22.98	25.55	28.30
t:	3.44**	3.98**	3.93**	3.42**	3.74**
Follow-up					
Ave.	246.36+	223.14	237.07	250.14	252.00
S. D.	25.67	20.82	32.76	41.88	35.39
t:	2.04†	0.23	1.32	1.07	1.22

	Usage	Lang Tot.	CoreTot.	Soc. Stud.	Science
Pretest					
Ave.	215.07	201.50	204.29	202.29	192.64
S. D.	32.87	24.17	18.81	19.72	27.59
Posttest					
Ave.	246.00	235.43	231.50	221.86	231.50
S. D.	26.94	20.21	18.45	28.70	38.30
t:	2.72*	4.03**	3.87**	2.10*	3.08**
Follow-up					
Ave.	255.79	248.71	245.07+	238.93	248.86
S. D.	36.04	29.32	20.24	33.43	35.51
t:	0.81	1.37	1.82†	1.42	1.22

Significance levels: * $p < .05$, ** $p < .01$, † $p < .1$

Table 10. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group (N=25) for Grade 5 (5E3) on pre-test, post-test and 1-year follow-up with Student's t values for significant gains.

	Compos.	Reading Vocab.	Reading Compre.	Reading Tot.	Math Concepts	Math Problems
Pretest						
Ave.	218.56**	213.80	218.64	216.24**	214.24	227.16*
S. D.	18.09	20.50	25.40	21.64	19.23	26.23
Posttest						
Ave.	236.04	226.96	231.08	228.96	229.88	238.44
S.D.	19.59	18.69	21.85	19.27	19.77	25.13
t:	3.28**	2.37*	1.86†	2.19*	2.84**	1.55
Follow-up						
Ave.	256.82**	244.18**	252.23**	248.27**	256.00**	268.45**
S.D.	20.12	16.53	24.96	19.82	18.83	21.80
t:	3.70**	3.45**	3.16**	3.49**	4.78**	4.51**

	Math Tot.	M. Comp.	Spelling	Capital.	Punctua.
Pretest					
Ave.	220.60**	210.64	212.00	225.28	229.12
S. D.	20.77	19.91	26.95	32.10	32.10
Posttest					
Ave.	234.20	226.64	231.04	237.44	244.92
S. D.	20.90	17.75	34.88	41.43	36.28
t:	2.31*	3.02**	2.16*	1.16	1.63
Follow-up					
Ave.	262.32**	254.73**	259.86**	270.82**	270.64*
S. D.	19.11	17.56	31.68	37.49	37.78
t:	4.96**	5.63**	3.06**	2.99**	2.46*

	Usage	Lang.	Core Tot.	Soc. Stud.	Science
Pretest					
Ave.	230.76*	224.32**	220.32	209.80**	214.80
S. D.	35.25	26.17	19.77	17.76	21.14
Posttest					
Ave.	251.96	241.28	234.84	231.28	239.84
S. D.	43.05	34.31	21.73	22.73	27.04
t:	1.91†	1.97†	2.47*	3.72**	3.65**
Follow-up					
Ave.	271.18	268.18**	259.59**	242.91	255.68
S. D.	37.33	29.80	20.08	22.47	30.52
t:	1.69	2.96**	4.18**	1.82†	1.94†

Significance levels of t: *: $p < .05$, **: $p < .01$, †: $p < .1$

Table 11. Average standard scores on Iowa Tests of Basic Skills (ITBS) for BTA experimental group Grade 6 (6E3) pre-test (N=20, includes one outlier), post-test N=20, includes one outlier) and 1 year longitudinal follow-up (N=14) with Student's t values for significant gains.

Test	Composit.	Read. Vocab.	Reading Compre.	Reading Total	Math Concepts
Pretest	245.45	240.90	244.85	242.85	236.95
S. D.	18.80	19.56	21.50	16.27	19.67
Posttest	268.90	255.30	259.05	256.70	260.15
S. D.	20.83	16.70	32.54	23.13	23.96
t:	3.74**	2.50*	1.63	2.19*	3.35**
Follow-up	282.54	268.50	281.86	275.29	275.93
S. D.	21.31	23.59	30.37	24.71	18.50
t:	1.86†	1.91†	2.07†	2.24*	2.07†

	Math Probs.	Tot.Math	M.Comput.	Spelling	Capital.
Pretest	253.90	245.40	221.26	229.60	251.85
S. D.	28.47	22.29	14.29	25.95	38.63
Posttest	273.05	266.40	267.78	248.15	278.40
S. D.	25.42	22.27	20.02	32.77	37.93
t:	2.24*	2.98**	8.46**	1.98†	2.19*
Follow-up	289.50	282.71	280.86	267.57	289.00
S. D.	26.54	20.68	22.95	31.31	30.93
t:	1.82†	2.16*	1.77†	1.73†	0.86

	Punctua.	Usage	Lang. Tot.	Core Tot.	Soc.Stud.	Science
Pretest	255.20	249.45	246.55	244.90	238.60	247.75
S. D.	37.69	29.18	28.78	19.37	18.99	23.24
Posttest	285.90	275.90	272.20	265.30	270.30	277.90
S. D.	45.73	36.82	32.21	22.41	24.13	31.36
t:	2.32*	2.52*	2.66*	3.08**	4.62**	3.45**
Follow-up	290.21	298.36	286.14	281.36	280.00	288.79
S. D.	34.51	25.79	26.53	20.85	23.23	31.18
t:	0.30	1.97†	1.33	2.12†	1.17	1.00

Significance levels of t: * p < .05, ** p <.01, † p < .1

Table 12. ITBS 1999 Longitudinal Academic Subject Comparisons of Experimental and Control Groups Gains
Grades 4, 5, 6, & 7 Point Differences of Standard Score Means, (DSSs) Pre- to Post-test and One-Year Longitudinal
Eight Experimental Groups (**58 sig. academic gains**) Comparisons with Two Control Groups (**2 sig. gains**) and ITBS National Norm Expectations

	Composite	Read Total	Vocab	Read Compr	Math Total	Math Concepts	Math Prob Solv	Math Computa	Lang Total	Spell	Core Total	Social Science	Science
CLASS	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA- NN	BTA – NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN	BTA - NN
4th E3 5th grade N = 14	26.86 – 10 16.64 ** 7 pooled	24.50 – 9 10.29** 8 pooled	20.64 – 9 15.57** 8 pooled	28.14 – 9 5.07** 8 pooled	22.64 – 12 17.57**14 pooled	16.51 – 12 21.29**11 pooled	28.93 – 11 13.57**10 pooled	30.07 – 14 1.57 – 13	33.92 – 13 13.29**10 pooled	31.28 – 13 14.43 † 10 pooled	27.21 – 11 13.57**10 pooled	19.57 – 9 17.07**8 pooled	38.86 – 9 17.36** 7
5th E3 6th grade N = 25	17.48 – 9 20.64 – 6	12.72 – 8 20.14** 7	13.16 – 8 18.05* 7	12.44 – 8 21.95* – 7	13.60 – 14 26.45* 10	15.64 – 11 14.53* 10	11.28 – 10 29.41* 8	16.00 – 13 27.77* 11	16.96 – 10 26.05 * 8	19.04 – 10 27.00** 8	14.52 – 10 24.14** 8	22.84 – 8 10.36 † 7 pooled	25.04 – 7 15.64 – 7
6th E3 7th grade N = 19	23.84 – 8 12.67 – 4	15.00 – 7 19.61 – 7	13.10 – 7 16.23 – 7	17.84 – 7 20.62 – 8	21.78 – 10 14.23 – 8	23.26 – 10 10.23 – 9	20.68 – 8 17.77 – 7	46.47 – 11 11.62 – 10	25.57 – 8 11.85 – 8	18.36 – 8 12.67 † 8	21.05 – 8 14.77 – 8	31.31 – 7 8.69 – 7	32.47 – 7 7.46 – 8
4th E1 5th grade N = 24	13.89 – 16 22.77**11 pooled	10.62 – 14 23.36**13 pooled	10.92 – 15 16.86**14 pooled	9.83 – 14 30.05**13 pooled	16.04 – 15 19.82**14 pooled	20.37 – 15 16.32**14 pooled	11.62 – 15 23.09**15 pooled	9.16 – 15 23.50 * 15	15.41 – 16 30.50**14 pooled	15.70 – 17 18.50 † 15 pooled	13.70 – 15 24.91**14 pooled	7.91 – 15 24.45**14 pooled	22.79 – 16 18.14**14 pooled
4th E2 5th grade N = 20	13.50 – 16 24.71**11 pooled	13.85 – 14 23.35**13 pooled	16.45 – 15 23.47**14	11.15 – 14 23.24**13 pooled	11.75 – 15 24.76**14 pooled	12.95 – 15 21.41**14 pooled	10.50 – 15 28.24**15 pooled	15.35 – 15 19.06 – 15	19.20 – 16 26.12**14 pooled	20.50 – 17 18.24 † 15 pooled	14.95 – 15 24.71**14 pooled	6.45 – 15 28.06**14 pooled	15.25 – 16 22.29**14 pooled
5th E1 6th grade N = 25	21.72 – 16 16.88 – 9	17.16 –13 10.72 –12	13.72–14 8.04 – 12	20.48 – 13 13.56 † 10 pooled	23.04 – 14 16.24 – 13	18.72 – 14 15.12 – 13	27.48 – 15 17.80 – 12	33.12 – 15 12.28 – 13	35.64 – 14 16.08 – 12	23.04 – 15 7.52 – 12	25.28 – 14 14.36 * 12 pooled	18.28 – 14 22.68 † 11 pooled	16.60 – 14 22.04 – 11
6th E1 7th grade N = 21	17.04 – 14 12.90 – 7	16.04 – 12 3.43 – 12	16.28 – 12 5.52 – 11	15.71 – 10 1.52 – 10	25.90 – 13 7.71 – 11	21.66 – 13 12.33 – 11	30.14 – 12 3.05 – 11	21.09 – 13 19.19 – 12	27.38 – 12 13.19 – 11	20.95 – 12 12.14 – 10	23.14 – 12 8.09 – 11	6.71 – 11 23.52 – 10	17.14 – 11 11.52 – 10
7th E3 8th grade N = 24	11.00 – 7 10.36 * 4	7.64 – 7 9.73 – 6	7.68 – 7 10.64 † 6	7.80 – 8 8.36 – 7	7.76 – 8 15.68* 7	4.12 – 9 22.91**9	11.24 – 8 8.45 – 6	10.28 – 10 16.73 – 9	9.17 – 8 13.50 † 6	15.76 – 7 7.14 – 8	8.16 – 8 12.95 * 7	10.36 – 7 5.72 – 7	14.36 – 7 2.32 – 11
5th Contrl 6th grade N = 26	19.30 – 16 16.83 – 9	19.03 – 13 8.42 – 12	19.69 – 14 9.00 – 12	19.03 – 13 7.58 – 10	23.65 – 14 13.92 – 13	23.23 – 14 11.67 – 13	23.80 – 15 16.63 – 12	23.42 – 15 16.67 – 13	28.38 – 14 17.46 – 12	21.92 – 15 11.58 – 12	23.69 – 14 13.25 – 12	8.26 – 14 26.33 – 11	25.76 – 14 12.42 – 11
6th Contrl 7th grade N = 22	17.81 – 14 15.63 – 7	15.27 – 12 15.16 – 12	14.86 – 12 9.68 – 11	15.13 – 10 20.68*–10	16.45 – 13 16.26 – 11	14.68 – 13 14.79 – 11	18.72 – 12 17.37 † 11	25.13 – 13 12.84 – 12	26.90 – 12 7.89 – 11	23.40 – 12 1.95 – 10	19.54 – 12 13.11 – 11	15.68 – 11 19.58 – 10	22.81 – 11 15.26 – 10
# Sig. Gains	**4-8**	**4-6**	**5-6**	**5-3**	**5-5**	**5-1**	**4-2**	**2-3**	**5-7**	**5-7**	**6-7**	**5-7**	**3-3**

Note: Each figure of Standard Score Mean Pt. Differences (DSSs) is followed by the National ITBS Norm Expectations (NN) (ITBS Fall & Spring Tables). Under eacl figure is the Longitudinal Mean Pt. Difference (DSSs) and subsequent grade for comparison. Number of Sig. gains is in the final row, followed by the significant gains in original pre-post treatment. Significant gains are highlighted. ** <.01 (37 academic subjects) * <.05 (12 academic subjects) † <.1 (9 academic subjects)

Nevertheless, one-year longitudinal analysis was conducted for this fourth grade comparison group following their completion of the fifth grade. The scores ranged what was typical for School 1 and this teacher: the low was +11 points for Math Computation, (13 points National Norm (NN) DSS expectation) and a high +25 points for Math Concepts (11 points National Norm (NN) DSS expectation).

Averaging the fourth grade no-treatment, comparison groups' scores for the same nine primary ITBS subtests for their post-test to 1-year longitudinal, the DSS gains ranged: a low of +15 DSS pints (1), +17 DSS points (3), three academic subtests ranged +20 to 23 DSS points, and a high of +27 DSS points for Language Arts. With the National Norm (NN) expectations for 4th and 5th grades ranging 9 to 15 DSS points, four of the primary subtests were above the norm expectations. This falls into accordance with School 1s' usual +1 1/2 to 2-year annual gains above the National Norms

Since the 5E3 class had surprisingly high continuance for having inconsistent initial BTA/AL application, with minimal achievement gain, an Intra-analysis for trending of the 5E3 class was made. This analyses compared 5E3 to the 4E3 and 6E3 classes, and also with the National Norm (NN) growth expectations (See Tables 13, 14, 15).

<u>School 1's 4E3 class</u> (98% - 98% compliance) (See Table 13).

Comparing the 4E3s two-year longitudinal post scores to the NN expectations of 6th grade mean scores, in the nine primary ITBS Reading, Math, Language Total and Core Total subtests, the differences ranged +26-39 points. The lowest DSS change was in Math Computation +26 points; the highest DSS change was with Language Total +39 points (See Table 13).

Averaging the nine primary ITBS subtests, the average gain was +34 points over the National Norm (NN) expectations. With NN yearly growth expectations,+7 to 13 points for these subtests, this shows an additional two and one-half to three years' growth in these primary subject areas.

To compare 4E3 with the fourth grade comparison/control group pre to post-test, analyses revealed that 4E3s scores had higher ranges: a low of +9 points in Reading Total, +12 DSS points in Reading Comprehension and Math Computation, to a high of +14 DSS points in the Composite. This is an additional one years' achievement growth.

Two-years longitudinally, the 4E3 class excelled an additional one-year gain over this 4th comparison group, when the second application of Accelerated Learning was received.

<u>School 1's 5E3 class (30% - 36% compliance)</u> (See Table 14).

The Two-year Longitudinal DSS gain, when compared to National Norm (NN) expectations, ranged from a low of +18 points in Reading Total, to a high +45 points in Math Computation. Averaging the nine primary ITBS subtests, and comparing with the NN, was +33 point difference. With the typical National Norms gain expectation +7 to 14 points for the various primary subtests, this is + 2 1/2 to 3 1/2 times over the NN expected gain, or an additional three years' longitudinal academic growth.

School 1's 6E3 class (73% - 77% compliance) (See Table 15) revealed similar change. The Two-year Longitudinal Standard Score Differences (DSSs) (when reaching 8th grade) compared to NN expectations, ranged with two scores at +37 DSS points (Reading Total and Math Computation), to a high +52 DSS points in Math Problem-Solving. The average point gain, compared to the National Norms, for the nine primary subtests was +44 points. With the NN expectation for sixth grade, +7 to +14 points, this is +3 1/2 times the NN expected gain, or three to four years' longitudinal academic growth.

To further evaluate this +3 1/2 to 4 years' growth, the schools' typical yearly growth had to be extrapolated. Annual school trending was analyzed for School 1. This school not only had two-year's longitudinal data, and two successfully treated classes which followed the executive criteria measures 77%-98%, but they also furnished three years of pre-BTA/AL data. School 2's two-year longitudinal data will be submitted in the year 2000.

Averages for three pre- BTA/AL training years was computed for each of the nine ITBS primary subtests: Composite, Reading (2), Math (4), Language Total, and Core Total.

School 1's 1994-1999 Trending Record

Table 16 shows a comparison between the two successful 4E3 and 6E3 classrooms, with the three low-compliance 5E3, 7E3, and 8E3 classes, and with the National Standard Score (NSS) growth expectations. Two- and three- year averages were analyzed. The 4E3, 5E3, 6E3 classes' ITBS two-year longitudinal Standard Scores (SS) were then compared against the National DSS Expectations, and also with grades six, seven, and eight averages.

Interestingly, a gifted class went through School 1 with consistently high achievement scores each year. One analysis included a gifted class (three pre-BTA/AL years), and another analysis did not include this gifted class (two pre-BTA/AL years (See Table 16). The 1997 column's grade 7 score represents this gifted classes' immediate Post BTA/AL having low compliance BTA/AL treatment. This offered a good comparison with the other more typical performing classrooms for School 1.

The low-compliance, gifted 7E3 class (25% to 30% policy compliance) had six longitudinal statistically significant longitudinal gains in achievement compared to the National Norm Expectations. Of these gains, just two are beyond the typical growth pattern of meeting the National Norms, for the 8th grade teacher. This was a +23 DSS (post to one-year longitudinal) test point gain in Math Concepts, and +16 DSS points for Math Total (See Table 12).

Then, comparing the 7E3 BTA/AL post-test nine subject average of +21 points (See Table 9), over cumulative National Norm Expectations, the noticeable gains were in Math Total and Math Problem-Solving: (each, +24 points), Language Total (+28 points), and Core Total (+34 points).

However, the BTA/AL 6E3 classes' DSS scores at the same longitudinal 8th grade point ranges were: a low +14 (Language Arts), mid-scores of +24 (Reading Comprehension and Com-

Table 13.

Fourth Grade Class (4E3) Pre Test and ITBS Longitudinal Data, School 1
Classroom with Complete *98% BTA Application* during BTA initial treatment
20% Multi-Ethnic, Special Needs Students Not Identified

	Pre-tests		Post-tests		Point Diff. vs. Expected Gain
Iowa Test of Basic Skills Subtests	M	SD	M	SD	Pt. Diff
COMPOSITE, 4th grade, (N=14)	202.57	17.99	229.43	22.72	**26.86 - 7**
One-year post longitudinal, 5th grade	229.43	22.72	246.07	25.46	**16.64 - 9**
Two-year post longitudinal, 6th gr. (N=13)	243.92	25.14	**261.54**	23.81	**17.62 - 7**
Nat'l Expected 6th grade mean			229.56	29.98	**20.37 Es Ave.**
Reading Compre. 4th grade, (N=14)	208.71	25.09	236.86	23.22	**28.14 - 9**
One-year post longitudinal, 5th grade	236.86	23.22	241.93	17.05	**5.07- 13**
Two-year post longitudinal, 6th grade	241.23	17.53	**263.08**	24.59	**21.84 - 9**
Nat'l Expected 6th grade mean			227.27	35.34	**18.88 Es Ave.**
Total Reading, 4th grade, (N=14)	205.57	20.85	230.07	21.84	**24.50 - 9**
One-year post longitudinal, 5th grade	230.07	21.84	240.36	15.59	**10.29 - 13**
Two-year post longitudinal, 6th gr (N=13)	239.69	16.02	**256.62**	16.02	**16.92 - 12**
Nat'l Expected 6th grade mean			226.98	29.88	**17.24 Es Ave**
Math Concepts, 4th grade, (N=14)	205.43	19.32	221.93	20.02	**16.50 - 12**
One-year post longitudinal, 5th grade	221.93	20.02	243.21	29.90	**21.29 - 14**
Two-year post longitudinal, 6th gr(N=13)	240.15	28.75	**262.62**	33.78	**22.46 - 13**
Nat'l Expected 6th grade mean			227.58	28.47	**20.08 Es Ave**
Math Problem Solving, 4th gr. (N=14)	207.00	14.44	235.93	22.51	**28.93 - 11**
One-year post longitudinal, 5th grade	235.93	22.51	249.50	23.89	**13.57 - 15**
Two-year post longitudinal, 6th grade	248.54	24.59	**266.54**	32.20	**18.00 - 12**
Nat'l Expected 6th grade mean			229.90	36.31	**20.17 Es Ave**
Total Math, 4th grade, (N=14)	206.14	15.10	228.79	19.44	**22.64 - 12**
One-year post longitudinal, 5th grade	228.79	19.44	246.36	25.67	**17.57 - 14**
Two-year post longitudinal, 6th grade	244.38	25.59	**264.62**	29.71	**20.23 - 10**
Nat'l Expected 6th grade mean			228.74	30.80	**20.15 Es Ave**
Math Computation, 4th grade, (N=14)	191.50	23.73	221.93	15.32	**30.07 - 13**
One-year post longitudinal, 5th grade	221.93	15.32	223.14	20.82	**1.57 - 15**
Two-year post longitudinal, 6th grade	221.54	20.74	**253.92**	25.92	**32.38 - 11**
Nat'l Expected 6th grade mean			228.44	29.34	**21.34 Es Ave**
Language Total, 4th grade, (N=14)	201.50	24.17	235.42	20.21	**33.92 - 12**
One-year post longitudinal, 5th grade	235.42	20.21	248.71	29.32	**13.29 - 14**
Two-year post longitudinal, 6th grade	245.85	28.40	**269.08**	24.97	**23.23 - 8**
Nat'l Expected 6th grade mean			230.96	37.21	**23.48 Es Ave**
Core Literacy Total, 4th grade, (N=14)	204.29	18.81	231.50	18.45	**27.21 - 11**
One-year post longitudinal, 5th grade	231.50	18.45	245.07	20.24	**13.57 - 14**
Two-year post longitudinal, 6th grade	243.23	19.80	**263.38**	19.52	**20.15 - 8**
Nat'l Expected 6th grade mean			228.89	29.98	**20.31 Es Ave**

Table 14.

Fifth Grade Class (5E3) Pre-Test and ITBS Longitudinal Data, School 1
which followed the Executive Criteria 30-36% due diligence
20% Multi-Ethnic, Special Needs Students Not Identified
Experimentals (N = 25)

	Pre-test		Post-test		Point Diff. vs. Expected Gain
Iowa Test of Basic Skills Subtests	M	SD	M	SD	Pt. Diff
COMPOSITE, 5th grade (N = 25)	218.56	18.09	236.04	19.59	**17.48 - 9**
One-year post longitudinal, 6th gr (N=22)	236.18	20.24	256.82	20.12	**20.64 - 6**
Two-year post longitudinal, 7th gr (N=22)	256.82	20.12	**270.18**	24.33	**13.36 - 7**
Nat'l Expected 7th grade mean			240.89	32.59	17.16 Ave.
Reading Comprehension, 5th grade	218.64	25.40	231.08	21.85	**12.44 - 13**
One-year post longitudinal, 6th gr (N=22)	230.27	21.92	252.23	24.96	**21.95 - 7**
Two-year post longitudinal, 7th gr (N=22)	252.23	24.96	**257.95**	31.57	**5.73 - 8**
Nat'l Expected 7th grade mean			238.42	38.59	13.37 Ave.
Total Reading, 5th grade, (N = 25)	216.24	21.64	228.96	21.64	**12.72 - 13**
One-year post longitudinal, 6th gr (N=22)	228.14	19.72	248.27	19.82	**20.14 - 7**
Two-year post longitudinal, 7th gr (N=22)	248.27	19.82	**256.32**	20.88	**8.04 - 7**
Nat'l Expected 7th grade mean			238.25	31.88	13.63 Ave.
Math Concepts, 5th grade, (N = 25)	214.24	19.23	229.88	19.77	**15.64 - 14**
One-year post longitudinal, 6th gr (N=22)	232.63	19.46	256.00	18.83	**23.36 - 10**
Two-year post longitudinal, 7th gr (N=22)	256.00	18.83	**275.18**	17.49	**19.18 - 9**
Nat'l Expected 7th grade mean			239.45	31.13	19.39 Ave.
Math Problem Solving, 5th grade	227.16	26.23	238.44	25.13	**11.28 - 10**
One-year post longitudinal, 6th gr (N=22)	239.05	25.54	268.45	21.80	**29.41 - 8**
Two-year post longitudinal, 7th gr (N=22)	268.45	21.80	**281.68**	30.04	**13.23 - 8**
Nat'l Expected 6th grade mean			241.33	39.52	17.97 Ave.
Total Math, 5th grade, (N = 25)	220.60	20.77	234.20	19.27	**13.60 - 14**
One-year post longitudinal, 6th gr (N=22)	235.86	21.24	262.31	19.11	**26.45 - 10**
Two-year post longitudinal, 7th gr (N=22)	262.31	19.11	**278.59**	22.16	**16.28 - 8**
Nat'l Expected 7th grade mean			240.46	31.27	18.78 Ave.
Math Computation, 5th grade, (N = 25)	210.64	19.66	226.64	17.75	**16.00 - 13**
One-year post longitudinal, 6th gr (N=22)	226.95	18.54	254.73	17.56	**27.77 - 11**
Two-year post longitudinal, 7th gr (N=22)	254.73	17.56	**285.50**	18.28	**30.77 - 10**
Nat'l Expected 7th grade mean			240.60	33.48	24.85 Ave.
Language Total, 5th grade, (N = 25)	224.32	26.17	241.28	34.31	**16.96 - 10**
One-year post longitudinal, 6th gr (N=22)	242.14	34.45	268.18	29.80	**26.04 - 8**
Two-year post longitudinal, 7th gr (N=22)	268.18	29.80	**278.50**	33.40	**10.32 - 8**
Nat'l Expected 7th grade mean			242.15	39.81	17.77 Ave.
Core Literacy Total, 5th grade, (N = 25)	220.32	19.77	234.84	21.73	**14.52 - 10**
One-year post longitudinal, 6th gr (N=22)	235.45	22.18	259.59	20.08	**24.14 - 8**
Two-year post longitudinal, 7th gr (N=22)	259.59	20.08	**271.14**	22.57	**11.55 - 8**
Nat'l Expected 7th grade mean			240.26	32.24	16.77 Ave.

Table 15.

Sixth Grade Class (6E3) Pre-Test and Longitudinal Data, School 1
which followed the Executive Criteria 73%-77% due diligence
20% Multi-Ethnic, Special Needs Students Not Identified
Experimentals (N = 19; longitudinal N = 13)

	Pre-test		Post-test		Point Diff. vs. Expected Gain
Iowa Test of Basic Skills Subtests	M	SD	M	SD	Pt. Diff
COMPOSITE, 6th grade, (N = 19)	247.47	16.92	271.31	18.29	**23.84 - 8**
One-year post longitudinal, 7th gr. (N=13)	273.50	17.14	286.17	17.57	**12.67 - 7**
Two-year post longitudinal, 8th gr. (N=13)	282.54	21.31	**294.69**	16.54	**12.15 - 7**
Nat'l Expected 8th grade mean			250.87	34.56	16.22 Ave.
Reading Compre, 6th grade, (N = 19)	245.31	21.98	263.15	27.59	**17.84 - 7**
One-year post longitudinal, 7th gr. (N=13)	265.77	23.79	286.38	26.24	**20.62 - 8**
Two-year post longitudinal, 8th gr. (N=13)	279.23	29.91	**293.69**	29.17	**14.46 - 7**
Nat'l Expected 8th grade mean			248.89	41.40	17.64 Ave.
Total Reading, 6th grade, (N = 19)	244.15	15.59	259.16	20.91	**15.00 - 7**
One-year post longitudinal, 7th gr. (N=13)	259.54	17.86	278.77	21.84	**19.23 - 7**
Two-year post longitudinal, 8th gr. (N=13)	274.00	25.22	**285.62**	26.29	**11.62 - 6**
Nat'l Expected 8th grade mean			248.79	34.13	15.28 Ave.
Math Concepts, 6th grade, (N = 19)	239.47	16.55	262.73	21.55	**23.26 - 10**
One-year post longitudinal, 7th gr. (N=13)	269.15	20.56	279.38	13.76	**10.23 - 9**
Two-year post longitudinal, 8th gr. (N=13)	276.69	19.02	**294.08**	24.14	**17.38 - 9**
Nat'l Expected 8th grade mean			250.44	33.53	16.96 Ave.
Math Problem Solving, 6th gr (N = 19)	255.21	28.61	275.89	22.60	**20.68 - 8**
One-year post longitudinal, 7th gr. (N=13)	275.38	24.71	293.15	23.67	**17.77 - 8**
Two-year post longitudinal, 8th gr. (N=13)	289.85	27.59	**302.69**	24.19	**9.54 - 6**
Nat'l Expected 8th grade mean			250.94	42.31	16.00 Ave.
Total Math, 6th grade, (N = 19)	247.31	21.14	269.10	19.20	**21.78 - 10**
One-year post longitudinal, 7th gr. (N=13)	272.07	20.75	286.31	16.35	**14.23 - 8**
Two-year post longitudinal, 8th gr. (N=13)	283.23	21.43	**298.54**	23.28	**15.31 - 7**
Nat'l Expected 8th grade mean			250.69	36.08	17.11 Ave.
Math Computation, 6th grade, (N = 19)	221.26	12.68	267.73	20.02	**46.47 - 11**
One-year post longitudinal, 7th gr. (N=13)	272.54	13.84	284.15	20.15	**11.62 - 10**
Two-year post longitudinal, 8th gr. (N=13)	283.08	22.72	**287.77**	20.83	**4.69 - 9**
Nat'l Expected 8th grade mean			251.26	36.84	20.93 Ave.
Language Total, 6th grade, (N = 19)	249.52	26.21	275.10	30.28	**25.57 - 8**
One-year post longitudinal, 7th gr. (N=13)	276.30	28.14	288.15	26.48	**11.85 - 8**
Two-year post longitudinal, 8th gr. (N=13)	286.46	27.58	**294.00**	27.68	**7.53 - 6**
Nat'l Expected 8th grade mean			251.69	41.57	14.98 Ave.
Core Literacy Total, 6th gr, (N = 19)	246.95	17.53	268.00	19.39	**21.05 - 8**
One-year post longitudinal, 7th gr. (N=13)	269.62	17.41	284.38	18.21	**16.38 - 8**
Two-year post longitudinal, 8th gr. (N=13)	281.23	21.69	**292.54**	21.52	**11.31 - 7**
Nat'l Expected 8th grade mean			250.39	33.98	16.25 Ave.

posite), and a high of +34 (Math Concepts) points higher than the gifted class (See Table 8. Compare post 8th BTA 1997 scores with 6E3 longitudinal '98-'99 data, and against the gifted classes' scores. The gifted class' figures are in bold).

Two years' previous pre-BTA/AL data was requested from the school. Unfortunately the 1991-1993 data was not ITBS Form K, but earlier Forms G and H, having dissimilar content, and also did not include NSS scores (Frisbie, D. Iowa Testing Service, 1999). Therefore, three years of School 1's former track-record was accepted for analyses.

Intra-Analyses of Table 8 Summary Chart of the 6E3 and 4E3 classes

Table 17 is an in-depth Intra-analysis of Table 16's comparison of School 1's previous track-record before the BTA/AL intervention.

6E3 experimental class compared to the gifted class.

The gifted classes' one-year longitudinal ITBS scores following the eighth grade, ranged: +10, 17, 21, 23, 24, 28 DSS points in Reading (two subtests), Math (four subtests), Composite, Language Total and Core Total, or nine primary ITBS subtests with an average of +21 DSS points over National Norm expectations.

By comparison, when the 6E3 class entered 8th grade two years later, the Standard Score (SS) growth was compared to the NN expectations and with the other eighth grade classes. (See Table 17). The 6E3 classes' two-years' longitudinal DSS scores were: two lows of +37, and +42, 43, 44, (2) 45, 52, and 58, (average: +44 points). This is twice what the low compliance gifted class scored (+21 points) post-BTA/AL over the NN expectations offering +2 1/2 years' growth beyond what the school normally received.

Additionally, a comparison was analyzed between NN expectations for the eighth grade and the pre-BTA/AL grade eight's two-years' average without the gifted. These DSS points ranged +19, 25, 29, 30, 34 (2), 37 (2), 40 (average: +32 DSS points). Therefore, the 2-year longitudinal post BTA/AL 6E3-class had a +12-point gain beyond the average of the schools' track-record (+44 pts. versus +32 pts. or +12 points difference).

This is approximately an additional one-years' growth for the BTA/AL treated 6E3 class. This also includes the addition of another unusually high-scoring eighth grade class in 1995 that was averaged into the Pre-BTA/AL years that would lower the gains' DSS scores. (See Table 16).

4E3 experimental class compared to the school's track-record without the gifted class.

Now, to compare the 4E3 class' 2 year longitudinal scores with the school's 6th grade track-record that did not include the gifted class. The range was a low of +18 DSS points for Reading Total, and a high of +31 DSS points for Math Computation. (See Table 17). The nine primary ITBS academic subtests averaged +22 DSS.

So therefore, without the gifted class, the average was +22 points, and with the gifted

Table 16.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other
Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

	Bold Figures Are the Gifted Class Scores									
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	4th Grade	5th Grade	6th Grade	Nat'l
	Other Classes			w/o Gifted	with Gifted		Longitudinal	Longitudinal	Longitudinal	SS
Year	1994	1995	1996	Class	Class	1997	98-'99	98-'99	98-'99	Expectat.
ITBS Subtest										
Composite										
grade 3	196.50	197.90	202.57	198.99						186.25
grade 4	**232.80**	224.00	218.56	221.28	225.12	229.43				202.72
grade 5	229.50	**252.10**	247.47	238.49	243.02	236.04	246.07			216.74
grade 6	253.80	248.00	**273.76**	250.90	258.52	271.31	261.54	256.82		229.56
grade 7	272.90	263.40	256.92	264.41		**284.76**		270.18	286.17	240.89
grade 8	276.50	287.60	279.2	281.10		271.35			294.69	250.87
Reading Compre										
grade 3	193.10	198.10	208.71	199.97						187.75
grade 4	**239.60**	229.60	218.64	224.12	229.28	236.86				202.59
grade 5	226.20	**257.70**	245.31	235.76	243.07	236.04	241.93			215.52
grade 6	250.60	241.80	**272.96**	246.20	255.12	263.15	263.08	256.82		227.27
grade 7	266.60	259.60	254.57	260.26		**280.76**		270.18	286.38	238.42
grade 8	270.80	281.40	269.50	273.90		270.14			293.69	248.89
Reading Total										
grade 3	195.00	199.40	205.57	199.99						186.35
grade 4	**231.70**	229.60	216.24	222.92	225.85	230.07				201.24
grade 5	224.20	**249.40**	244.15	234.18	239.25	228.96	240.36			214.76
grade 6	248.40	240.70	**267.68**	244.55	252.26	259.16	256.62	248.27		226.98
grade 7	263.60	256.50	253.14	257.75		**275.32**		256.32	278.77	238.42
grade 8	257.20	277.20	268.40	267.60		264.78			285.62	248.89

Table 16.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other
Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

Bold Figures Are the Gifted Class Scores										
							4th Grade	5th Grade	6th Grade	Nat'l
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	Longitudinal	Longitudinal	Longitudinal	SS
Math Concepts	**1994**	**1995**	**1996**	w/o Gifted	with Gifted	**1997**	**98-'99**	**98-'99**	**98-'99**	**Expectat.**
grade 3	192.20	188.80	205.43	195.48						185.2
grade 4	**227.80**	215.10	214.24	214.67	219.05	221.93				200.35
grade 5	225.70	**240.40**	239.47	232.59	235.19	229.88	243.21			214.61
grade 6	250.50	247.00	267.84	248.75	255.11	262.73	262.62	256.00		227.58
grade 7	275.60	254.90	**273.35**	267.95		**271.96**		275.18	279.38	239.45
grade 8	286.00	289.50	277.40	284.30		259.71			294.08	250.44
Math Prob-Solv										
grade 3	198.30	202.80	207.00	202.70						186.57
grade 4	**236.50**	215.10	227.16	221.13	226.25	235.93				202.85
grade 5	239.10	**256.80**	255.21	247.16	250.37	238.44	249.50			216.89
grade 6	259.00	250.60	**280.60**	254.80	263.40	275.89	266.54	268.45		229.90
grade 7	279.60	262.30	264.64	268.85		291.84		281.68	293.15	241.33
grade 8	294.00	288.60	289.50	290.70		273.78			302.69	250.94
Math Total										
grade 3	195.50	195.90	206.14	199.18						185.89
grade 4	**232.00**	221.20	220.60	201.02	224.60	228.79				201.60
grade 5	232.60	**248.70**	247.31	239.96	242.87	234.20	246.36			215.75
grade 6	254.70	248.90	**274.20**	251.80	259.27	269.10	264.62	262.61		228.74
grade 7	277.60	258.60	262.35	266.18		281.96		278.59	286.31	240.46
grade 8	289.90	289.30	283.50	287.57		273.42			298.54	250.69

Table 16.

School 1 Interclass Longitudinal DSS Comparison

4E3 and 6E3 Classes with BTA-ALCompliance Compared to Other Three Low-Compliance (25-50%) Classrooms (5E3, 7E3, and 8E3)

Bold Figures Are the Gifted Class Scores							4th Grade	5th Grade	6th Grade	Nat'l
	Pre BTA	Pre BTA	Pre BTA	Pre Average	Pre Average	Post BTA	Longitudinal	Longitudinal	Longitudinal	SS
Math Computation	1994	1995	1996	w/o Gifted	with Gifted	1997	98-'99	98-'99	98-'99	Expectat.
grade 3	188.40	185.10	191.50	188.33						185.36
grade 4	**119.70**	214.20	210.64	212.42	181.51	221.93				200.69
grade 5	218.00	**232.00**	221.26	219.63	223.75	226.64	223.14			215.28
grade 6	252.40	265.40	**258.88**	258.90	258.89	267.73	253.92	254.73		228.44
grade 7	270.50	263.00	255.64	263.05		**269.16**		285.50	284.15	240.60
grade 8	284.10	283.60	270.80	279.50		271.93			287.77	251.26
Language Total										
grade 3	190.70	193.10	201.50	195.10						187.50
grade 4	**234.50**	223.20	224.32	223.76	227.34	235.42				204.09
grade 5	235.80	**251.70**	249.52	242.66	245.67	241.28	248.71			218.41
grade 6	259.40	246.60	**277.88**	253.00	261.29	275.10	269.08	268.16		230.96
grade 7	277.10	267.30	262.57	268.99		**287.00**		278.50	288.15	242.15
grade 8	281.10	293.00	289.10	287.73		280.35			294.00	251.69
Core Total										
grade 3	193.80	196.90	204.29	198.33						186.58
grade 4	**232.80**	223.40	220.32	221.86	225.51	231.50				202.31
grade 5	230.80	**249.90**	246.95	238.88	242.55	234.84	245.07			216.31
grade 6	254.10	245.40	**273.28**	249.75	257.59	268.00	263.38	259.59		228.89
grade 7	272.70	267.30	259.35	266.45		**281.44**		271.14	284.38	240.26
grade 8	279.40	293.00	280.30	284.23		272.85			292.54	250.39

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Table 17.

Intra-Analysis of Table 16's Summary Chart.

Table 17 is a longitudinal comparison of the successfully BTA/AL treated 4E3 and 6E3 classes' ITBS Standard Score Point Differences (DSS) with the National Norm Expectations and the schools' former track-record averages.

Academic Subject (ITBS) Point Differences	Comp	Read Comp	Read Total	Math Conc-epts	Math Probs	Math Total	Math Comp	Lang. Total	Core Total	Ave. Gain
6E3 BTA/AL 2-yr 8th Long. with Norms	44	45	37	44	52	48	37	42	43	44
Post 1997 Non-Compliant BTA/AL 8th Gifted & Norm Expectations	21	21	17	10	24	24	21	28	34	21
Pre BTA/AL 8th w/o Gifted Ave. & Norm Expectations	30	25	19	34	40	37	29	37	34	32
4E3 BTA/AL 2-yr 6th Long. and Norm Expectations	32	36	30	35	37	36	26	38	34	34
Pre BTA/AI 6th Ave. Including Gifted & Norm Expectations	29	28	25	27	33	30	31	30	29	29
Pre BTA/AL 6th Ave. w/o Gifted & Norm Expectations	21	19	18	21	25	23	31	22	21	22

Shaded 8th and 6th grade classes = BTA/AL treated classrooms, longitudinal profile.

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class in sixth grade, the average was +29 additional DSS points, or seven extra points. Sixth grade norm DSS growth expectations range of +7 - 14 points. The BTA/AL treated 4E3 two-year longitudinal class, had +34 points, or +5 point gain (approximately one-half year's growth) over the gifted classes' average. They had +12 points average, or a full year over the no-treatment average that did not include the gifted class.

This is evaluating the averages for just the nine primary ITBS subtests. In many instances, the BTA/AL academic growth was +1 1/2 to 2 1/2 years beyond what the school routinely obtained in the ITBS academic subjects.

Additionally, in analyzing the two 4E3 and 6E3 classes longitudinally and comparing it to School 1's track-record average, it should be considered that the 4E3 and 6E3 longitudinal score compilation included the usual ensuing year's conventional teaching.

Projecting the 4E3s next two years beyond 6th grade with a conservative +9-10 point per year, or +18-20 points, the scores will range similarly or even beyond the 6E3s longitudinal averages. Reviewing Table 17, adding +20 points to the +26 to 37 point scores would bring the scores into the high +40s to 50s ranges over National Norm (NN) growth expectations. One subtest, Math Computation, had a lower gain during the fifth grade year.

<u>School 2's 4E1 and 4E2 One-Year Longitudinal Analyses</u>

Table 10 compares School 2's 4E1 and 4E2 low auditory, low achievement classrooms' National Standard Score (NSS) gains, pre- post to 1-year longitudinal (4th to 5th to 6th grades) with other 6th grade classrooms and the DSS expectations.

The two classrooms' WDJ pre-test Visual Speed (subtests 2 & 7 baseline was 58% for 4E1, and 57% for 4E2. The WDJ Auditory Memory baseline (subtests 3 & 10) was 55% for the 4E1 classroom, and a lower 37% for the 4E2 classroom. In this researcher's previous article (Erland, 1998), both visual and auditory memory gains were noted. On the ITBS CogAT test, there was a substantial, yet unusual, gain in the Quantitative and Nonverbal subtests (Drahozal, Riverside Publishing Co. communication).

Table 18. reveals that these two lagging classrooms which fell below the NN (DSS) entering fifth grade, now have scores closely matching gains made by other sixth grade classrooms a year later. While the 4E1 class scores ranged slightly higher than the NN in ITBS achievement, the 4E2 classroom is +20-23 points higher in many of the ITBS academic subtests (NN Expectation for 6th grade is +7 - 14 points). These scores show that these two fourth grades had now caught up to their peers in academic achievement, particularly in reading and math, and were also higher than the National Norm expectations. Reading and Math Summary for 4E1 and 4E2:

<u>Reading Total</u>: 4E1, +9 pts above the National Norms, 4E2, +22 points above the National Norms. <u>Math Total</u>: 4E1, +7 points above the National Norms, 4E2, +14 points above the National Norms.

Table 18.
School 2s' 4E1 and 4E2 Low Auditory Memory Classes Pre BTA/AL Treatment and Post 1-Yr. Longitudinal NSS Comparisons
To Other 6th Grade Classes In That School and The National Norm Expectations

				Reading			Math	Math			
	Composite	Reading	Reading	Total	Math		Total	Computa	Language		
		Vocab	Compreh	NSS	Concepts	Probs.	NSS		Spelling	Capitalizati	Puctuation
3rd Gr. Pre 2 classes	182	182	183	183	175	180	178	172	174	176	173
4E1 Class											
4th Gr. Pre BTA/AL	199	199	203	201	190	199	194	188	189	201	194
5th Gr. Post BTA/AL	213	210	213	212	210	211	210	198	205	208	210
6th Gr. 1-Yr. Post BTA/AL	230	220	237	229	222	230	226	219	222	239	245
4E2 Class											
4th Gr. Pre BTA/AL	206	204	208	206	197	203	200	183	190	207	199
5th Gr. Post BTA/AL	220	221	219	220	210	213	212	199	211	214	221
6th Gr. 1-Yr. Post BTA/AL	243	243	241	242	228	238	233	221	228	247	249
Nat'l SS Fall Expecta											
3rd Gr. Pre BTA/AL	176	175	177	176	173	175	174	171	174	175	177
4th Gr. Pre BTA/AL	192	191	194	192	188	192	190	187	190	192	193
5th Gr. Post BTA/AL	208	206	208	207	203	207	205	203	206	209	209
6th Gr. 1-Yr. Post BTA/AL	222	220	220	220	217	221	219	217	221	223	223
5th Controls, AMA											
5th Gr. Pre AMA	217	213	216	214	212	213	212	205	207	210	210
6th Gr. Post AMA	237	232	235	234	235	239	237	229	229	244	246
6th Controls, AMA											
6th Gr. Pre AMA	238	233	235	234	234	235	235	221	218	241	248
6th 6E1-BTA/AL											
6th Gr. Pre BTA/AL	244	235	248	242	235	239	237	224	229	245	245

Table 18.
School 2s' 4E1 and 4E2 Low Auditory Memory Classes Pre BTA/AL Treatment and Post 1-Yr. Longitudinal NSS Comparisons To Other 6th Grade Classes In That School and The National Norm Expectations

		Lang			
		Total	Core Total	Social Studies	Science
	Usage / Exp	NSS	NSS		
3rd Gr. Pre 2 classes	179	176	179	187	184
4E1 Class					
4th Gr. Pre BTA/AL	194	194	197	201	199
5th Gr. Post BTA/AL	215	210	210	209	222
6th Gr. 1-Yr. Post BTA/AL	243	237	231	228	228
4E2 Class					
4th Gr. Pre BTA/AL	200	199	202	212	214
5th Gr. Post BTA/AL	227	218	217	218	229
6th Gr. 1-Yr. Post BTA/AL	245	242	239	243	255
Nat'l SS Fall Expecta					
3rd Gr. Pre BTA/AL	177	176	175	176	177
4th Gr. Pre BTA/AL	194	192	191	193	193
5th Gr. Post BTA/AL	209	208	207	209	209
6th Gr. 1-Yr. Post BTA/AL	223	223	221	223	223
5th Controls, AMA					
5th Gr. Pre AMA	214	210	212	223	219
6th Gr. Post AMA	238	239	237	229	245
6th Controls, AMA					
6th Gr. Pre AMA	236	236	235	239	240
6th 6E1-BTA/AL					
6th Gr. Pre BTA/AL	247	241	240	248	248

Discussion.

It was hypothesized that the BTA experimental treatment classrooms would have reading and math gains greater than the control groups' gains. The eleven Experimental classrooms had twenty-three academic subject gains statistically significant over the robust controls pre- to post-test: sixty-five were significant over the norms and controls combined. Longitudinally, the experimentals had fifty-eight statistically significant academic subjects over the two control groups. Thirty of these gains were in reading and math, thereby meeting the hypothesis.

The two schools typically obtained one to one and one-half years' growth yearly, dependent upon student and teacher variables. The BTA/AL training provided an additional +1 1/2 to 2 1/2years' academic achievement growth beyond this, creating the three to four years' total gains as revealed by Tables 15, 16, & 17.

Earlier longitudinal studies (Erland, 1999, 1994, 1989b) reported that the previous BTA IAL robust three-year gains maintained, and continued to build in subsequent years. This study concludes that there can be as much as +three- to four-year gains in academic achievement. Extracting the schools' typical achievement record, this brings expectations down to +1 1/2 to 2 1/2 years' additional gain per year when accompanied with good classroom teaching.

Accelerated Learning (AL) techniques and The Bridge To Achievement (The BTA) can offer consistent academic achievement results when taught prescriptively. Required lessons, items, and number of prescribed days should be instructed according to time and task, scope and sequence.

It was fortuitous for the study that the strong application classrooms alternated with each of the misapplied classrooms, and that there was a continuing comparison with the gifted class. This created a contrasting effect, and exposed the treatment's working elements. With the alternate years of slower growth due to BTA/AL misapplication, it is a clear indicator that the BTA/AL cognitive skills eight- or ten-week treatment should be implemented again the following year for maximum effect and continuing growth.

This second treatment is advisable when cognitive skill pre-test measures reveal a class average of less than the 40th percentile rank in visual or auditory memory. Therefore, specific gains would not have to be extrapolated between school years, as gains would be more consistent. Lower achieving students would receive that important second session that has been shown valuable in earlier studies (Erland 1989a, 1989b).

If Accelerated Learning is applied continuously in consecutive semesters or years, consideration would also need to be made for learners with higher and lower capabilities, and should define school achievement goals for student and teacher leadership plans.

Evaluation criteria particularly useful to this study were the works of Feuerstein (1988), Meeker (1991,1968), Gardner (1985), and Lozanov (1978). These researchers are cited because of their ability to apply theory to successful practice.

This study differs from these pedagogical applications because harmony was found through merging these complementary theories by selecting viable elements from each, and applying them in a creative, automated media AL application to expedite performance outcome.

These four acclaimed psychologists have years, even decades, of research and academic achievement results backing their educational pedagogy and practice. Meeker was the graduate student of the eminent psychologist J. P. Guilford, and Feuerstein and Lozanov both studied under the illustrious Swiss child psychologist, Jean Piaget.

Yet, according to a 1999 report by the Thomas B. Fordham Foundation, headed by Chester E. Finn Jr., former Assistant Secretary of Education, Ballou and Podgursky (1999) challenge the lack of solid empirical student achievement results available for applications of Gardner's Theory of Eight Intelligences. Although hundreds of articles have been written on Gardner's Eight Intelligences, and his theory is widely accepted by classroom teachers in raising student motivation and self-esteem, actual prescriptive methods for classroom application become unclear. Therefore, although Gardner's Eight Intelligences lead in current instructional practice, student performance outcome is nonetheless uncertain (Klien, 1999).

Therefore, with four prominent intelligence theories in place, a comparison can be made concerning practice and implementation factors. These measures indicate that there are treatment gains if the executive criteria measures are applied 50% of the time or more, verifying Schuster and Gritton's (1986) predictions.

The essential additional component was the recognition of actual implementation problems and resulting outcome discrepancies. These irregularities were a product not of policy design but of the realities of the implementation. Yet, without these implementation problems, obtaining a clearer understanding of the causal relationships herein would be considerably more speculative.

It is fortuitous for the study that the 7E3-classroom teacher used the BTA worksheets and played the BTA video and audio-tapes, but did not apply the accelerated learning methodology, thinking it inappropriate. This indicates that the results dwell not within the curriculum materials per se, but are dependent upon a prescriptively applied system of accelerated learning techniques. In other words, simply handing out the BTA worksheets will not foster results.

The layers of causes and effects of correct administration of program policy and outcome results were carefully analyzed. The incorporation of longitudinal data analysis was critical to the sorting of various criteria. There is a strong correlation between following accelerated learning principles and outcome.

This study's implementation problems are not an isolated occurrence. Foundation, school district, state education administrators, and market analysts from different geographical regions expressed concern of teacher reluctance to adopt new paradigms requiring teacher training, instructional time, and effort. The application of new media technologies can sometimes be an intimidating addition to the conventional classroom where teachers are already burdened with learning and behavior problems.

Furthermore, a New York Times article (Pollack, 1999) quoted The National Center for Educational Statistics, Washington, DC reporting "Nearly Fifth of Teachers Say They Feel Unqualified." Although the Secretary of Education, Richard W. Riley said the survey evinced "a cry for help," The American Federation of Teachers blamed schools for not being supportive enough. Of teachers surveyed, just 41 percent said they were prepared to implement new methods of teaching. Only 20 percent of teachers said they could integrate educational technology in the grade or subject they taught. And, 28 percent of teachers said they felt very qualified to use student performance assessment techniques. Therefore, new teaching methods and media technologies need to be made available for teachers for effortless application in the classroom.

Undoubtedly, video taping would serve as a tool for schools to duplicate the instruction successfully so their upcoming classes could continue to obtain similar positive results. Future studies should incorporate videotaping of the Accelerated Learning classroom instruction to aid instructional evaluation and teaching. Videotapes become a valuable instructional index because they serve as a training reference for teachers, administrators, and evaluators.

Peer modeling proficiency (Bandura, 1997, 1986, 1971; Kaplan, 1991) with peer interaction is an important element and can be incorporated into DVD-ROM. Two or more paired students can work at a computer terminal and verbally reinforce each other with positive affirmations. Additionally, the students' attention and concentration is better with computerized interaction, as there is less distraction. Teachers also would have less micro-management responsibilities of behavior.

School administrators and teachers determine crucial learning style factors such as seating, room temperature, extraneous noise, and lighting (Dunn & Dunn, 1988, 1987). There will be tradeoffs, as ideal conditions are difficult to replicate across classrooms.

Good auditory memory (listening) is key to learning capability, and must integrate with visual memory for conceptualization to result. Guilford (1986, 1984, 1967), Meeker (1999, 1991, 1969), Reid and Hresko (1981) and Woodcock (1989, 1978, 1977). Auditory memory scores were noticeably affected in this study when BTA application was inconsistent (Erland, 1998).

Unfortunately, the classrooms having students with the lowest auditory memory scores, (4E1, 4E2, 5E3, 7E2, 8E3) had implementation shortcomings, which affected their students' ITBS outcomes. With minimal auditory memory improvement, the achievement gains were limited. Additionally, this study confirms that what gains they initially had, did not maintain longitudinally with high achievement results.

Although the 4E1 class applied most of the Accelerated Learning strategies, several critical encoding-decoding lessons were removed or taught incorrectly. Consequently, the 4E1 class made only a small two-point auditory memory gain (Erland, 1998), resulting in a more conservative DSS gain in Reading and Math over the National Norms.

The 4E2 class, although having slightly lower executive criteria implementation adherence than the 4E1 class, nevertheless consistently applied the Accelerated Learning strategies, cut fewer of the items and lessons, and implemented only one lesson incorrectly, thereby making a more significant five-point Auditory memory gain (Erland, 1998). This translated to higher DSS point gains in Reading and Math over the National Norms than the 4E1 class.

These two low auditory memory fourth grade classrooms from School 2, applied executive criteria BTA/AL policy just 63% to 68%. Nevertheless, they obtained substantial auditory memory gains on the DTLA-2, and ITBS CogAT. Subsequently, they evidenced statistically significant academic achievement results, pre- to post-test, when pooled with the high-scoring 4E3 class from School 1 (Erland, 1999, 1998).

Longitudinally, the 4E1 class had sixteen, or all, academic achievement areas statistically significant, and 4E2 had fifteen subjects (See Table 4). This sudden growth spurt had not occurred before, as these classes met, or hovered slightly below, the National Norms since their ITBS testing in third grade.

Yet, interestingly, these two fourth grade classes were the only School 2 classes that received cognitive skill growth on the CogAT in all three psychological domains of Verbal, Quantitative and Figural (Erland, 1998). It can be speculated that the properly implemented Accelerated Learning techniques, which increased cognitive skill and memory levels, may have created this effect.

As the ITBS-CogAT is designed to do, cognitive skills testing offers schools a blueprint for measuring student aptitudes, learning requirements and prescriptive brain-based instructional methods for teachers and students. Prescriptive measurement and evaluation of cognitive skills can also offer schools an efficient way to identify and train remedial students in the regular classroom.

The other low auditory memory classes (5E3, 7E2 and 8E3) with implementation shortcomings, eliminated Accelerated Learning (AL) components, and therefore made fewer academic achievement gains.

Surprisingly, the 5E3-class, although achieving fewer statistical gains with the BTA treatment (Social Science, $p < .05$), made strong gains in Science and Social Studies, and the class later had robust longitudinal gains (See Table 12). This is because of two factors: 1) a dedicated accelerated-learning (AL) trained teacher the following year reinforced incomplete application of the BTA during the treatment year. Although as sixth graders they did not have the BTA materials to use, these 5E3 students were reinforced with Accelerated Learning methodology accompanied with good instructional teaching. 2) cognitive skill growth does not always show immediate academic achievement test gain. Many times, the mental growth builds with subsequent practice, activates, and becomes evident with achievement score gains in ensuing years (Erland, 1999, 1998, 1994, 1989b; Meeker 1991).

The following year, when the 5E3 teacher subsequently took over the high-scoring 4E3-class, they continued to maintain its longitudinal gains. The teacher had applied some Accelerated Learning techniques, but had eliminated BTA protocol. Consequently, the 5E3 teacher retained the same pattern of obtaining the expected +6 to +20 DSS point gains. Although Accelerated Learning strategies will increase scores (Schuster and Gritton, 1986), the BTA media instruction serves as a performance catalyst, as it did with 4E1, 4E2, 4E3, 5E3, and 6E3 (See

Table 14).

The proficient 6E3 teacher typically attained +11 to +20 pt- gains in standard scores (See Table 15). For the 1996-year with the gifted students, the SS point gain ranged higher, +16 to +25 points. Yet, in the year of the BTA study without the gifted, this teacher's DSS point gains ranged from +15 to +46 points with an average of +44 points over the National Norm expectations two years following the BTA/AL treatment. Nonetheless, the formerly low-compliance 5E3 class with the low auditory memory scores now had gains due to the subsequent AL booster training.

The principal and Site Supervisor expressed puzzlement over the high performing seventh grade class that had a long, continuous record of high ITBS achievement test success (See Tables 7 and 12) since the early primary grades. They did not realize that this class had high cognitive skills test scores as an aggregate group. It can be an anomaly not to have a few low cognitive skill-functioning students in a classroom.

However, even the brightest students can lose their peak performance edge when their classroom instruction lacks prescriptive instructional techniques. This study demonstrates that it is therefore possible for slower or lower cognitive level students receiving better instruction, to pass gifted students having average instruction. The lower- to-average cognitive skill students became retrained, and raised to higher learning ability levels. With the good AL instruction, they surpassed, or at the very least, matched the gifted 7E3 in ITBS DSS point gain (See Tables 16 and 17).

Consequently, the critical Accelerated Learning elements that become the catalysts for future instructional improvement, were revealed and documented by the irregular implementation factors. The executive criteria measures were prescriptively monitored and scored on classroom visitation criterion checklists (Erland, 1999, 1998). Additionally, a criterion referenced performance baseline was formed by the study. This growth index continues even when followed by teachers teaching with traditional, conventional methods (See Tables 15, 16, & 17).

Additionally, earlier studies (Erland, 1989a, 1989b) reported that The BTA/AL training had longitudinal maintenance gains by adult learners as well as with younger students.

In one published study (Erland, 1995, 1989a), a Multivariate Analysis of Covariance (MANCOVA) Using 7 Dependent Variables, revealed that the experimentals had evidenced the same amount of statistically significant cognitive skill and memory improvement for a wide range of ages (nine to adult), and ability levels (low to high).

For this earlier study, the independent variables were group, age, and pace. Group: experimentals and controls. Age: two age groups, 10-15, versus 16 to adult. Pace: included two varying cognitive skill ability levels of low and high. There was a significant overall main effect for the experimentals, $F=26.55$, $p < .01$. There were no significant main effects for age and pace.

Caveats.

Accelerated Learning (AL) techniques and The Bridge To Achievement (The BTA) can offer consistent academic achievement results when taught prescriptively. Required lessons, items, and number of prescribed days should be instructed according to time and task, scope and sequence.

Furthermore, Accelerated Learning (AL) techniques should be taught according to what empirical data validates. Although the works of Lozanov, (1978) and Schuster and Gritton, (1986) have field research- data support, their important constructs of adding baroque music of varying dynamics, and extensive visualization exercises of Concert Reading 1 and 2 were not applied in this study due to time and logistics restraints.

These creative techniques have proven to be most effective in carefully controlled settings when applied by experts. Yet, practicing them in conservative settings such as schools, or in corporate training sessions with large seated groups of participants, without the supervision of a trained psychologist or certified AL practitioner, can have uncertain reactions or outcomes.

None the less, the fifteen accelerated learning (AL) methods listed in the Training and Procedures section, by Fairbanks (1991), were prescriptively applied,[1] while the standard AL concert readings, extensive visualizing of places and events, and progressive relaxation techniques were not applied. Other behavioral accelerated learning embellishments of balloons, flowers, and candy were not needed to obtain measurable change in thinking, memory, and learning ability.

More specifically, visualization was taught in brief segments of placing a picture in the mind, according to the earlier constructs of Gillingham (1970, Orton-Gillingham) and Fernald (1943), well known for their successful work with learning problems and Dyslexia.

Often, creative fun-filled activities serve as the principle centerpiece of accelerated learning. The AL application is not an end to itself, but should enhance learning within a specific curriculum or training construct. While these AL enhancements do remove barriers to learning, they should be used with a plan in mind and accompanied with solid instruction or training.

Unfortunately, when AL methods are given piece-meal, abridged, or modified beyond recognition, solid, measurable, scientific results become problematical. That is not to say that the average teacher or trainer can not add creative AL applications as needed, nor do they need to have the technical expertise of this researcher - practitioner to experience motivational and learning success in the classroom.

Moreover, this study confirms that training auditory sequential memory is necessary for visual/auditory integration leading to conceptualization, and for the learning of technical material.

Unfortunately, the indiscriminate application of music can be contra-indicatory for auditory training, particularly with large groups, as it can create mental interference for some left-brain dominant learners.

Furthermore, some students or cultures may find music distracting as they may reflect upon the melody, theme, orchestration, tempo, harmony, composer, or arrangement rather than being on task in a mental exercise format. Yet, if used within a prescriptive method for a specific training objective, it can be quite successful. Each training situation is unique and the learners require consideration according to the instructional objectives, size, or content of the class.

Software applications into DVD-ROM would produce positive results because the electronic medium can effectively regulate systematic BTA implementation of the nineteen executive criteria measures within Fairbanks's (1991) fifteen AL principles.

Additionally, to eliminate performance problems due to teachers' varying acceptance of teaching additional curricula outside their in-place lesson plans, the instruction would be best automated. This automation would also support teachers' review of the prescriptive teaching strategies and understanding the theories and rationale behind the instruction.

Ideal for Distance Learning applications and laptop computer projections for larger instructional groups, the teacher would not be eliminated from this specialized instruction. The automated instruction could be accompanied with warm, dynamic facilitator-student coaching interaction. Yet, alternatively, this instruction could also be applied to computer stations, requiring less teacher supervision, with participants working in pairs, for independent learning success.

Conclusion.

With cognitive skills malleable and correctable, with all learning pathways treatable to become optimally operational, we do not have to settle for what basic nature and nurture, our environment, gives us for information processing capability.

Erland (1989a) discovered by clinically assessing over a thousand individuals in a wide range of ages, ability levels, and walks-of- life, everyone had areas of cognitive skills or memory levels that could be enhanced. Whether individuals are gifted, of average abilities, or remedial, (as with Attention Deficit Disorder, or ADHD) cognitive skills can be further developed to enable individuals to reach higher potentials. Average or low average performance no longer interfaces with the technological age.

Then, through almost two decades of test-teach-revise-test iterations, Erland (1998, 1994, 1989a, 1989b) determined that minds are renewable and retrainable through creative prescriptive exercise. Furthermore, if learning problems can be alleviated or eliminated, by application of a cognitive skill - AL methodology such as the one applied in this study, the training should be available for schools to assist all students with learning. Accelerated Learning offers the necessary bridge to achieving and maintaining high academic performance.

It can therefore be concluded that if students receive Accelerated Learning methodology in early grade school years, they can synergistically carry cognitive skill, memory, and academic achievement growth forward through their formative years into adulthood (Erland, 1995, 1989b).

Additionally, if adults can improve their learning proficiency through improved information processing capability, they can maintain a vital edge in the high performance workplace (Erland, 1999, 1997). The wide range of solid results for the BTA/AL experimental classes demonstrates the strength and viability of Accelerated Learning to open avenues for instruction in a variety of settings, ages, and with multiple populations.

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Endnotes

[1] Fairbanks, D. (1992). The fifteen Accelerated Learning methods applied: Rhythm and vocal intonation, speech patterning, imagery and visualization, addressing the physical environment, motivational exercises, positive affirmations, addressing barriers to learning, the review of material, playful multi-modal learning, active presentation in learning, understanding how the brain works, teaching with creativity, accommodating diverse learning styles, empowering learners and teachers, emphasizing relationships and systems thinking, maximizing utilization of training time, using methods of relaxation.

A Review of David Bohm, Ph.D. (1994)
Thought As A System

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Thought As A System is the edited transcript of a seminar held in Ojai, California between November 31 and December 2nd 1990. Noted physicist and best selling author Dr. David Bohm, Ph.D., conducted the seminar.

Can thought be aware of itself? That was the central question posed. No sooner was this formidable question raised than a warning was issued to keep the question stationary. The warning was not to allow thought to produce 'beyond thought,' saying "I did not produce it. It was already there." This is a most dangerous source of confusion, Bohm urges. The scientific discipline he brings to bear on this highly subjective topic is both exceptional and necessary. Facts, principles and questions follow each other step by step in ways that lead the reader to see more clearly what really is and what is not, beginning with the explanation that one will never rid thought of incoherence. The latter may be a shocking statement to many. Bohm guides us to seeing that it is so:

> " Whatever thought represents can become how you perceive it. Outside you can correct for incoherence but inside it is much harder. Thought presents itself as separate from perception as just telling you the way things are."

Bohm begins by showing us that thought is a process; it is neurophysical, intellectual and emotional; one part of the system can not be separate from another. Showing how thought acts as a reflex, however more subtle and complex than most, it is no wonder that the notion of necessity is critical to our whole ordering of thought. And so can be its opposite, which is contingency, Bohm points out. Going no deeper into the inquiry than to substitute contingency for the powerful thought reflex the force of necessity would by itself solve the majority of our social and personal problems.

Digging without disturbing the central question is a key element in this inquiry. Why? Because, as Bohm methodically and clearly shows, thought has a fault throughout the system everywhere and nowhere. As thought is fragmented, it produces that problem. But, we don't see that our intentions are incoherent. At one end of the stick are the words used by a society — their shared version of wisdom. And at the opposite end arises the question " is there the unconditioned?" The incoherence in thought and the use of words at one end of the stick and the location of the unconditioned at the other end, if in fact it does exist, is summed up when Bohm expresses the fault in thought this way:

"There is no limit to how far you can extend thought, saying now we can grasp this. Tomorrow we could grasp more. We could go on indefinitely. But each thought is limited. Thought is limited in what it can grasp. Thought does not grasp the whole. What is missing is that we have to see that thought is actually participating in perception. Not to see that participation is a crucial mistake."

In order to rid thought of its participation in reality the reader is introduced to proprioception by first seeing what physical proprioception is. If you move any part of your body, you know that you have moved it. The movement resulted from your intention. Time, observer and thought do not enter into the action. Bohm cites this case where the quality of physical proprioception was lost by an individual and severe consequences resulted. A woman in bed in a dark room could not see that her left hand had struck her right arm. She mistakenly thought she had been struck by someone else and began to fight off her attacker, who struck back after each blow landed. Only when the lights were turned on could she see that she had struggled by herself with herself. No less severe are those results than are the ones we live with personally and as a society from day to day due to the our lack of 'proprioception in thought.'

"Since everyone does not share the same assumptions, it is easy to see that each of us has a way of hiding his or her assumptions." In *Thought As A System,* Bohm uncovers the basic fact that the brain is set up to hide assumptions. "These assumptions are merely hidden reflexes. These hidden reflexes trigger electrochemical charges in the brain that together cause thoughts and feelings to participate in reality which blocks 'proprioception in thought' from occurring." After pointing this out, Bohm urges us to put our assumptions into words. The reflexes tend to hide causing tension. "Finding the words" gets behind the tension and the reflex loosens, but needs continual *watchfulness*. Some people may not like the word "proprioception", saying it is presumptive — like any other word, only a word — yet insight and feel is necessary.

Bohm concludes that "to reach an intellectual conclusion is not enough. That alone is not enough to change the reflexes. "Thought as a system, as a material process, implies that an electrochemical change in the brain is called for." What is suggested is not a cure; it is being done to learn. It won't change anything if you try to change, for it is still incoherent. The button that will make the machine go is words. "We have to dig until we find the words."

Bohm further concludes, "to form meaningful dialogue groups is the ground for this type of learning to occur." The digging to place our assumptions into words is Bohm's battleground for peace within ourselves, in the long run and with the world. "The suggestion is that we shouldn't think of it as a task. The whole point of dialogue is that we are not going to have an agenda or purpose. We are going to *see* the meaning and act accordingly."

Sources of reference information on accelerated learning

The easiest access to published information on accelerative (-ed) learning, SALT, suggestopedia, and Super Learning is through the ERIC system available in many university and college libraries. Secondary sources are *Dissertation Abstracts* and *Psychological Abstracts* along with the periodic author and topic indices of the *Journal of Accelerative Learning and Teaching.* Chapter 3 of *Suggestive Accelerative Learning Techniques* (1986) by Schuster and Gritton [University of Toronto Press] has an extensive review of the literature then available.

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