EDUCATIONAL OUTCOMES OF PSYCHIATRIC INPATIENTS IN A STATE HOSPITAL ADULT LITERACY PROGRAM

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ABSTRACT

Hospitalized individuals with psychiatric problems often exhibit poor educational skills. The present study examined educational outcomes of psychiatric inpatients in response to literacy instruction. The Woodcock-Johnson Psycho-Educational Battery-Revised (Woodcock & Johnson, 1989, 1990) measured participants' reading and mathematics performance before and one year after the enrollment in the Adult Literacy Program at Hawai'i State Hospital. In addition, the effects of individual characteristics such as developmental status and ESL were explained. Multivariate analyses demonstrated positive outcomes of participants in mathematics ($p = .004$) and vocabulary ($p = .001$) and an effect of developmental status on the vocabulary outcomes ($p = .018$) with the ESL status entered into the analysis as a control variable, suggesting that the psychiatric inpatients with developmental disability improved vocabulary skills.

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CHAPTER 1: INTRODUCTION

During the past three decades, the presence of a large number of illiterate adult populations in the world has stimulated much research on adult literacy. UNESCO (2004) has estimated that 862 million adults in the world today are unable to read and write. In the United States, the 1992 National Adult Literacy Survey (NALS) of the Department of Education reported that 40 to 44 million American adults scored in the lowest reading level (Level 1 of Levels 1-5) and were classified as "functionally illiterate." This means they lacked the reading skills necessary to understand basic written materials. In addition, the survey found that over 90 million adults, representing almost half of the adults in the United States, lack some literacy skills (Ad Hoc Committee on Health Literacy, 1999). The NALS drafted a definition of adult literacy that has grown in popularity among American educators: "using printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential" (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. 2).

An ERIC search in December of 2003 indicated that 797 articles on adult literacy were published between 1974 and 1983, compared with 2,830 between 1984 and 1993, and 2,816 between 1994 and 2003 (Educational Resources Information Center, 2003). Despite the fact that adult literacy has received considerable attention in research over the past three decades, published adult literacy studies typically have concentrated on healthy adult individuals. Individuals with psychiatric disabilities, for example, have often been ignored or have not been studied. The limited data available indicate that individuals with psychiatric disabilities lack basic literacy skills. According to NALS, about 75% of adults with a mental health problem are either "functionally illiterate" or "marginally literate" as

compared to about 50% of general population (Kirsch et al., 1993). In these results, however, factors such as education and poverty that might be associated with mental illness were not controlled for (Sentell & Shumway, 2003). Other studies also indicate that reading levels among psychiatric populations tend to be significantly lower than in the general population (e.g., Currier, Sitzman, & Trenton, 2001). In 1978, Coles, Roth, and Pollack reported almost half of 48 psychiatric inpatients in a state hospital read below a fourth-grade level. In 1980, Berg and Hammitt administered word recognition and reading comprehension subtests of the Peabody Individual Achievement Test (PIAT) (Dunn & Markwardt, 1970) to 100 adult psychiatric inpatients at a state hospital. Fifty-four percent scored below a seventh-grade level on reading comprehension as compared with 20% of the general population.

Other achievement tests were used to measure literacy levels of adult psychiatric populations. Baker, Johnson, Velli, and Wiley (1996) administered the Wide Range Achievement Test-Reading (WRAT-R) (Jastak & Jastak, 1984) to 57 adults over age 50 recruited from the partial hospitalization program in a community mental health center ($n = 17$), an inpatient psychiatric unit ($n = 24$), and two-high rise residences for senior citizens ($n = 16$). Of the 57, 27 were reading below a seventh-grade level. Of the 57, only 10 were reading at a 10th-grade level or above. In 1999, Christensen and Grace administered the Rapid Estimate of Adult Literacy in Medicine (Davis, Long, & Jackson, 1993) to 45 psychiatric services consumers consisting of the homeless or persons at high risk of homelessness. The test scores indicated that 76% of the participants read at or below an eighth-grade level. In 2001, Currier et al. administered the WRAT-R to randomly sampled 53 walk-in clients at a psychiatric emergency service clinic.

Fifty-three percent of the sample read at or below an eighth-grade level.

While studies in general hospitals also document patients' inadequate literacy skills as consent forms (LoVerde, Prochazka, & Byyny, 1989), health and medical education materials (Doak, Doak, & Root, 1996), and discharge instructions (Williams, Counselman, & Caggiano, 1996) often require reading comprehension exceeding patients' reading skills, low literacy is particularly common among adults with mental illness (Sentell & Shumway, 2003). Hospital documents are written at levels far in excess of literacy skills of most psychiatric patients (Berg & Hammitt, 1980) requiring literacy levels above the levels of psychiatric patients. Berg and Hammitt (1980) found that a minimum reading level required to comprehend hospital documents such as consent forms and release of information was the 10th grade, determined by Flesch Reading Ease Chart (Flesch, 1948) and Gunning Fog Index (Gunning, 1968) (see Schirmer, 2002). Baker et al. (1996) found that a literacy level necessary to understand and complete forms from the Social Security Administration, the community mental health center, and the inpatient unit was the 10th grade, as determined by a computer program (Reference Software International, 1992). Currier et al. (2001) reported that literacy levels at high school or above were required to understand hospital documents such as patient rights handbooks, study consent forms, and hospital general consent forms, determined by the Flesch Reading Ease Chart (Flesch, 1948), using the computer program (Reference Software International, 1992).

The above studies indicate a discrepancy between necessary reading levels of psychiatric populations to comprehend hospital documents (e.g., admission information, directions of hospital, instructions for medications and diets) and their actual reading

levels determined by standardized test scores. Grace and Christensen (1998) reported that chronically mentally ill individuals are particularly vulnerable to the negative effects of low literacy as they cannot function well within most mental health care systems. The mental health care system has faced difficulties communicating with those individuals with limited literacy (Miles & Davis, 1995). Those individuals may not have an ability to read and complete application forms for hospital admission, and to understand the meaning of consent forms because majority of hospital documents and hand-outs are written at a tenth-grade level or above. The prevalence of low literacy may lead to increased recognition of the need to accommodate low-literate individuals in mental health care communication systems; however, in a recent literature search, no documented structured adult literacy programs designed especially for psychiatric populations were found.

The Adult Literacy Program at Hawai'i State Hospital

Psychiatric inpatients may also have educational deficiencies that interfere with rehabilitation efforts. Low literacy extends rehabilitation time and, consequently, slows the process of discharge from the hospital. To alleviate this problem at the Hawai'i State Hospital, the Adult Literacy Program (ALP) targeted patients with poor literacy skills. The program began in January, 2001. Two full-time teachers and other staff members provide approximately 40 students with one-on-one instruction for a duration of 60 min per session. The students learn skills in reading and basic mathematics for two to three hours per week per subject area.

Teaching model. The ALP utilizes the Morningside Model of Generative Instruction (Johnson & Layng, 1994) because of its applicability to diverse populations

and age groups, adaptability to meet needs of individual students, and efficacy in improving literacy skills of the learner. The Morningside model has been developed at the Morningside Academy in Seattle, Washington, a learning laboratory for educational practices and designing educational programs and instructional methods (see www.morningsideacademy.org, 2002). The instructional methods include Precision Teaching (Binder, 1988; Lindsley, 1990), the mathetical instructional design (Gilbert, 1978; Engelmann & Carnine, 1982), Keller and Sherman's personalized system of instruction (Keller, 1968; Sherman, Ruskin, & Semb, 1982), and Whimbey's Think Aloud Problem Solving (Whimbey, Johnson, Williams, & Linden, 1993).

The methods of Precision Teaching are based on principles of behavior analysis stressing accuracy and frequency of behavior. It includes self-assessment of student performance by daily charting, heavy emphasis on fluency, and the use of "learning channels" consisting of inputs and outputs (e.g., input "hear" is paired with output "write") (Binder, 1993; Lindsley, 1994, 1997). The mathetical instructional model consists of three steps of efficient leaning of which there are two types. Those types are (a) demonstrate, prompt, release (Gilbert, 1978) and (b) model, lead, test (Engelmann & Carnine, 1982). The first step is the preparation for the learner to acquire a skill. The teacher describes the skill and actually performs it. In the second stage, the prompt or lead, the learner practices the skill with the teacher's assistance. In the third stage, the learner practices and performs the skill without the teacher's assistance.

Positive achievement outcomes of the Morningside model, using the above methods with both children and adults, have been shown at the Morningside Academy and other educational settings. For example, students at Fort Fraser Elementary School in

British Columbia, primarily serving rural Native American students, showed gains on the Canadian Tests of Basic Skills (King-Shaw, Hieronymus, & Scannel, 1989). Third-grade students were tracked over a three-year period. Before the Morningside curriculum was introduced, the third-grade students at the Fort Fraser Elementary School scored at the 31st percentile in reading when compared with their peers across Canada. When they took the tests two years later, they performed at the 48th percentile. In addition, they demonstrated similar gains in mathematics, improving from the 33rd percentile to the 50th percentile during the same period of time. Fifth-grade students who performed at the 29th percentile in reading and the 24th percentile in mathematics were also tracked over a three-year period. After receiving the Morningside curriculum, the fifth-grade students performed at the 50th percentile in reading and the 51st percentile in mathematics on the tests. (www.morningsideacademy.org, 2002).

Positive achievement outcomes of adult populations were also reported. Thirty-two African American males with literacy skills ranging from the second to eighth grade levels gained 1.7 grade levels per month on average at the Seattle Literacy Project (Johnson & Layng, 1994) of the Morningside Academy. After this 12-month project with a total of 20 hours of instruction, 29 of 32 participants achieved eighth grade or higher literacy levels. This is particularly noteworthy because these individuals also had history of homelessness and criminal behavior. Twenty Asian American females with skills between fifth- and eighth-grade levels also entered the Seattle Literacy Project. Of 20 participants, 19 attained literacy skills at or above an eighth-grade level. The average gain of the 20 participants was 2.1 grade levels per month (Johnson & Layng, 1992).

At Malcolm X College in Chicago, serving predominantly urban African

American students, 33 high school graduates with the fifth-grade mathematics skills entered a program utilizing the mathematics curriculum of the Morningside Model. During the six-week program with about 12 hours of instruction per week, these high school graduates made gains between 0.6 and 2.2 grade levels in computation, problem solving, and mathematical concepts (Johnson & Layng, 1992). These studies demonstrate the efficacy of the Morningside program across different populations (African Americans, Caucasians, and Native Americans) and age groups (children and adults).

The Morningside model was utilized in the ALP at Hawai'i State Hospital for several reasons. First, background characteristics of a number of participants in Morningside programs (e.g., Seattle Literacy Project) are at least somewhat comparable to adult psychiatric populations. The participants included the retarded, the behavior-disordered, persons with criminal records and at risk of homelessness (Johnson & Layng, 1992). Second, educational levels of the students were specifically comparable to that of adult psychiatric populations; the entry educational levels in reading and mathematics are mostly between the second and eighth grades. Third, students in different settings and from different backgrounds consistently demonstrated academic gains of more than one grade level. It should be noted that all of these studies were completed by the Morningside staff and have not been replicated by others. However, the lack of existing literature, the gains discussed by different populations, and the individualized instruction suggested this was a curriculum that should be tested with the Hawai'i State Hospital population.

Instructions. The ALP provides students with individualized one-on-one instruction. Each session is designed in such way that the learner's educational level,

progress, and preferences are considered. The ALP instructional strategies were implemented according to the Morningside Generative Instruction model which is based on two major concepts: fluency and positive reinforcement. Fluency is a goal of the Precision Teaching, a systematic approach by which students must achieve fluency in "tool" skills in order to progress smoothly to more advanced material (Haughton, 1972). Fluency is speed plus accuracy as a definition of "mastery." Typically accuracy alone (e.g., a person scoring 100% on an exam) is used to define "mastery." Adding speed helps "quantify" student performance (e.g., a person scoring 100% on an exam and completing it in 15 min may be consider more proficient than an individual that accurately completes the exam in 70 min). Fluent performance enables the student to perform a skill in the presence of distraction, retain the skill with speed, and use it in real-life settings (Binder, 1988, 1993). Morningside educators have hypothesized that the fluency component has help reduce the need for review that occurs at the beginning of each school year. Tool skills are basic elements of more complex skills for building fluency. Reciting words, writing numbers, and doing single-digit addition and multiplication are examples of tool skills.

For example, in the ALP mathematics curriculum, when a learner can read and write numbers in the Morningside Mathematics Fluency (see Appendix A for the complete list of textbooks) accurately at a high rate of speed, the next goal of the learner is to achieve fluency at higher levels of mathematics skills such as addition and subtraction. This step-by-step approach allows the learner to achieve the next goal of fluency for adding one digit numbers (e.g., 60 problems per minutes) without difficulties in writing and reading numbers (see Johnson & Layng, 1992). After building skills of

additions and subtractions, the learner is taught, models, and practices more complex skills such as multiplications, divisions, fractions, and word problem solving. Advanced students receive instruction in algebra and geometry. The Standard Celeration Chart (Johnson & Layng, 1992) is used as a record of students' progress in a particular skill until fluency of the skill is achieved. The Standard Celeration Chart is also used for reading curricula to record students' progress in both accuracy and speed.

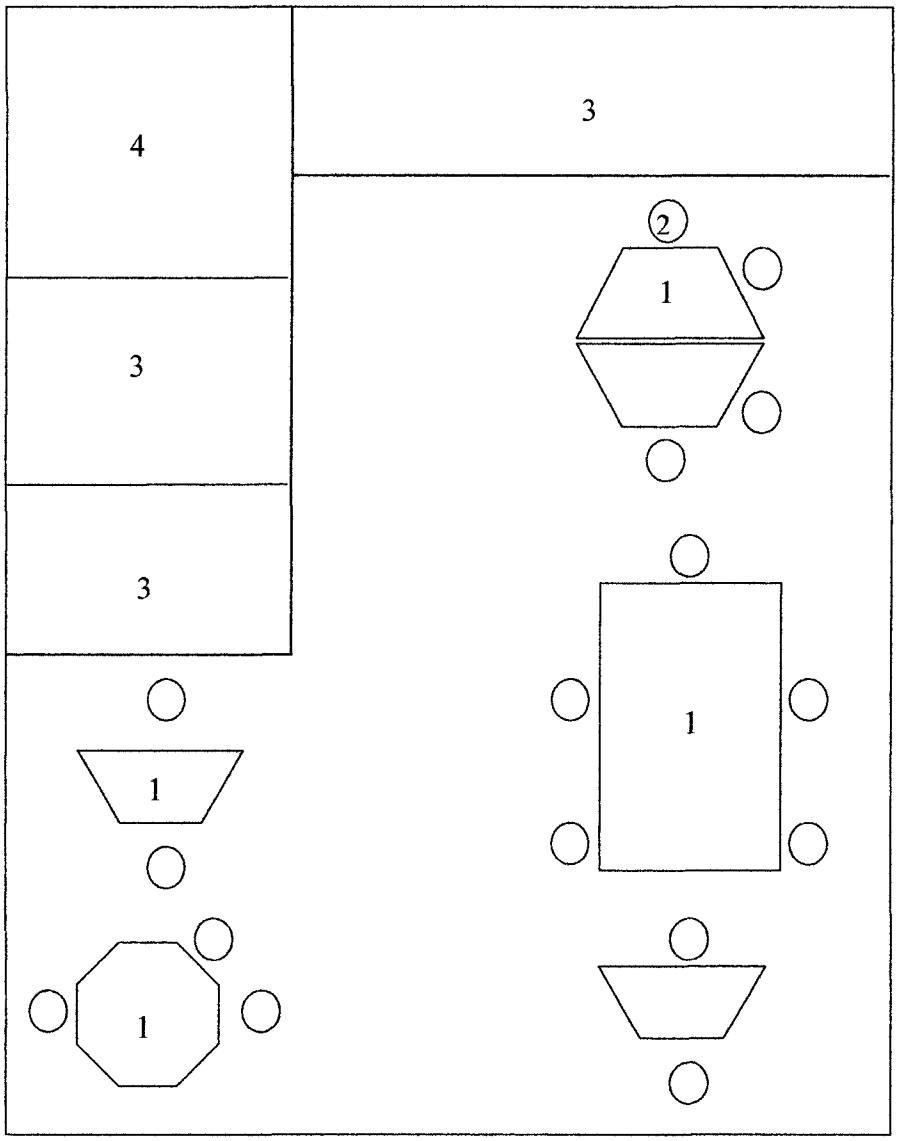
Instructors for students at the lowest level use picture-based textbooks to facilitate the students' understanding words. Students with the intermediate literacy level learn paragraph reading, writing, and comprehension. At the advanced level, students are taught complicated skills such as analogies, antonyms, summarizing short story, and stating and retelling the main idea of a story. Lists of vocabulary words are used to build to fluency. Each lesson is designed based on students' previous performance. As students master initial vocabulary words, more difficult words are added. For example, for the intermediate reader, time is provided to the student to read a short story in an appropriate textbook. Mistakes are corrected with immediate feedback (e.g., the instructor demonstrates correct performance). Students' correct responses are praised immediately after the responses. This allows the students to distinguish between correct and incorrect performance. Hesitation and difficulty in reading words are monitored. The student reviews those words and learns more difficult words in the next lesson. A variety of instructional texts (see Appendix A) are used to aid instructions in the ALP. Texts are selected according to students' literacy levels and their preferences. All instructional activities described above are hands-on, interactive, and individually tailored.

Personnel. Personnel in the ALP consist of two full-time instructors, one psychologist, and six graduate students in social work, psychology, and education. Prior to the implementation of the ALP, the two full-time instructors received two weeks of intensive training at the Morningside Academy in Seattle, Washington. Morningside Academy staff members make quarterly visits to provide the ALP instructors with consultation services and training to maintain the quality of educational practices.

Physical space. The ALP classroom was originally located at the hospital barbershop (about 15 feet by 20 feet) in the Hawai'i State Hospital in Kaneohe, O'ahu, Hawai'i. In rare occasions, the classroom was shared with a hospital barber. As of February, 2003, the classroom is located in the Administration building in the Hawai'i State Hospital. Time conflicts with barbering operations have been resolved by moving to a new space. The new classroom space is approximately 500 square feet (20 feet by 25 feet) with a resource room where a computer, textbooks, teacher's manuals, and other educational materials are stored. There are three rooms for the instructors and five instructional tables at which literacy skills are taught one-on-one and face-to-face (see Figure 1).

It is possible that the application of a combination of those instructional methods described previously, or textbooks or physical environment of the ALP is associated with positive or negative educational outcomes for the ALP students. To begin with, the present study examined the educational outcomes of the ALP students. The purpose of this study was to describe the ALP students' reading and mathematics outcomes one year after enrollment in the ALP.

Figure 1. Adult Literacy Classroom layout.



LEGEND

1. Instruction station
2. Instructors' and students' chairs
3. Instructors' rooms
4. Resource room

CHAPTER 2: METHOD

Participants

Fifteen psychiatric inpatients aged 29 to 57 years (15 males, mean age = 44, *SD* = 9.3) who were continuously enrolled in the ALP for one year participated in this study. Participants received one-on-one instruction in reading or/and basic mathematics two to three hours per week. Sessions lasted approximately 60 min. Participants were administered the Woodcock-Johnson Psycho-Educational Battery-Revised (Woodcock & Johnson, 1989, 1990) before the enrollment in the ALP and at 6-month intervals thereafter. Participants' initial test scores and subsequent test scores one year after the initial administration were compared to determine the outcomes of the psychiatric inpatients. The participants included 6 receiving both mathematics and reading instructions who were treated as statistically independent. In total, educational outcomes of 10 mathematics and 11 reading participants were determined. The participants' reported completed education levels ranged from the 6th to 12th grade levels with a mean of 9.9 grades. Participant characteristics included developmental disability and language statuses. Of the 15 participants, 6 were English-as-a-Second Language (ESL) learners from different countries, and 5 had a developmental disability (DD) in addition to severe psychiatric disability. Table 1 provides ethnic backgrounds of the participants.

Table 1

Ethnic Backgrounds of Participants with One Year of Enrollment (n = 15)

Ethnicity	Subgroup	Subtotal
African American		1
Asians		5
Chinese	1	
Filipino	2	
Koreans	1	
Laotian	1	
Hawai'ian		3
Mixed		6
Caucasian Hawai'ian	1	
Chinese Hawai'ian	1	
Filipino Japanese	1	
Filipino German Spanish Hawai'ian	1	
Portuguese Hawai'ian	2	
Total		15

Instruments

Woodcock-Johnson Psycho-Educational Battery-Revised. Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R) (Woodcock & Johnson, 1989, 1990) is a set of commonly used, norm-referenced tests for measuring cognitive abilities and academic achievement. It consists of two sets of tests: Tests of Cognitive Ability and Tests of Achievement. The latter has been used since inception of the ALP. The WJ-R Tests of Achievement (WJRTA) has two parallel forms: Form A (standard) and Form B (supplemental), in order to reduce a participant's familiarity with content of a particular test item and also allow the test administrator flexibility when retesting the same participant. In the ALP, both Form A and Form B are used for measuring reading and mathematics performance. In this study, the WJRTA was used as an instrument to assess the participants' reading and mathematics performance. Each subject area had its

subtests:

1. Reading test consists of four subtests: Letter-Word Identification, Passage Comprehension, Word Attack, and Reading Vocabulary.
2. Mathematics test consists of three subtests: Calculation, Applied Problems, and Quantitative Concepts.

These two sets of subtests on reading and basic mathematics skills define and measure participants' literacy skills.

The reliability and validity of the tests have been calculated by data from the norming sample of 6,359 participants ranging in age from 2 to 95 years (see Woodcock & Mather, 1989, 1990 for complete overviews). The education levels of the norming sample ranged from children beginning kindergarten (K.0) to seniors finishing college (16.9) in over 100 geographically diverse communities in the United States. Internal consistency reliability coefficients were in the mid-.90s for clusters. This indicates good reliability for the broad cognitive and broad achievement clusters. As for the validity of the tests, correlations were typically in the .60 to .70 range when compared to other achievement tests (e.g., PIAT; WRAT-R; Basic Adlerian Scales for Interpersonal Success-Adult Form, Wheeler, Kern, & Curlette, 1993; Kaufman Assessment Battery for Children, Kaufman & Kaufman, 1983; Kaufman Test of Educational Achievement, Kaufman & Kaufman, 1985), indicating adequate concurrent and content, but not construct validity. Intercorrelations between the subtests of WJ-R were performed to estimate construct validity. Correlations among the subtests for each subject area (i.e., reading or writing or mathematics) tended to be higher than that across subject areas (Woodcock & Johnson, 1989, 1990).

Although there is no indication of absence-of-bias results in the examiner's manual (Woodcock & Mather, 1989, 1990) and the sampling did take into account a diverse population; unfortunately, psychiatric populations are not represented. For this reason, whether or not the WJ-R is specifically suitable for psychiatric populations is open to question. However, the reliability and validity calculated on the norm sample of a wide range of cultural diversity (e.g., age, grade level) provided a basis for test selection. The diversity of tested population was based upon variables such as geographic location, community size, sex, ethnicity, and occupation (for adults).

Materials and Apparatus

A test administrator used the WJRTA, scoring sheets, a pencil, and a clipboard attached to the scoring sheets. An answer sheet, a pencil, and an eraser were provided for a participant at the beginning of the test.

Procedure

Measurement. Each participant's literacy skills were measured prior to the ALP instruction by a staff member in the ALP using the WJRTA. Participants' scores from the initial administration of the WJRTA (Pretest) were used to estimate the participants' entering literacy level. Since the ALP admitted its participants throughout the year, each participant's entering date varied. Participants' pretest scores were compared with posttest scores obtained one year after the initial administration (Post).

Grade level was chosen as a unit of measurement to report the students' performance; all numbers reported in this study for reading and mathematics scores are grade levels. The grade levels were obtained from the transformation of students' raw scores (i.e., the number of correct responses). The raw scores are transformed into W

scores (see Rasch, 1960; Woodcock, 1978; Woodcock & Dahl, 1971; Wright & Stone, 1979). For example, if the average W score on the Reading Vocabulary subtest for students in the fifth month of the second grade in the norming sample is 477, then an ALP student who scored 477 on the Reading Vocabulary subtest would receive a 2.5 grade level. The students' mathematics performance was determined by calculating the mean score for the Calculation, Applied Problems, and Quantitative Concepts subtests. The students' reading performance was determined by calculating the mean score for the Letter-Word Identification, Passage Comprehension, Word Attack, and Reading Vocabulary subtests. The students' performance growth defines outcomes and was calculated by subtracting Pretest grade levels from Post grade levels.

Design. The following research questions were designed for both reading and mathematics to determine the educational outcomes of the students enrolled in the ALP for one year.

1. What are the educational outcomes of psychiatric inpatients after one year of enrollment in the ALP?
2. What is the effect of developmental disability status on the students' educational outcomes?
3. What is the effect of language status on the students' educational outcomes?
4. What is the effect of developmental disability status on the students' educational outcomes when the students' language variation is taken into account?

This study was designed to account for individual differences as the students may differ in their outcomes due to their characteristics interacting with one-year instruction in the ALP.

Analysis. A General Linear Model (GLM) repeated-measures Analysis of Variance (ANOVA), using the SPSS Multivariate Analysis of Variance (MANOVA) procedure, was employed to answer all research questions. Dependent variables were the students' mathematics and reading scores. An independent variable was the one-year instruction. Each dependent variable had two measures: pretest scores and posttest scores. Mathematics and reading scores were analyzed separately. First, a repeated-measures ANOVA with instruction as a within-participants factor was performed in order to answer research question 1. The difference between the students' pretest and posttest scores was analyzed to test whether or not the change from Pretest to Post is significant.

Second, participant characteristics were added to the first analysis. Research questions 2, 3, and 4 involved looking at the interaction effect between instruction and individual characteristics. To answer research question 2, a 2 x 2 ANOVA with instruction as a within-participants factor and developmental disability status (DD vs. Non-DD) as a between-participants factor was conducted. The question of interest was whether the students' improvement in test scores from Pretest to Post is greater for students without developmental disability (Non-DD) than for students with developmental disability (DD), or vice versa. The changes from Pretest to Post within each group (DD or Non-DD) were compared. Research question 3 was examined likewise except that language status was used as a characteristic factor. A 2 x 2 ANOVA with instruction as a within-participants factor and language status (ESL vs. Non-ESL) as a between-participants factor was conducted to determine whether students' improvement in educational performance depends on their language status.

Third, in order to answer research question 4, the language status was used as an individual characteristic control variable to investigate the effect of developmental disability status after equalizing the sample in terms of the language status. The control variable was entered into the second analysis used in research question 2. Using the control variable (coded as ESL students = 1, non-ESL students = 0), the 2 x 2 ANOVA with instruction as a within-participants factor and developmental disability status as a between-participants factor was performed again to increase the sensitivity of the analyses. The students' language variations were equalized by the control variable. A .05 alpha level was used for significant tests. A Bonferroni correction was used for multiple comparisons. Individual student data are provided in Appendix B for interested readers.

CHAPTER 3: RESULTS

Mathematics Outcomes (n = 10)

A significant difference between the students' pretest and posttest scores was found in the first analysis for mathematics performance. Results from GLM Multivariate Tests of the within-participants effect of instruction revealed that the students' scores at Post were significantly higher than at Pretest, [Wilks' $\Lambda = .37$, $F(1, 9) = 15.29$, $p = .004$, $\eta^2 = .63$, power = .93]. The students averaged 3.21 ($SD = 1.94$) at Pretest and 4.57 ($SD = 2.58$) at Post with the average growth of 1.36 grades in one year.

In the second analysis, results from the 2 x 2 repeated-measures ANOVA with a within-participants factor of instruction and a between-participants factor of developmental disability status indicated no interaction effect. A significant main effect of instruction on the outcomes was found, [Wilks' $\Lambda = .38$, $F(1, 8) = 13.16$, $p = .007$, $\eta^2 = .62$, power = .89]. The multivariate tests of the within-participants effects are displayed by the GLM procedure (see Table 2). The mean grade levels of students with DD (n = 4) were 2.80 ($SD = 2.23$) at Pretest and 3.74 ($SD = 2.50$) at Post, of students without DD (n = 6) were 3.48 ($SD = 1.90$) at Pretest and 5.12 ($SD = 2.70$) at Post. As shown in Table 3, Bonferroni's pairwise comparisons indicated that the students without DD significantly improved their performance (gain = 1.64 grades) while the students with DD did not (gain = 0.94 grades). The students' growth is graphically depicted in Figure 2. The gain difference between DD and Non-DD was 0.70 grades.

Table 2

Multivariate Tests for Instruction Main Effect and Instruction-by-DD Interaction Effect on Mathematics Outcomes

Effect		Value	*F*	*df*	Error *df*	Sig.
Instruction	Pillai's Trace	.622	13.161(a)	1	8	.007
	Wilks' Lambda	.378	13.161(a)	1	8	.007
	Hotelling's Trace	1.645	13.161(a)	1	8	.007
	Roy's Largest Root	1.645	13.161(a)	1	8	.007
Instruction × DD	Pillai's Trace	.108	.969(a)	1	8	.354
	Wilks' Lambda	.892	.969(a)	1	8	.354
	Hotelling's Trace	.121	.969(a)	1	8	.354
	Roy's Largest Root	.121	.969(a)	1	8	.354

a Exact statistic

Table 3

Bonferroni's Pairwise Comparisons in Students with and without DD Test Scores between Pretest and Post

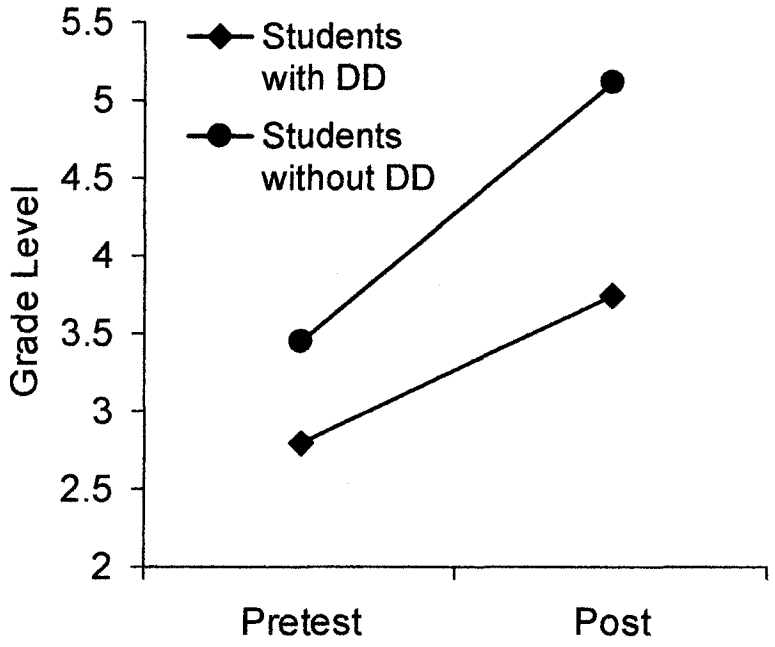
DD	(I) Time	(J) Time	Mean Difference (I-J)	*SE*	Sig.(a)	95% Confidence Interval for Difference(a)	
						Lower Bound	Upper Bound
No	1	2	-1.644(*)	.451	.007	-2.684	-.604
	2	1	1.644(*)	.451	.007	.604	2.684
Yes	1	2	-.943	.552	.126	-2.216	.331
	2	1	.943	.552	.126	-.331	2.216

Based on estimated marginal means

* The mean difference is significant at the .050 level.

a Adjustment for multiple comparisons: Bonferroni.

Figure 2. Mathematics performance of students with and without DD.



In the second analysis, another individual characteristic, the student language status was investigated for it possibly affected the student outcomes. The 2 x 2 repeated-measures ANOVA with a within-participants factor of instruction and a between-participants factor of ESL status was conducted. The results showed no interaction effect between instruction and ESL status, and a significant main effect of instruction, [Wilks' $\Lambda = 0.40$, $F(1, 8) = 11.82$, $p = .009$, $\eta^2 = .60$, power = .85] (see Table 4). Bonferroni's pairwise comparisons (Table 5) indicated that Non-ESL students (n = 8) made significant improvement in one year whereas ESL students (n = 2) did not. The growth rate of the ESL students (gain = 1.85) was higher than that of Non-ESL students (gain = 1.24), however. The ESL students scored 2.27 (*SD* = 0.09) at Pretest and 4.12 (*SD* = 1.77) at Post on average whereas non-ESL students scored 3.44 (*SD* = 2.13) at Pretest and 4.68 (*SD* = 2.83) at Post, such results are plotted in Figure 3.

Table 4

Multivariate Tests for Instruction Main Effect and Instruction-by-ESL Interaction Effect on Mathematics Outcomes

Effect		Value	*F*	*df*	Error *df*	Sig.
Instruction	Pillai's Trace	.596	11.820(a)	1	8	.009
	Wilks' Lambda	.404	11.820(a)	1	8	.009
	Hotelling's Trace	1.477	11.820(a)	1	8	.009
	Roy's Largest Root	1.477	11.820(a)	1	8	.009
Instruction × ESL	Pillai's Trace	.054	.457(a)	1	8	.518
	Wilks' Lambda	.946	.457(a)	1	8	.518
	Hotelling's Trace	.057	.457(a)	1	8	.518
	Roy's Largest Root	.057	.457(a)	1	8	.518

a Exact statistic

Table 5

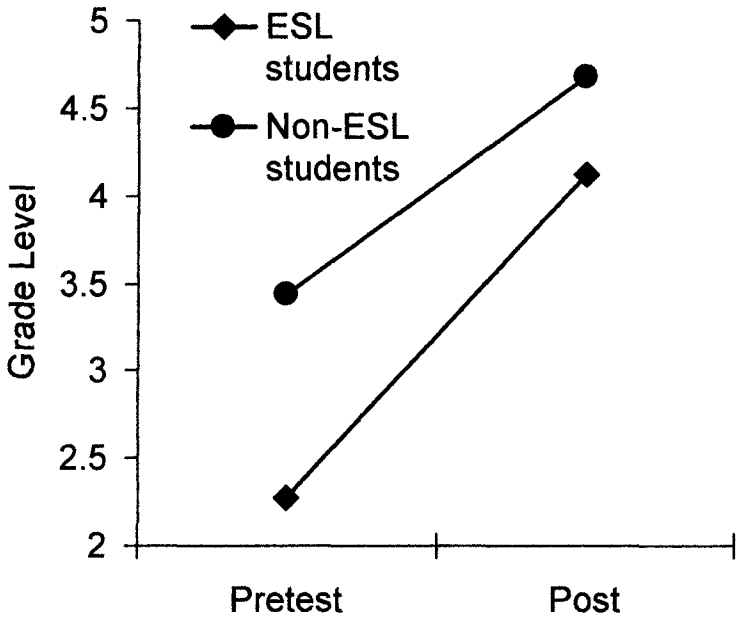
Bonferroni's Pairwise Comparisons in ESL and Non-ESL Student Test Scores between Pretest and Post

ESL	(I) Time	(J) Time	Mean Difference (I-J)	*SE*	Sig.(a)	95% Confidence Interval for Difference(a)	
						Lower Bound	Upper Bound
No	1	2	-1.242(*)	.402	.015	-2.170	-.315
	2	1	1.242(*)	.402	.015	.315	2.170
Yes	1	2	-1.850	.804	.050	-3.705	.005
	2	1	1.850	.804	.050	-.005	3.705

* The mean difference is significant at the .050 level.

a Adjustment for multiple comparisons: Bonferroni.

Figure 3. Mathematics performance of ESL students and Non-ESL students.



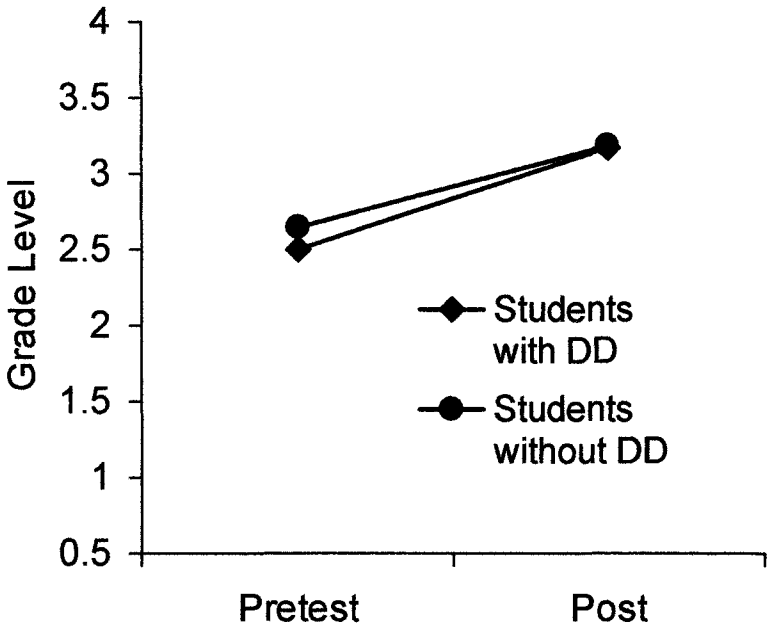
The third analysis was not necessary since students with DD included no ESL learners.

Reading Outcomes (n = 11)

There was no significant growth between Pretest and Post in the students' reading performance. The overall mean grade levels were 3.50 (*SD* = 2.38) at Pretest and 4.08 (*SD* = 2.75) at Post. On average the students grew 0.58 grades in overall reading performance. The students' test scores were further analyzed in terms of student performance for each skill area. The four research questions were reviewed for each subtest performance. A significant growth was found on the Reading Vocabulary subtest scores, [Wilks' $\Lambda = 0.29$, $F(1, 10) = 24.48$, $p = .001$, $\eta^2 = .71$, power = .99]. The students averaged 2.59 (*SD* = 1.83) at Pretest and 3.18 (*SD* = 1.73) at Post, demonstrating a 0.59 grade level gain in one year. No significant growth was found for other subtest performance. The results that follow are of vocabulary outcomes.

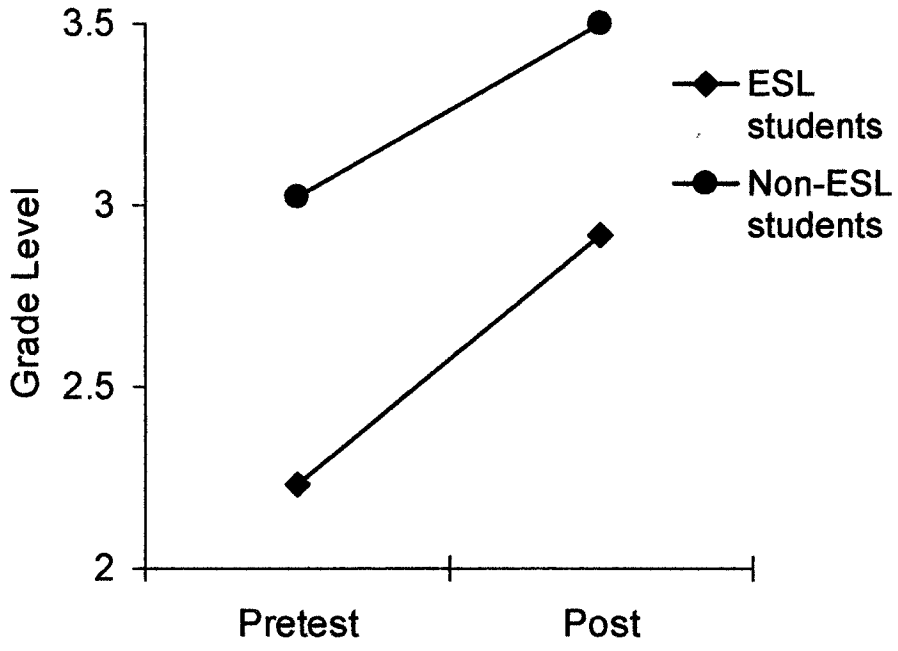
Results from the 2 x 2 repeated-measures ANOVA with a within-participants factor of instruction and a between-participants factor of developmental disability status indicated no interaction effect. A significant main effect of instruction was found, [Wilks' $\Lambda = .29$, $F(1, 9) = 22.29$, $p = .001$, $\eta^2 = .71$, power = .99]. The students with DD (n = 4) averaged 2.50 ($SD = 2.10$) at Pretest, 3.18 ($SD = 2.03$) at Post, and gained 0.68 in one year. The students without DD (n = 7) averaged 2.64 ($SD = 1.83$) at Pretest, 3.19 ($SD = 1.71$) at Post, and gained 0.55 in one year. The students' growth is illustrated in Figure 4. The results from Bonferroni's pairwise comparisons showed that both students with and without DDs demonstrated the significant changes from Pretest to Post in vocabulary performance; $p = .010$, $p = .007$, respectively. The gain difference in vocabulary growth between the students with and without DDs was 0.13 grades.

Figure 4. Vocabulary performance of students with and without DD.



The 2 x 2 repeated-measures ANOVA with instruction as a within-participants factor and language status as a between-participants factor was conducted. Results revealed no interaction effect between instruction and language status. A significant main effect of instruction was found, [Wilks' $\Lambda = 0.283$, $F(1, 9) = 22.81$, $p = .001$, $\eta^2 = .72$, power = .99]. According to Bonferroni's pairwise comparisons, there was significant improvement from Pretest to Post for both ESL (n = 6) and Non-ESL (n = 5) students; $p = .002$, $p = .026$, respectively. The ESL students improved by 0.69 grades, and Non-ESL students improved by 0.48 grades in one year. The growth rate of the ESL students was greater than Non-ESL students. The mean scores for ESL students were lower; 2.23 ($SD = 1.61$) at Pretest, 2.92 ($SD = 1.70$) at Post than for Non-ESL students; 3.02 ($SD = 2.16$) at Pretest, 3.50 ($SD = 1.90$) at Post. The means are plotted in Figure 5.

Figure 5. Vocabulary performance of ESL and Non-ESL students.



A significant instruction-by-DD interaction effect was found with the language status being equal, [Wilks' $\Lambda = 0.48$, $F(1, 8) = 8.74$, $p = .018$, $\eta^2 = .52$, power = .74]. No main effect of instruction was observed. Table 6 provides the results from the multivariate tests. Taking into account the language status, the effects of instruction on the vocabulary outcomes of students with and without DDs were significantly different. Bonferroni's pairwise comparisons showed that the students with DD demonstrated significant improvement from Pretest to Post, $p = .001$, while students without DD did not (Table 7). The change from Pretest to Post was greater for students with DD than for students without DD. With the language status being equal, the scores for students with DD were 0.94 at Pretest and 2.15 at Post with an average gain of 1.21 grades, and for students without DD were 3.53 at Pretest and 3.77 at Post with an average gain of 0.24 grades. The gain difference between DD and Non-DDs was 0.97 compared to 0.13 when the language variation was not controlled for. See Figure 6 in comparison with Figure 4.

Table 6

Multivariate Tests for Instruction Main Effect and Instruction-by-DD Interaction Effect on Vocabulary Outcomes after Controlling for ESL Status.

Effect		Value	*F*	*df*	Error *df*	Sig.
Instruction	Pillai's Trace	.139	1.293(a)	1	8	.288
	Wilks' Lambda	.861	1.293(a)	1	8	.288
	Hotelling's Trace	.162	1.293(a)	1	8	.288
	Roy's Largest Root	.162	1.293(a)	1	8	.288
Instruction × DD	Pillai's Trace	.522	8.743(a)	1	8	.018
	Wilks' Lambda	.478	8.743(a)	1	8	.018
	Hotelling's Trace	1.093	8.743(a)	1	8	.018
	Roy's Largest Root	1.093	8.743(a)	1	8	.018

a Exact statistic

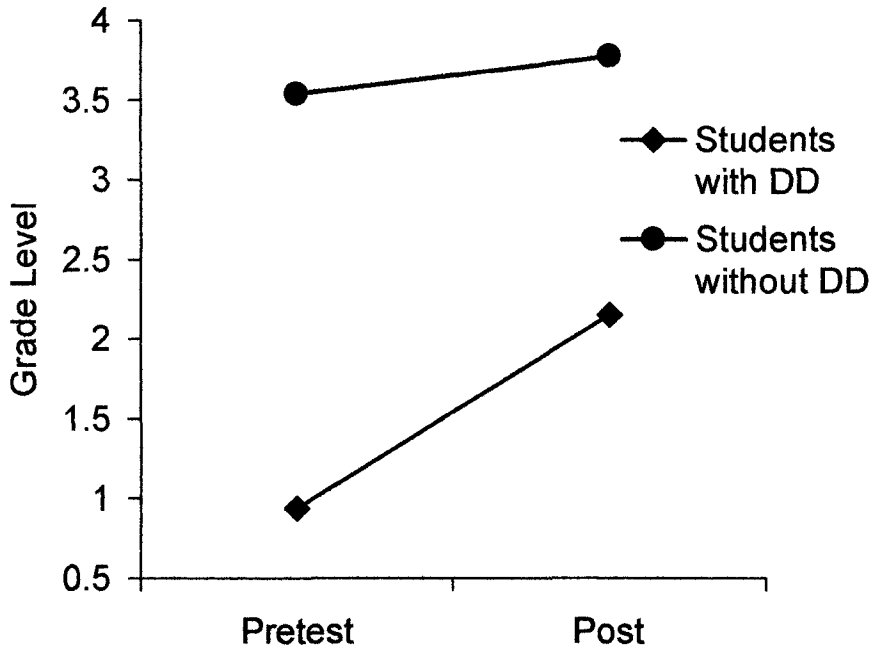
Table 7

Bonferroni's Pairwise Comparisons in Students with and without DD Test Scores between Pretest and Post after Controlling for Language Status

DD	(I) Time	(J) Time	Mean Difference (I-J)	*SE*	Sig.(a)	95% Confidence Interval for Difference(a)	
						Lower Bound	Upper Bound
No	1	2	-.236	.149	.152	-.581	.108
	2	1	.236	.149	.152	-.108	.581
Yes	1	2	-1.211(*)	.228	.001	-1.737	-.686
	2	1	1.211(*)	.228	.001	.686	1.737

* The mean difference is significant at the .050 level.
a Adjustment for multiple comparisons: Bonferroni.

Figure 6. Vocabulary performance of students with and without DD after controlling for language status.



CHAPTER 4: DISCUSSION

This study shows that students with severe and persistent mental illness improve their literacy skills after one year of the individualized, interactive instruction of the Adult Literacy Program. Positive outcomes of the students' academic performance were observed in both mathematics and reading. The results revealed more rapid gains in the students' mathematics performance than reading performance. This study asked, "What are the educational outcomes of psychiatric inpatients after one year of enrollment in the ALP?" The statistically significant growth in mathematics performance suggests that overall adult male psychiatric inpatients improve mathematics skills in one year with two to three hours of weekly one-on-one instruction. There were no significant reading outcomes although the results showed some positive gains. The reading outcomes were further evaluated by examining the students' subtest scores. The significant effect of instruction on the change from Pretest to Post in the students' vocabulary performance suggests that vocabulary skills of adult male psychiatric inpatients improve in one year with two to three hours of weekly one-on-one instruction.

This study also asked whether there is an effect of developmental disability or language status on the students' educational outcomes. In mathematics, the comparison of the changes from Pretest to Post indicated that the improvement is the same between ESL and Non-ESL students, and between students with and without DDs. This was true with or without controlling for the language status. The non-interaction effect confirmed that the students do not differ in response to one-year ALP instruction due to developmental disability or language status interacting with the one-year instruction. Therefore, there is no effect of developmental disability or language status on the

mathematics outcomes. In vocabulary, on the other hand, a significant effect of disability status on the outcomes was found when the language variation was taken into account, as evidenced by the significant interaction effect. When individual differences in terms of language status are controlled for, the disability status does have an effect on vocabulary outcomes. The students with DD improved vocabulary skills significantly greater than the students without DD. This is an example of the importance of defining and including individual characteristics in outcome research. It is important because with individual differences present, and with a control variable that explains included in the analysis, the outcomes may differ significantly. It is possible that the students' outcomes in response to instruction differ depending on cultural characteristics. It should be noted that, however, the effect of disability status depends on subject areas (the effect was not significant for overall mathematics or reading outcomes). The students without DD improved mathematics skills significantly even after controlling for the language status. The findings indicated that the language variations do not affect the vocabulary outcomes. Both the ESL and Non-ESL students demonstrate significant vocabulary growth after one year of instruction.

This study has some limitations and should be interpreted with caution. First, an inherent limitation was imposed by the sampling procedure. The ALP did not have control over who was referred to the program. It is possible that individuals who were too disorganized due to disabling psychiatric conditions were not referred. It was a convenience sample of all ALP enrollees referred to the program. Thus, whether or not the findings can be generalized to a larger population is open to question for random sampling was not employed in this study.

Second, the small sample size was a clear limitation of this study. The sample size of this study was not large enough to conduct multivariate analyses to control for possible correlations between reading and mathematics performance. The findings described above might have been different with a larger sample. Given that the statistical tests become more sensitive by eliminating error variance, efforts were made to reduce the error variance emerged from the data; however, the efforts become more meaningful with a larger sample size.

Third, limits were imposed by providing the participants with clear descriptions of the study, and by not employing a double-blind design. For this reason there might have been a Hawthorne effect on the students' educational outcomes that should be accounted for the findings of this study. However, it is unlikely that the students make performance gains because a study was being undertaken, for I believe students learn literacy skills for themselves, neither for the study nor for the researcher because the ALP is designed to provide services to benefit its students exclusively. Given the nature of the participants characterized by low literacy and poor educational history, and no other gains reported in the literature, the positive outcomes of the participants are considerable.

The fourth limitation involved the student assessment procedure in determining the students' educational outcomes. There were no students who were fully of Caucasian ethnicity. The majority spoke Hawai'ian-Creole English or was ESL students. The testing materials were most relevant for students of European ancestry and were not necessarily appropriate for Hawai'ian-Creole English speakers or students from different countries. Especially students who spoke with a heavy local dialect did not do well on the Word Attack subtest measuring phonetic skills, in which scoring criteria were based on

mainstream school ways. For this reason, scoring reading test results has been culturally and linguistically challenged, favoring the White, middle-class students' ways of making meaning and pronunciation at the expense of the underrepresented, disadvantaged minority students.

Fifth, the data collected must be interpreted cautiously with much respect for the limitation imposed by variability of teacher quality and effectiveness. The findings might be different with more qualified teachers. The teachers in the ALP included only one full-time experienced teacher with educational background in teaching literacy (the other changed to a part-time status four months after the inception of this study). Other teachers consisted of graduate students in social work, psychology, and education, and hospital staff without educational background working as part-time. If those teachers had been well-trained in teaching literacy, the results of the study might have been influenced.

The final limitation of this study involves variability of psychiatric inpatients. Characteristics of psychiatric disability might have created difficulty in assessing educational outcomes of the ALP students. It is possible that scores on the particular day a student's educational performance was measured were not their true performance. Given that all individuals in the ALP are diagnosed with a mental disorder (e.g., schizophrenia, bipolar disorder), influence of medication side effects (e.g., sleepiness, agitation, and nervousness) on test performance cannot be ignored. However, throughout this study period the students engaged in appropriate classroom behavior during the instruction (only in few occasions did they claim sleepiness and show agitation or nervousness reported by instructors). Also, symptoms of the disorder that is characterized by difficulty concentrating or disorganized behavior (American Psychiatric

Association, 2000) may have resulted in unpredictable test scores.

Taking those individual characteristics and difficulties associated with the mental disorder into account, it is remarkable that the students engaged in appropriate classroom behavior and demonstrated significant improvement in mathematics and vocabulary skills. Also, previous studies found that ALP participants engaged in on-task behavior the great majority of time during instruction (Schirmer, 2002; Asada, 2003). An explanation is that the lesson methods of the ALP are highly interactive in nature where the students actively engage in a number of reciprocal activities (e.g., solving mathematics problems with teacher's assistance, responding to mathematics quizzes verbally, or working on vocabulary work sheets with the teacher). The fact that the students always have tasks to perform during the instruction receiving one-on-one attention may allow them to focus on the lesson.

Another explanation is varied instructional activities in the ALP. During the instruction, students received interactive activities where the activities changed at least every 20 min. For example, in mathematics class, during the first 20 min, a teacher introduced different methods of performing addition and subtraction for 1 and 2 digit numbers to a student, and the student engaged in addition and subtraction problems with the teacher's assistance using the methods. During the next 20 min period, the student was committed to solving computation problems by himself, and the last 5 min of this period was used for timing his performance. The last 20 min included a 5-min break, a game, and quizzes to which the student verbally responded to the teacher. These varied activities created an active learning environment that allowed students to enjoy learning and concentrate better in the short blocks of time and, consequently, the students

sustained attention during the instruction. Previous findings suggest that ALP enrollees enjoyed and liked the services they received in the program (Mezo, 2003). Anecdotal evidence suggests that sometimes the students talk about the program with their friends and recommend the program to their friends. It is consistent with research findings that varied instructional techniques are more effective than traditional teaching methods such as lecturing.

Student characteristics included a high percentage of history of dropping out. Of the total of 15 students, 11 were either middle school or high school dropouts (73%). However, what is very interesting to note is the fact that 11 students (73%) of the 15 students participated in the ALP for one year or longer until they were discharged from the hospital, or continued to participate in the program. This implies history of dropping out is not associated with the outcomes of the ALP students. The heavily structured activities coupled with a strong emphasis on social interaction may contribute to the significant educational outcomes as well as the high rate of participation in the program. The ALP instructional approaches (e.g., heavy emphasis on social interaction, varied instructional techniques) are potentially well-matched with the diverse learning needs of the students with difficulties.

In searching for solutions to the limitations of this study, replication in larger sample size is recommended in order to further substantiate the findings of this study. It is often difficult for researchers to set a control or comparison group in educational research for the purpose of evaluating effectiveness of a program. However, the educational outcomes found in this study may further be validated by implementing more adult literacy programs with other psychiatric populations and by replicating the study at

different facilities in the islands of Hawai'i or different states across the United States. If possible, the use of random assignment should reduce the threat of selection. Furthermore, increased and standard hours of instructions may be linked to solutions to the limitations of this study. As the outcomes found in this study were based on two to three hours of weekly instruction provided primarily by teachers without sufficient expertise in teaching literacy, with improved teacher fidelity, determining educational outcomes for five hours of weekly instruction, for instance, would be of interest. Finally, consideration of testing materials or modifications of student assessment methods (e.g., the use of portfolios) is recommended to lead to more accurate outcomes for students who be culturally and linguistically different (e.g., Hawai'ian-Creole English speakers). Development of instructional activities might be considered in teaching to accommodate students of different needs, abilities, interests, aptitudes, and outcomes in response to instruction. Assessing individual characteristics may guide educators to accommodate instructions in providing culturally appropriate educational practices and developing new strategies for teaching the students of diverse ethnic and cultural backgrounds.

An example of possible future research directions is comprehensive evaluation research using multivariate statistical methods to determine the effectiveness of the program or to develop a model of student learning within the context of the adult literacy program. Effects of variables such as, teacher quality, hours of instruction, and positive reinforcement including positive feedback, rewards such as praise and tokens can be investigated. A characteristic variable affecting the students' educational outcomes based on this study was developmental disability status. Language variations did not affect the outcomes. The positive feedback and rewards are not considered Hawthorne effects or

extraneous variables for I believe those are important elements that represent the Adult Literacy Program. Future research on psychiatric populations might require creativity in developing a model of learning literacy, with little aid of past research in which no models are found.

Findings of this study include a discrepancy between the students' reported educational levels and actual literacy levels measured by the WJRTA. This finding substantiates previous research that the literacy level of psychiatric patients is considerably lower than their reported grade levels. In a study of psychiatric patients, Baker et al. (1996) reported that 63% of patients had a discrepancy of a median of five grades between the patients' reported education levels and reading levels. Christensen and Grace (1999) reported about a four-year gap between average reading level (the 7th grade) and average reported completed education level (the 11th grade). Seventy-six percent of patients read at or below the eighth-grade level, though 72% reported they read well or very well. Currier et al. (2001) documented 53 percent of the sample of psychiatric population read at or below an eighth-grade level. The authors found that the gap between the reported completed education level and actual reading level was about 3.3 grades. In this study the gap between the students' average reported education levels and actual literacy levels (the Pretest scores) was greater than five grades. The average grade level for all reading participants (n = 41) was 4.9 and for all mathematics participants (n = 40) was 4.3, upon entry to the program. Their reported completed education levels averaged 10.1 grades. (These data were obtained from all participants [N = 54] including those discharged from the hospital or withdrew from the ALP due to poor health or motivation within one year.) The literature and present study suggest that

participants' reported education levels are likely unreliable. Additionally, neither the ALP students' prior literacy skills measured by the WJRTA, nor education levels reported by the ALP students were related to their educational outcomes. It appears that the ALP students improve mathematics and vocabulary skills in one year regardless of their prior mathematics or vocabulary skills, or educational attainment.

This study demonstrated the possibility for the adult male psychiatric inpatients with DD to improve vocabulary skills. Results from the GLM estimation imply if the students with DD receive an average of the first-grade instruction as a starting point, they may grow more than those without DD in vocabulary skills. An implication is that there is room for vocabulary improvement for students with DD even if they were ESL learners. After starting with what the students know, educators may be able to include instructional activities which offer an appropriate challenge in the areas of vocabulary to students with DD. This instructional approach, providing a challenge, is not supported by the findings for mathematics outcomes, showing that the growth rate in students with DD tended to be lower than that in students without DD. In mathematics, providing students with DD with a challenge requires judgments, so do determining appropriate instructional modifications according to those students' needs. Students with DD are often unaware that they have developmental disabilities or reluctant to identify themselves or to request accommodations and support systems. They may require more supportive mathematics instruction than it is now. For example, a teacher may develop individualized mathematics instruction especially designed for a student with DD by incorporating hands-on and step-by-step approaches emphasizing practices that enhance learning of mathematical concepts (e.g., fractions, counting by numbers).

Language variations are also interesting individual characteristics that may have interfered with the students' academic performance. However, the results revealed that the language status does not affect mathematics or vocabulary outcomes, and that the students improve both mathematics and vocabulary skills regardless of their language variations, implying the possibility for the ESL students to demonstrate gains in mathematics and vocabulary. According to research on language variations, it is the underestimation of educational skills of students who are linguistically and dialectically different that reduces teacher expectations for student abilities (Baugh, 2000). When teacher expectations are low, potential student performance is diminished (Nieto, 2000; Delpit & Dowdy, 2002). Culturally sensitive attitudes and educational practices toward the adult male individuals with psychiatric disabilities and diverse language backgrounds in the ALP may have resulted in adequate expectations for all students.

The one-on-one and face-to-face instruction allows the students to observe and imitate the teacher's performance. The students learn literacy skills by communicating with the teacher and by using the teacher's performance as a guide. This learning cannot occur in a socially neutral setting. A sociocultural approach that connects social and individual learning processes through a joint literacy activity between learner and teacher is consistent with the educational practices of the ALP in seeking cultural and social explanation of human learning activity rather than biologically-based understanding of human behavior. According to the sociocultural paradigm of social context of disability, it is the individual's social milieu that modifies her or his course of development and learning (Vygotsky, 1995). It is one of the challenges of the 21st century education to increase efforts to change negative societal attitudes towards the disadvantaged,

underrepresented individuals with disabilities.

All individuals, regardless of background or disability, are entitled to learn and grow. Literacy skills are essential in everyday lives for all individuals. The Adult Literacy Program demonstrated the statistically significant positive outcomes of psychiatric inpatients for overall mathematics performance and vocabulary performance, and the possibility for students with DD to significantly improve their vocabulary skills. This study shows that the individuals with severe psychiatric disabilities can appropriately participate in educational activities in a classroom setting through social interaction with the individualized, culturally specific educational program. Given that a review of the literature indicated no published adult literacy articles on this population, the findings of this study are promising and exciting.

There are now 36 current participants including one tutor who is learning how to teach with aid from an expert in the ALP. I believe this is one of the very few adult literacy programs that apply the collaborative-apprenticeship learning approach (Bayer, 1990) to a psychiatric population. A student with severe disability can become a tutor, or a teacher, with aid from an expert. The hope is that an application of the collaborative-apprenticeship learning approach to instruction leads to increase the number of teachers in order for the program to grow and for more low-literate individuals to become literate. The Adult Literacy Program at the Hawai'i State Hospital is one of the first adult literacy programs designed specifically for a psychiatric population whose educational outcomes are promising.

APPENDIX A: READING AND MATHEMATICS TEXTS

Reading Texts

Alameda, R.K. (1997). *Na mo'olelo Hawai'i o ka wa kahiko: Stories of old Hawai'i.* Honolulu, HI: Bess Press.

Boning, R.A. (1977). *Drawing conclusions.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1977). *Following directions.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1977). *Getting the main idea.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1977). *Locating the answer.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1977). *Using the context.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1977). *Working with sounds.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1978). *Detecting the sequence.* Baldwin, NY: Barnell Loft, Ltd.

Boning, R.A. (1982). *Getting the facts.* Baldwin, NY: Barnell Loft, Ltd.

Cunningham, S. (2000). *Hawai'ian magic spirituality.* St. Paul, MN: Lewellyn.

Freeman, G., & Haughton, E. (1997). *Phonological coding: Phonemic awareness.* Napa, CA: Haughton Learning Center.

Fry, E. B. (1989). *Reading drills.* (2nd ed.). Lincolnwood, IL: Jamestown.

Goodman, B. (1996). *English, Yes!.* Lincolnwood, IL: Jamestown.

Goodman, B. (1998). *Adventures.* Lincolnwood, IL: Jamestown.

Goodman, B. (1999). *Travels.* Lincolnwood, IL: Jamestown.

Goodman, B. (1999). *More travels.* Lincolnwood, IL: Jamestown.

Jamestown's signature reading. (2000) Lincolnwood, IL: Jamestown.

Johnson, K., Ford, V., & Peters, J. (1983). *The Morningside Language Fluency: Expressive Writing I and II.* Seattle, WA: Morningside Academy.

Johnson, K., & Kevo, H. (1993). *Morningside phonics fluency: Decoding B.* Seattle, WA: Morningside Academy.

Johnson, K., & Kevo, H. (1995). *Morningside phonics fluency: Decoding A (revised).* Seattle, WA: Morningside Academy.

Kalakaua, D. (1990). *The legends and myths of Hawai'i. Honolulu,* HI: Mutual.

Pauk, W. (2001). *Six-way paragraphs in the context areas.* Lincolnwood, IL: Jamestown.

Spargo, E. (1989). *Timed readings.* (3rd ed.). Providence, RI: Jamestown.

Thompson, V. L. (1969). *Hawai'ian legends of tricksters and riddlers.* Honolulu, HI: University of Hawai'i Press.

Westervelt, W. D. (1963). *Hawai'ian legends of volcanoes.* Tokyo, Japan: Charles E. Tuttle Company.

Whimbey, A. (1995). *Mastering reading through reasoning* (2nd ed.). Cary, NC: Innovative Sciences, Inc.

Whimbey, A. (1999). *Analytical reading through reasoning* (3rd ed.). Cary, NC: Innovative Sciences, Inc.

Williams, J. S. (1993). *Kamehameha the great* (revised). Honolulu, HI: Kamehameha School Press.

Mathematics Texts

Engelmann, S., & Carnine, D. (1981). *Multiplication.* New York: Science Research Associates.

Engelmann, S., & Carnine, D. (1981). *Subtraction.* New York: Science Research Associates.

Engelmann, S., & Steely, D. (1978). *Fractions, decimals, percents.* Chicago, IL: Science Research Associates.

Hake, S., & Saxson, J. (1995). Mathematics 65: *An incremental development* (2nd ed.). Norman, OK: Saxson Publishers, Inc.

Hake, S., & Saxson, J. (1996). Mathematics 76: *An incremental development* (2nd ed.). Norman, OK: Saxson Publishers, Inc.

Harzog, D.A. (2000). *GED mathematics workbook* (5th. ed.). Lawrenceville, NJ: Thomson Learning.

Howett, J. (2001). *Number power: Fractions, decimals, and percents.* Lincolnwood, IL: Jamestown.

Johnson, K. R. (1993). *Morningside mathematics fluency: Basic number skills.* Vol. 2: reading and writing whole numbers [6-9] digits and decimals). Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 1: addition & subtraction. Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 2: addition & subtraction. Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 3: addition & subtraction. Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 4: multiplication & division. Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 5: multiplication & division. Seattle, WA: Morningside Academy.

Johnson, K. R. (1993). *Morningside mathematics fluency: Mathematics facts.* Vol. 6: multiplication & division. Seattle, WA: Morningside Academy.

Johnson, K. R. (1994). *Morningside mathematics fluency: Whole number computation.* Vol. 1: addition and subtraction. Seattle, WA: Morningside Academy.

Johnson, K. R. (1994). *Morningside mathematics fluency: Whole number computation.* Vol. 2: multiplication & division. Seattle, WA: Morningside Academy.

Johnson, K. R. (1994). *Morningside mathematics: Addition and subtraction, equations and problem solving.* Vol. 4: problem solving practice. Seattle, WA: Morningside Academy.

Mitchell, J. (2001). *Number power: Pre-algebra.* Lincolnwood, IL: Jamestown.

Saxson, J. H. (1990). *Algebra 1: An incremental development* (2nd ed.). Norman, OK: Saxson Publishers, Inc.

Saxson, J. H. (1995). *Algebra 1/2: An incremental development* (2nd ed.). Norman, OK: Saxson Publishers, Inc.

Stein, M., Gilbert, J., & Carnine, D. (1992). *Designing effective mathematics instruction: A direct instruction approach.* (3rd ed.). New York: Prentice Hall.

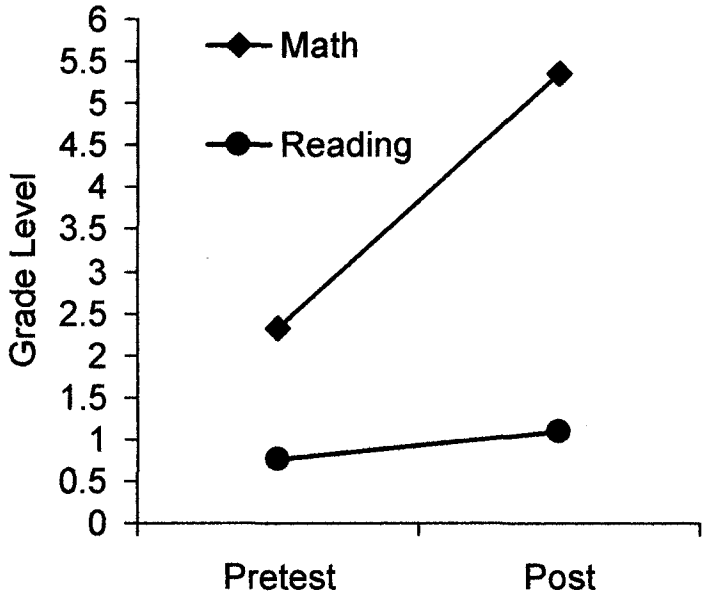
Whimbey, A., Lochhead, J., & Potter, P. (1990). *Thinking through mathematics word problems.* Hillsdale, NJ: Lawrence Erlbaum Associates.

APPENDIX B: INDIVIDUAL STUDENT PERFORMANCE

Participant 1: "Andy"

"Andy," a reading and mathematics participant, was discharged from the hospital during the participation of the ALP. His cultural characteristics included language status of English as a Second Language (ESL) and Chinese as his first language, and disability status of having a history of Attention Deficit Hyperactivity Disorder (ADHD). His pretest grade levels were 2.33 in mathematics and 0.75 in reading. As shown in Figure 7, overall his performance improved more rapidly in mathematics than in reading.

Figure 7. "Andy:" Overall reading and mathematics performance.



Figures 8 and 9 show his subtest performance. In mathematics, he demonstrated most rapid gains in his problem solving skills (gain = 3.8 grades), measured by the Applied Problems subtest. In reading, he made most gains in decoding skills (gain = 1.1 grades), measured by the Letter-Word Identification subtest, as compared to other skill areas. Overall, his reading growth was 0.3 grades.

Figure 8. "Andy:" Mathematics subtest performance.

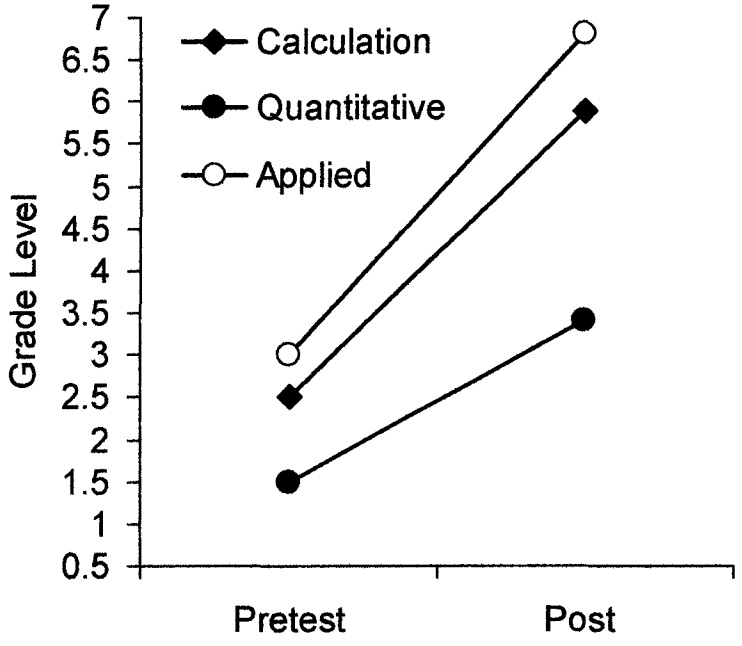
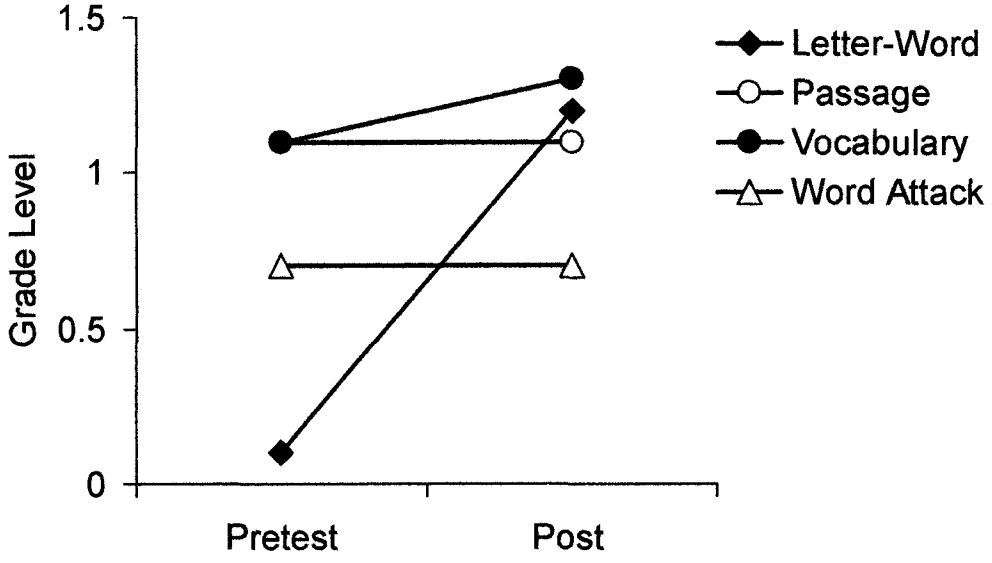


Figure 9. "Andy:" Reading subtest performance.



Participant 2: "Daniel"

"Daniel," another ESL student from the Philippines, demonstrated gains in mathematics in one year. He had attended school in Philippine up to the sixth grade. His pretest grade levels were 2.2 in mathematics and 0.8 in reading. Overall his mathematics performance improved by 0.67 grades whereas his reading performance declined by 0.8 grades (see Figure 10). Figures 11 and 12 display his subtest performance. In mathematics, he made most rapid gains in quantitative concept (1.6 grades) as compared with other subtests. In reading, his comprehension skills measured by the Passage Comprehension subtest declined severely by 1.3 grades.

Figure 10. "Daniel:" Overall reading and mathematics performance.

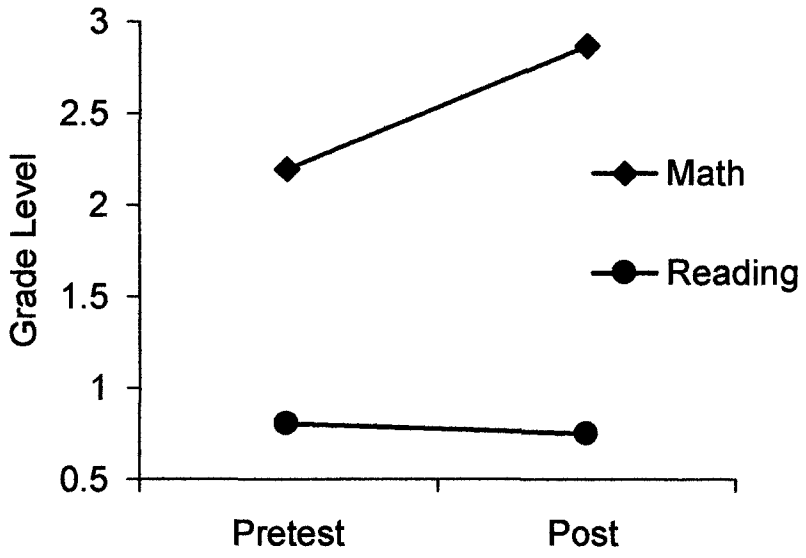


Figure 11. "Daniel:" Mathematics subtest performance.

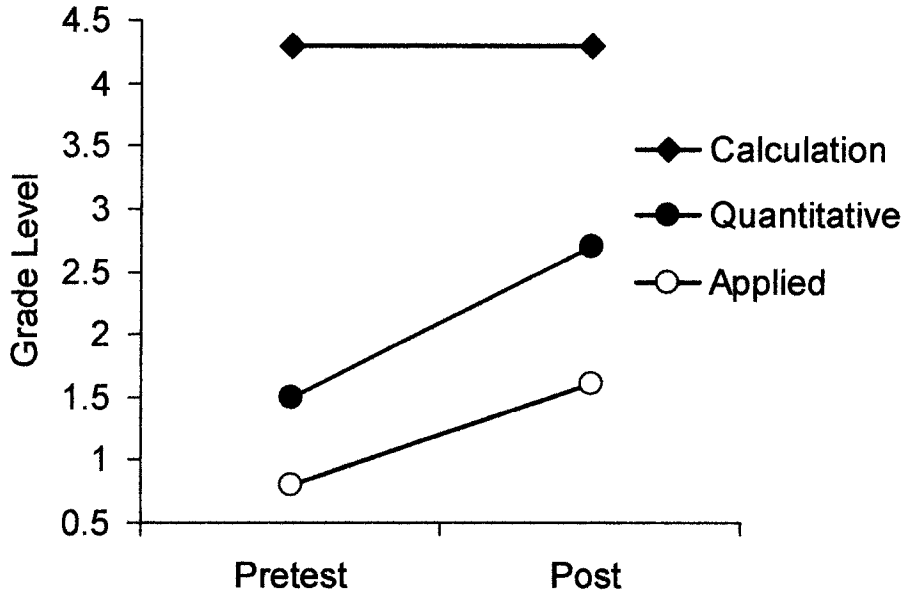
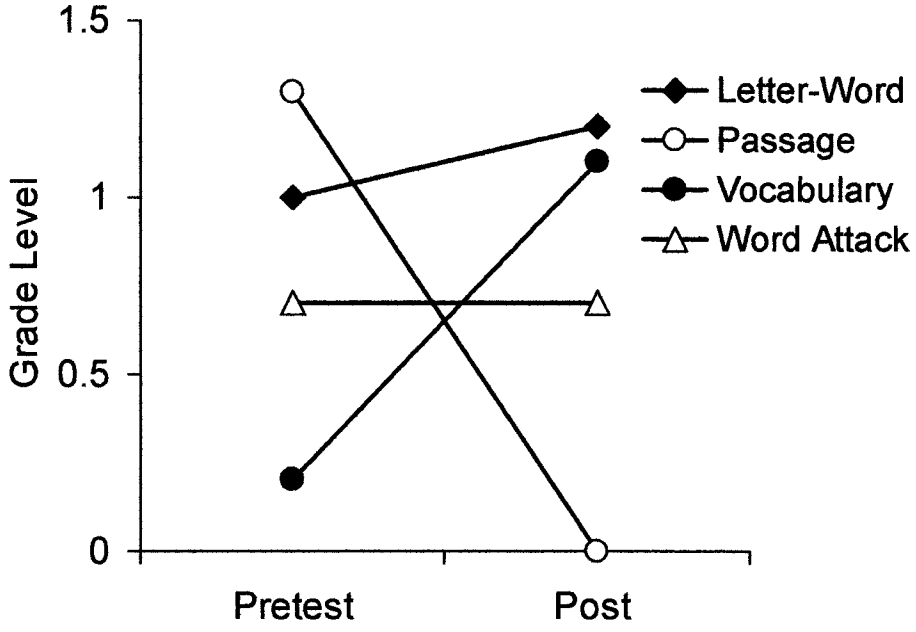


Figure 12. "Daniel:" Reading subtest performance.



Participant 3: "Kimo"

"Kimo," with developmental disability, was discharged during the participation in the ALP. Before the admission of the hospital, he had graduated from high school where he attended in special education. He is one of the few participants who graduated from high school. His pretest scores were 2.23 in mathematics and 1.13 in reading. Figures 13, 14, and 15 show his overall and subtest performance. Overall, he demonstrated more gains in mathematics than in reading (2.03 grades in mathematics and 0.37 in reading). Results from his mathematics subtest scores showed greater improvement in calculation and in problem solving than in quantitative concept. In reading, his decoding skills improved by 0.4 grades whereas scores in other subtests decreased or remained the same.

Figure 13. "Kimo:" Overall reading and mathematics performance.

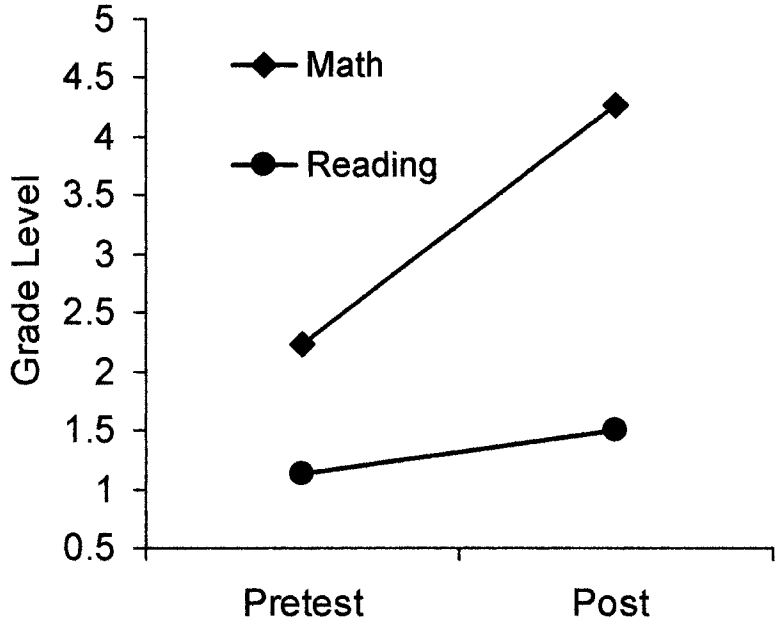


Figure 14. "Kimo:" Mathematics subtest performance.

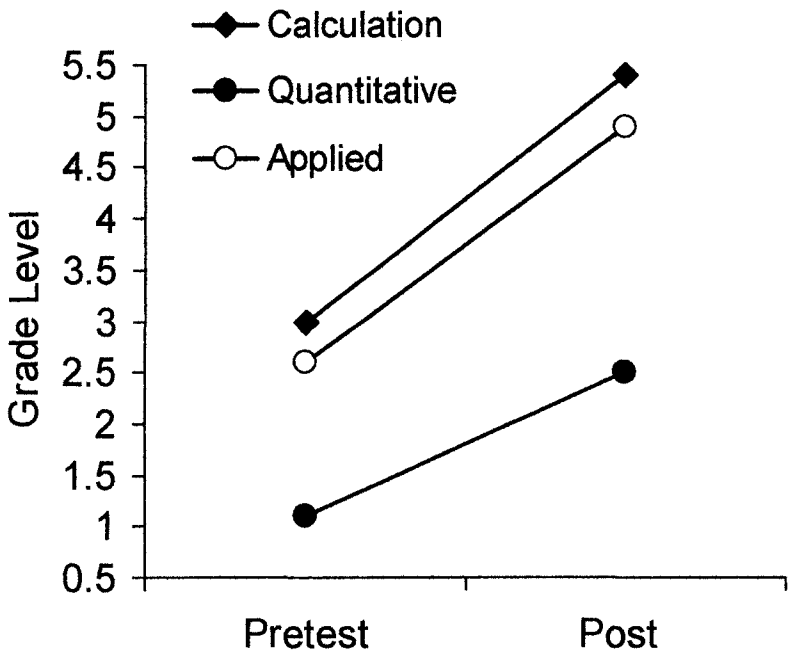
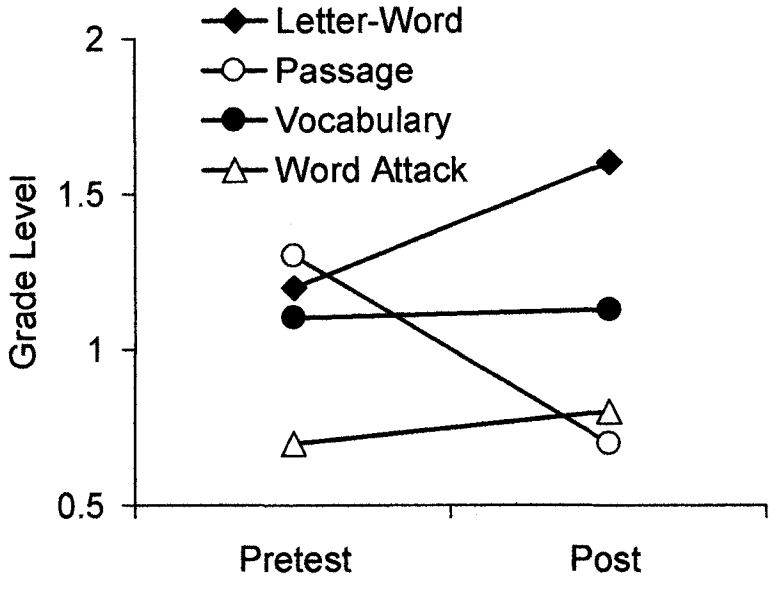


Figure 15. "Kimo:" Reading subtest performance.



Participant 4: "Leo"

"Leo," an active mathematics participant, entered the ALP with pretest scores equivalent to 6.4 grades. He had no additional difficulties of having developmental disability or as an ESL learner other than psychiatric disabilities. He showed 1.9 overall grade level gains in one year (Figure 16). As shown in Figure 17, his calculation and problem solving skills improved more rapidly than skills in quantitative concept.

Figure 16. "Leo:" Overall mathematics performance.

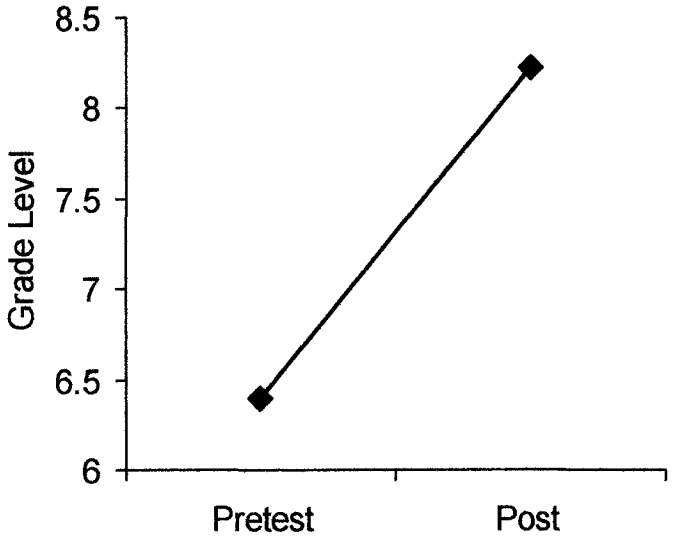
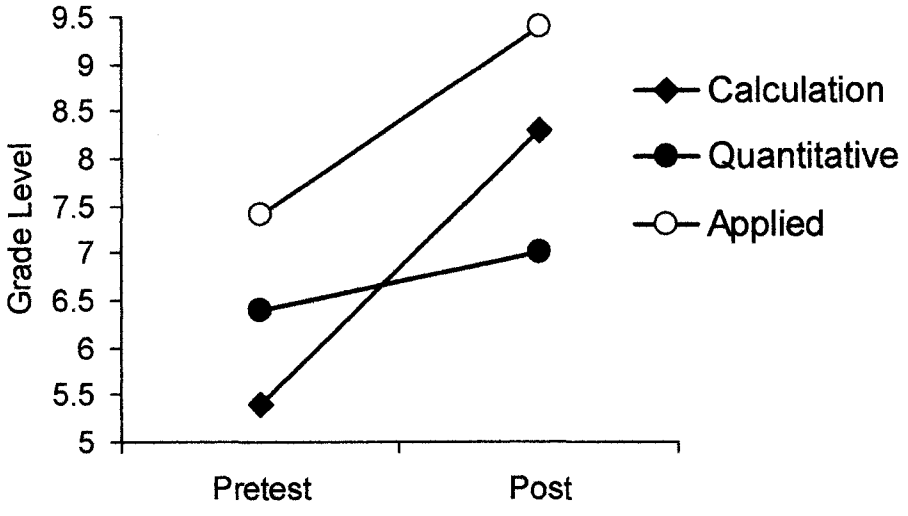


Figure 17. "Leo:" Mathematics subtest performance.



Participant 5: "Ramon"

"Ramon," an active participant with developmental disability, entered with a skill level of 4.8 grades in reading and 6.0 grades in mathematics. His mathematics performance improved by 1.0 grades and reading performance improved by 0.85 grades in one year. Although it was not evident from looking at his overall growth in Figure 18, his reading subtest performance showed mixed results. His subtest performance is provided in Figures 19 and 20. In mathematics, his performance improved in all subtests. In reading, all of his subtest performance improved except for the Letter-Word Identification subtest measuring decoding skills. He made most rapid gains in comprehension skills.

Figure 18. "Ramon:" Overall reading and mathematics performance.

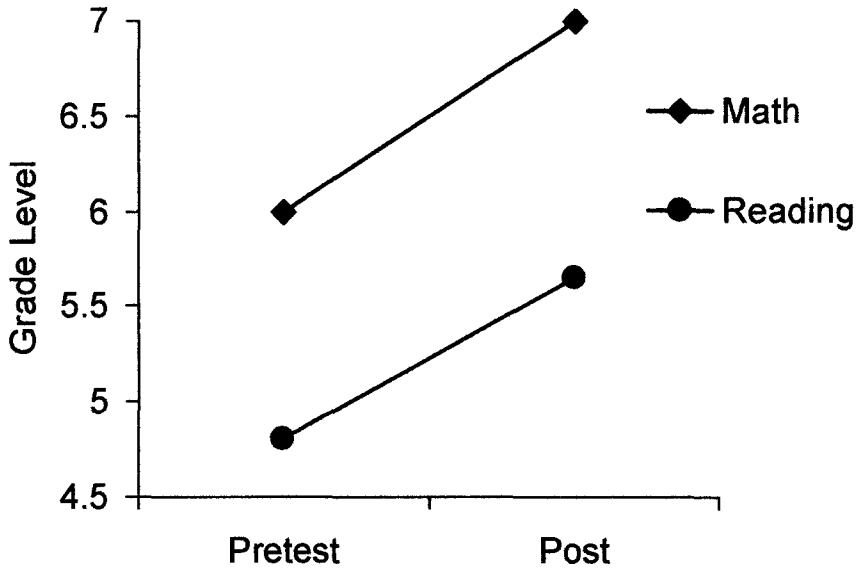


Figure 19. "Ramon:" Mathematics subtest performance.

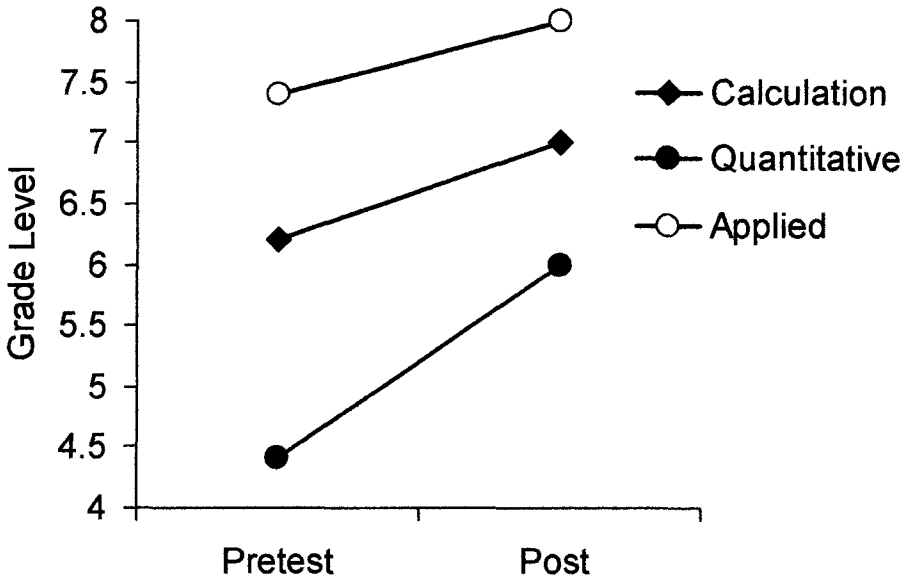
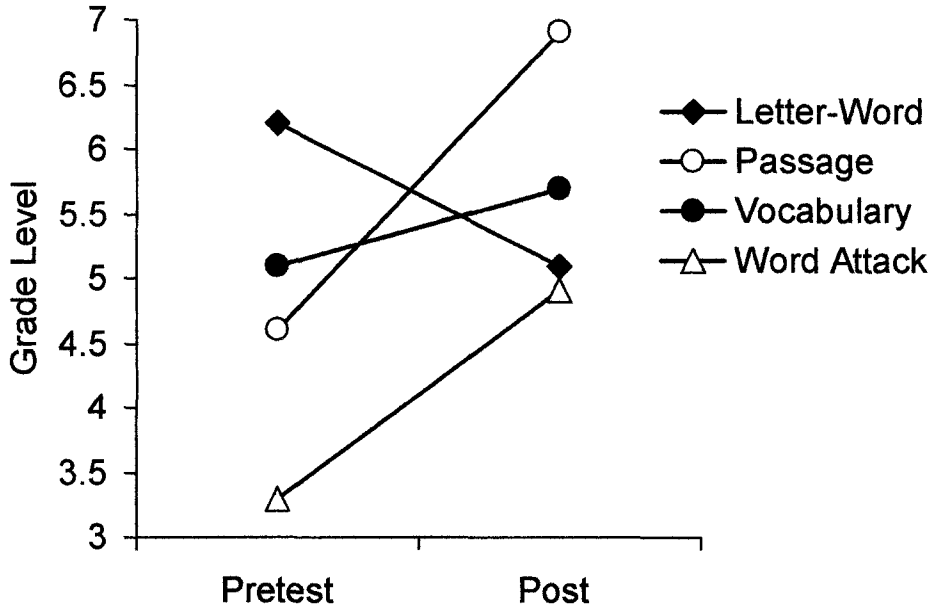


Figure 20. "Ramon:" Reading subtest performance.



Participant 6: "Robin"

"Robin," a mathematics participant, who was discharged, demonstrated greatest gains of 3.23 grades in the sample (see Figure 21). "Robin" was a native English speaker and did not have developmental disability. His pretest scores were at the fifth-grade level. As illustrated in Figure 22, his growth rates varied in terms of subtests. "Robin"'s subtest performance did not show remarkable gains in all subtest areas. He made most rapid gains of 5.4 grades in word problem solving and the slowest gains of 1.0 grade in quantitative concept. His calculation skills improved by 3.3 grades.

Figure 21. "Robin:" Overall mathematics performance.

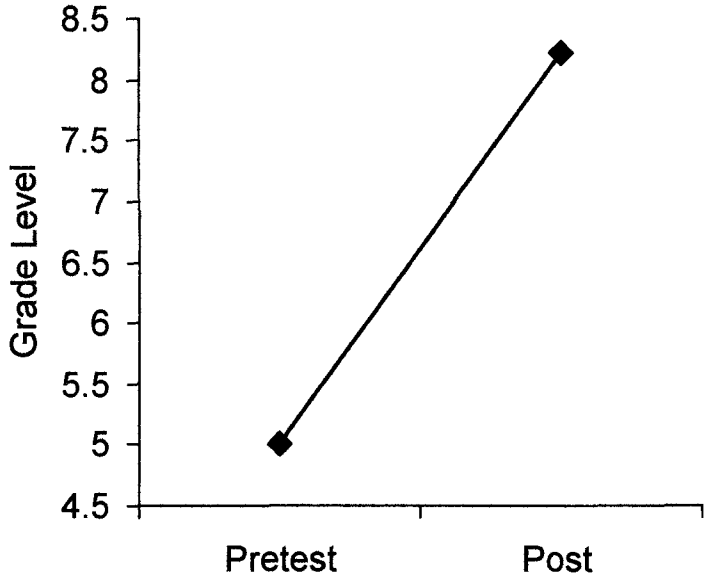
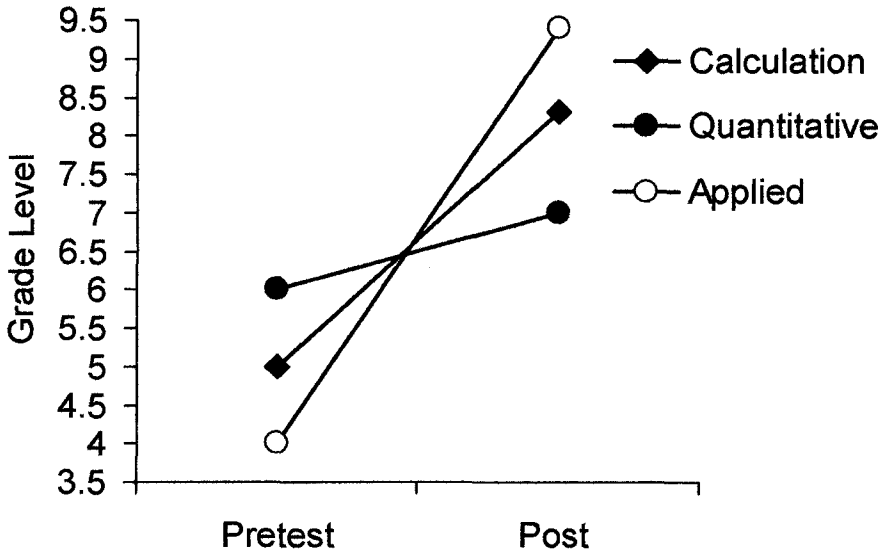


Figure 22. "Robin" Mathematics subtest performance.



Participant 7: "Randy"

"Randy," an active participant with developmental disability, entered the ALP with a pretest grade level of 2.13 (gain = 0.34 grades) in mathematics and 1.43 (gain = 0.1 grades) in reading (Figure 23). Figures 24 and 25 illustrate his gains and declines in subtest scores.

Figure 23. "Randy:" Overall reading and mathematics performance.

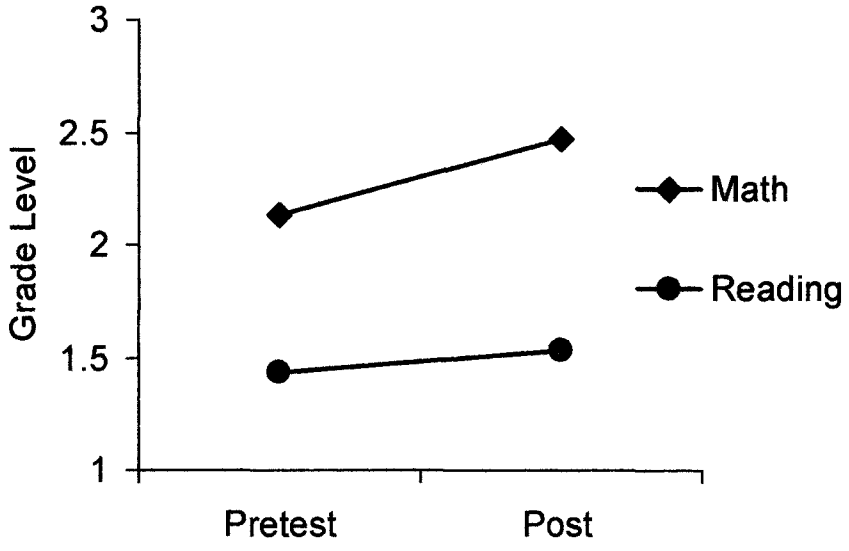


Figure 24. "Randy:" Mathematics subtest performance.

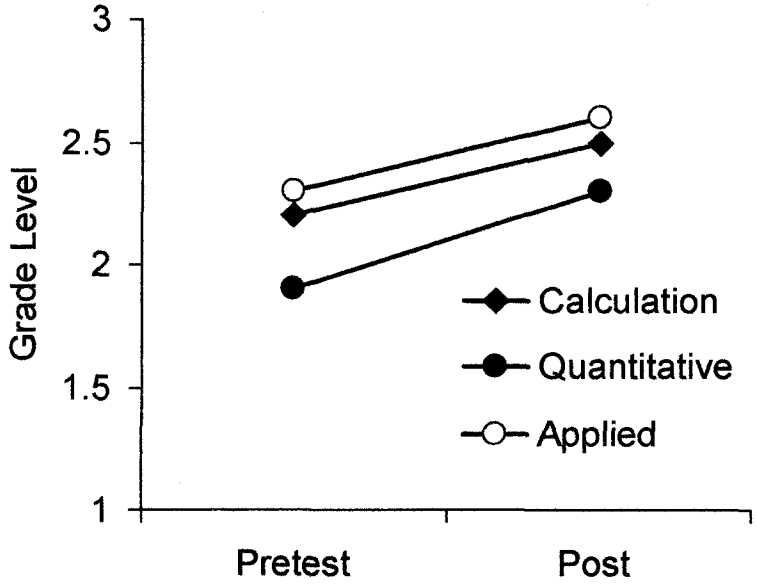
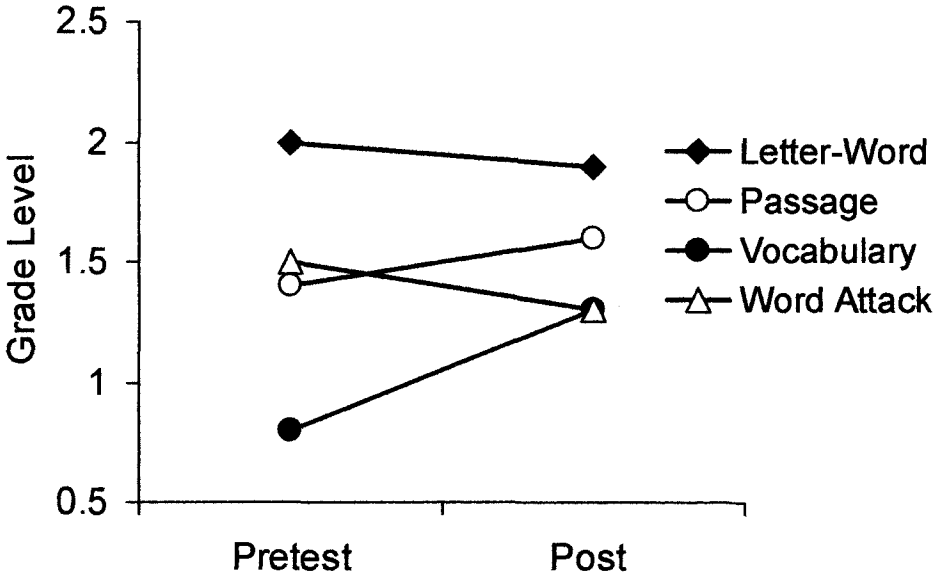


Figure 25. "Randy:" Reading subtest performance.



Participant 8: "Ryan"

"Ryan" entered the ALP with pretest scores of a 3.5 grade level in mathematics and an 8.08 grade level in reading. Overall, he demonstrated 0.73 grade level gains in mathematics and a 2.53 grade level decline in reading. His overall scores are plotted in Figure 26. In mathematics, he demonstrated the highest grade level performance in quantitative concept among other subtest performance (see Figure 27). In reading, a severe decline was observed in his phonetic skills, which was measured by the Word Attack subtest (see Figure 28).

Figure 26. "Ryan:" Overall reading and mathematics performance.

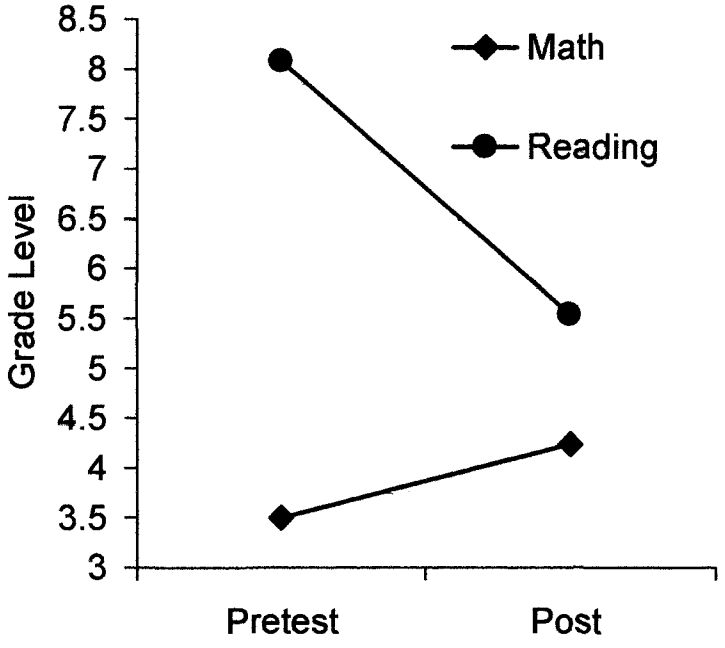


Figure 27. "Ryan:" Mathematics subtest performance.

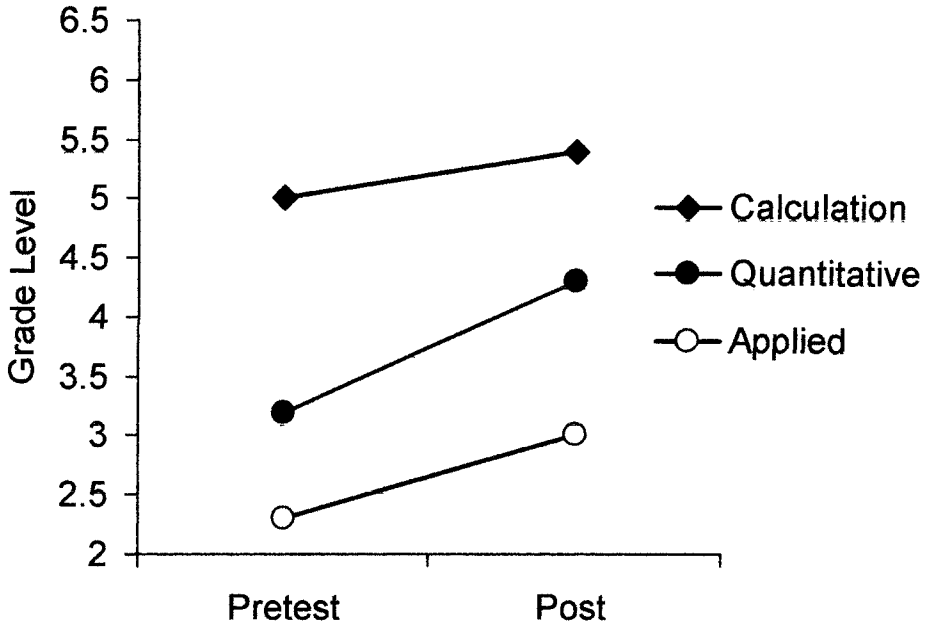
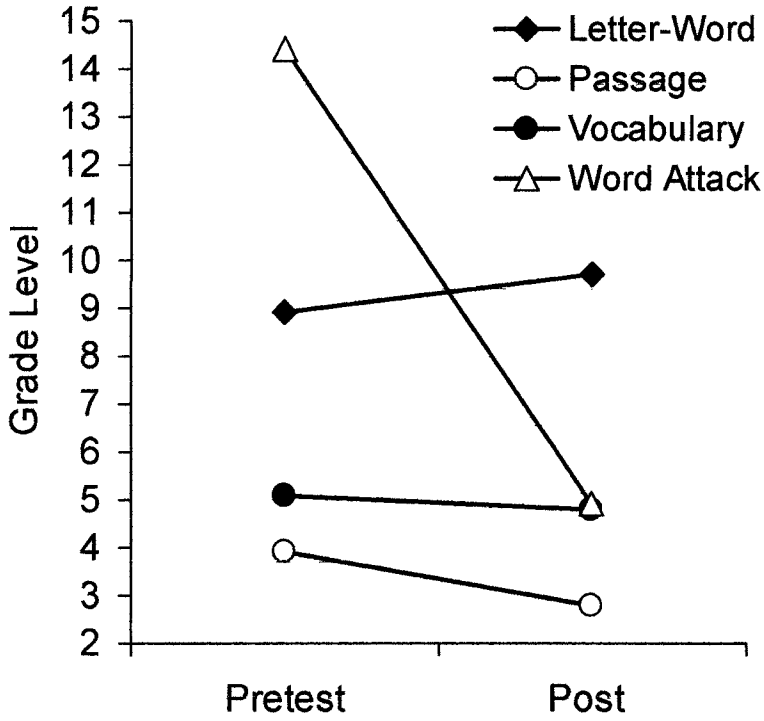


Figure 28. "Ryan:" Reading subtest performance.



Participant 9: "Rudy"

"Rudy," a mathematics participant, performed at a 0.83 grade level at Pretest and made 0.4 grade level gains. Although his problem solving skills improved remarkably by 1.3 grades, other skills declined or remained nearly the same after Pretest. Figures 29 and 30 provide his overall and subtest performance.

Figure 29. "Rudy:" Overall mathematics performance.

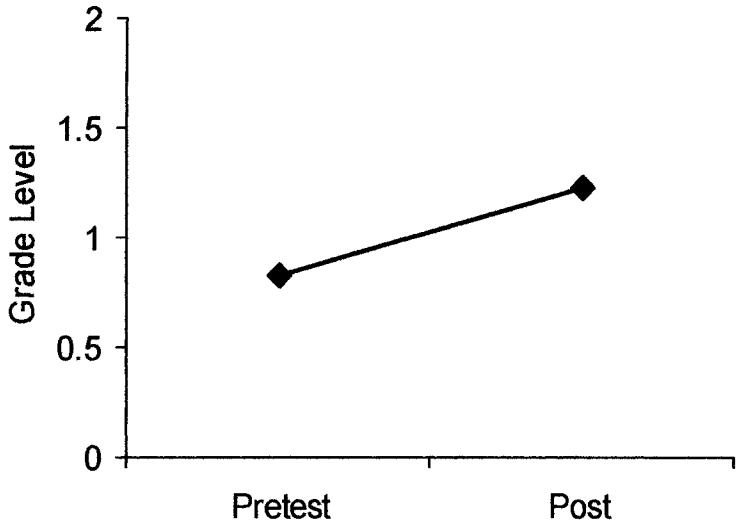
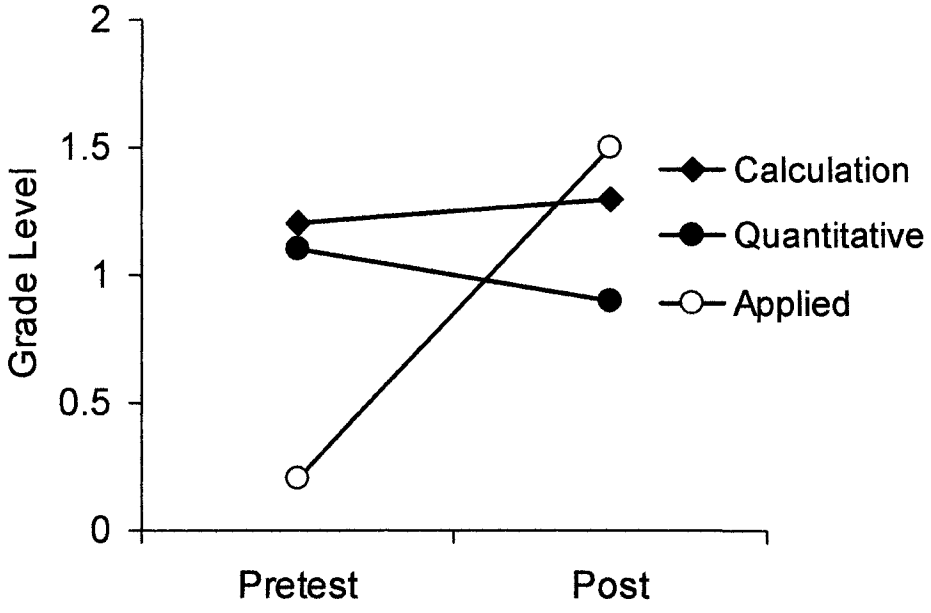


Figure 30. "Rudy:" Mathematics subtest performance.



Participant 10: "Wong"

"Wong," a mathematics participant, performed at 1.43 grades at Pretest. Overall, he gained 0.37 grades. Figures 31 and 32 illustrate gains and declines in his performance. His calculation skills declined over one year. He demonstrated most rapid gains in quantitative concept (1.1 grades). His gains in problem solving skills were 0.3 grades.

Figure 31. "Wong:" Overall mathematics performance.

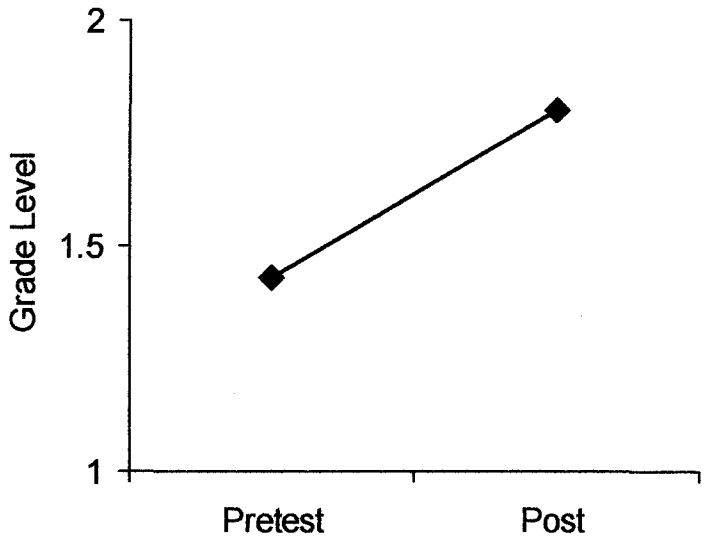
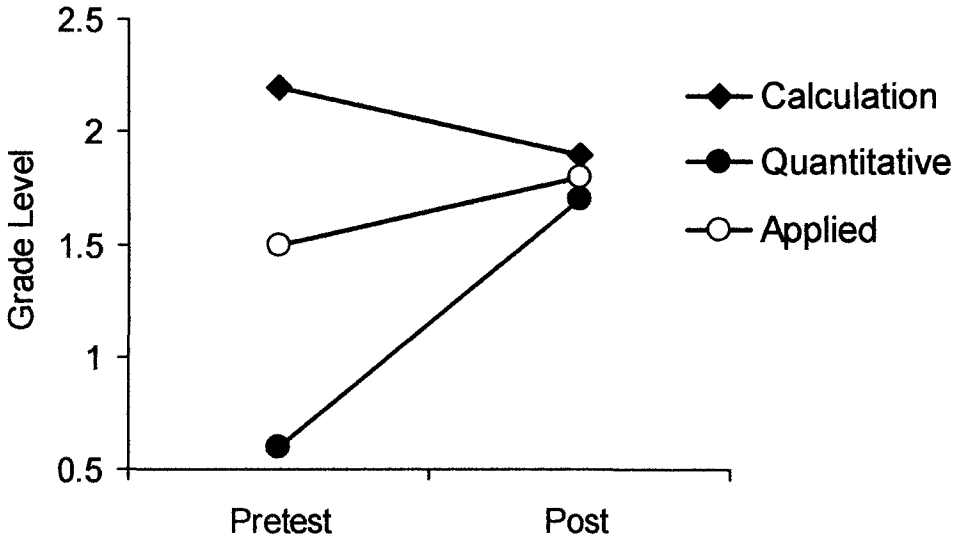


Figure 32. "Wong:" Mathematics subtest performance.



Participant 11: "Chris"

"Chris," an ESL reading participant, improved his skills by 3.8 grades overall after he entered the ALP with a reading level equivalent to 5.6 grades (see Figure 33). His phonetic skills improved greatly by 10.5 grades (see Figure 34). He performed the skill at a college level of 16.9 grades, the highest in the sample.

Figure 33. "Chris:" Overall reading performance.

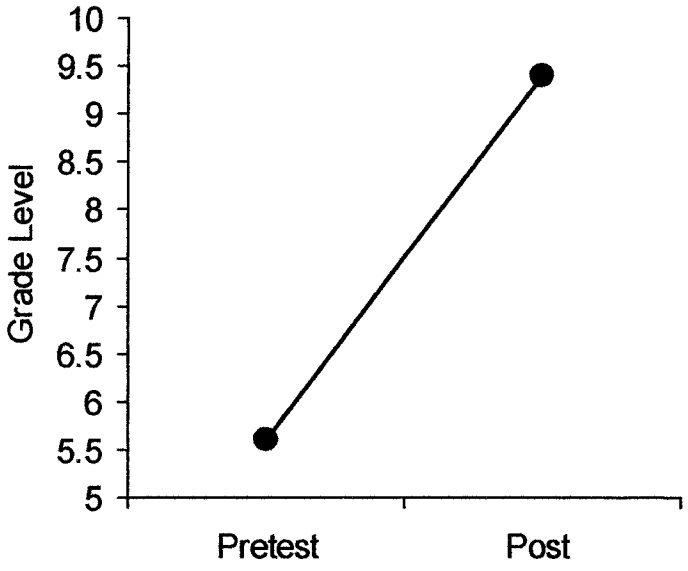
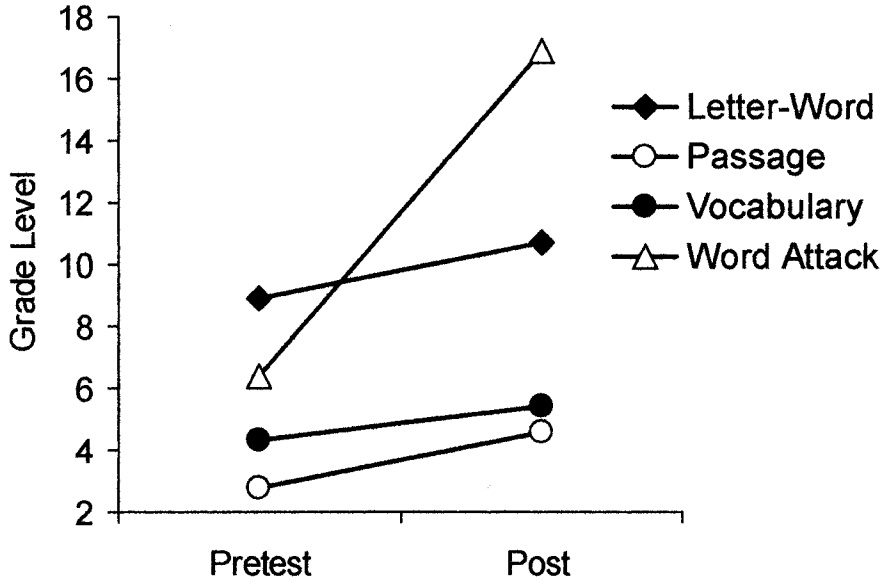


Figure 34. "Chris:" Reading subtest performance.



Participant 12: "Dave"

"Dave," a reading participant, entered the ALP with a pretest score of 4.47 grades. Overall, his performance declined by 0.42 grades (Figure 35). Figure 36 shows his subtest performance. His changes across subtests remained within a 0.6 grade level range during one year except for his phonetic skills performance which declined by 2.9. His scores on the Reading Vocabulary and Passage Comprehension subtests were identical.

Figure 35. "Dave:" Overall reading performance.

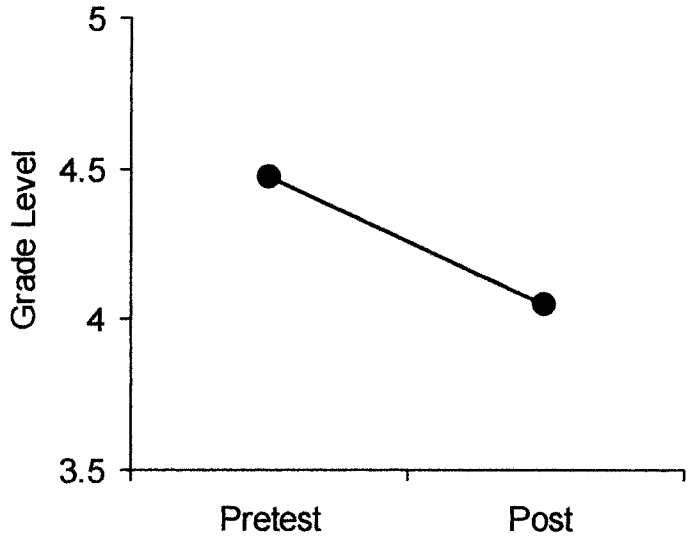
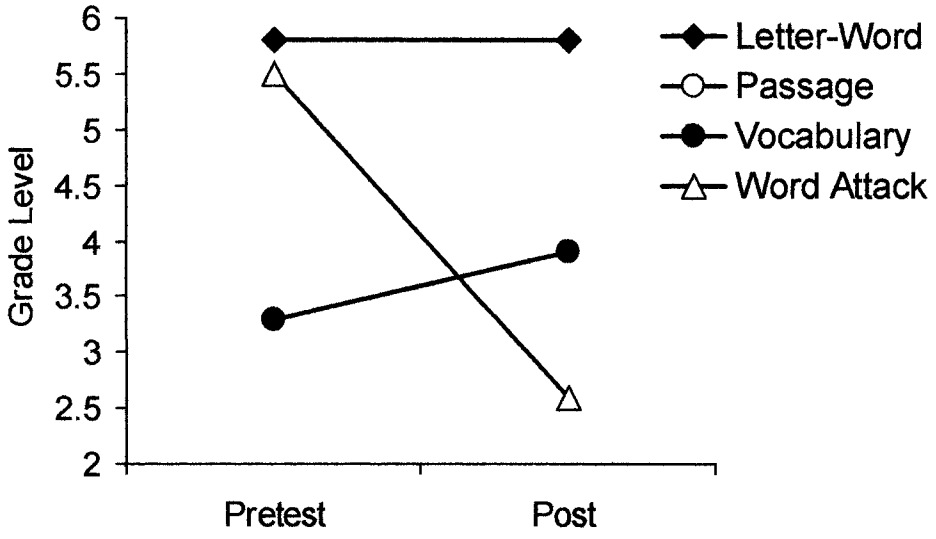


Figure 36. "Dave:" Reading subtest performance.



Participant 13: "Ichiro"

"Ichiro," another ESL reading participant entered the ALP at a 4.6 grade level. Overall, his performance declined by 0.2 grades (see Figure 37). He entered the ALP with relatively higher skills in decoding and phonics (9.7 and 5.5 grades, respectively) compared with his vocabulary and comprehension skills (1.5 and 1.7 grades). Figure 38 depicts the wide range of his skill levels across subtests.

Figure 37. "Ichiro:" Overall reading performance.

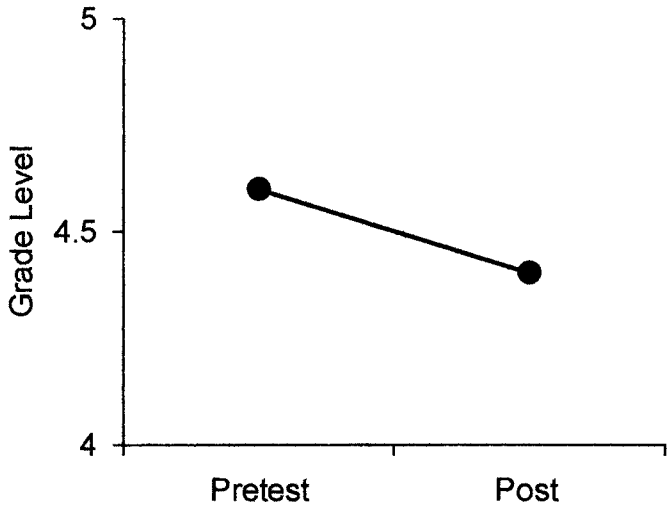
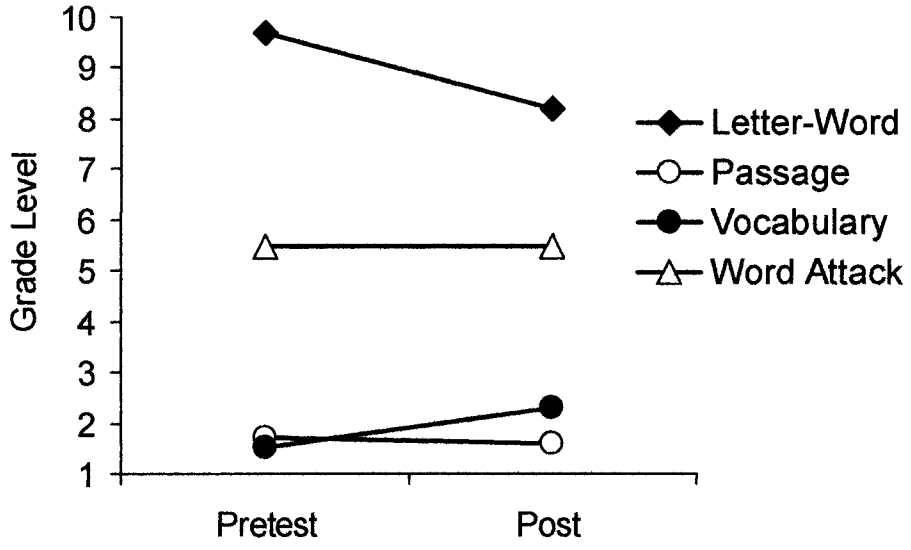


Figure 38. "Ichiro:" Reading subtest performance.



Participant 14: "Joshua"

"Joshua," an ESL active reading participant, demonstrated remarkable improvement of 2.63 grades overall after entering the ALP at a 4.52 grade level (see Figure 39). His subtest performance illustrated in Figure 40 reveals the greatest gains of 4.8 grades in decoding, the second greatest gains of 3.7 in phonics, and the small positive changes in vocabulary (0.4 grades) and comprehension (1.6 grades).

Figure 39. "Joshua:" Overall reading performance.

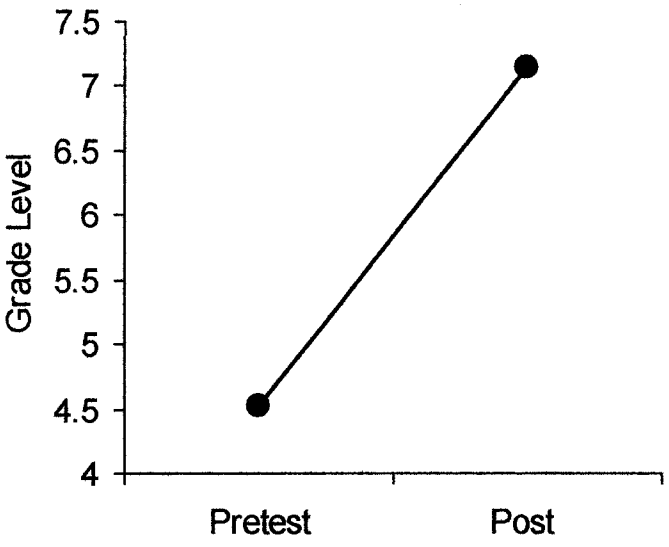
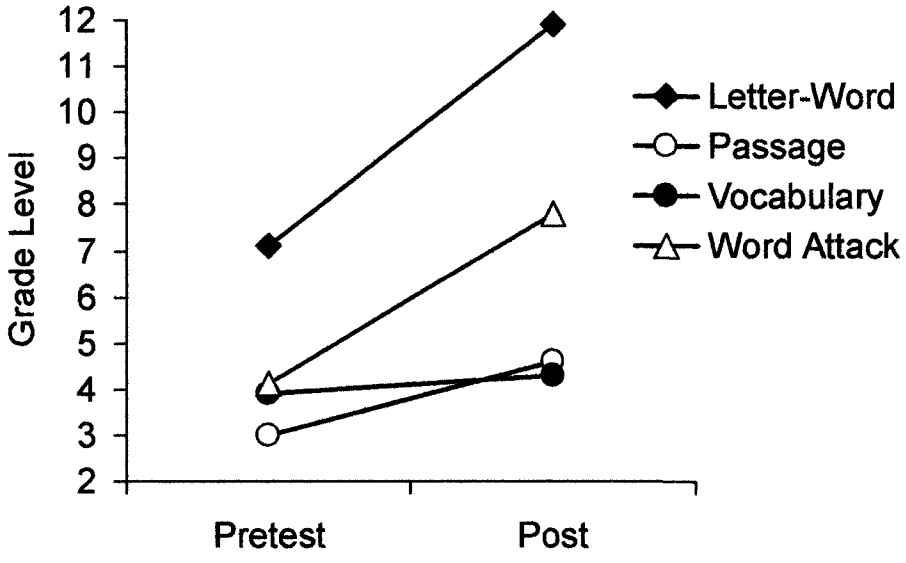


Figure 40. "Joshua:" Reading subtest performance.



Participant 15: "Kalani"

"Kalani," still another ESL active reading participant, started the program at a 2.3 grade level. He demonstrated 1.5 grade level gains in one year (Figure 41). His decoding skills improved most rapidly (2.7 grades) whereas his vocabulary skills improved the slowest (0.7 grades) (Figure 42). Overall, he demonstrated positive gains in all skill areas.

Figure 41. "Kalani:" Overall reading performance.

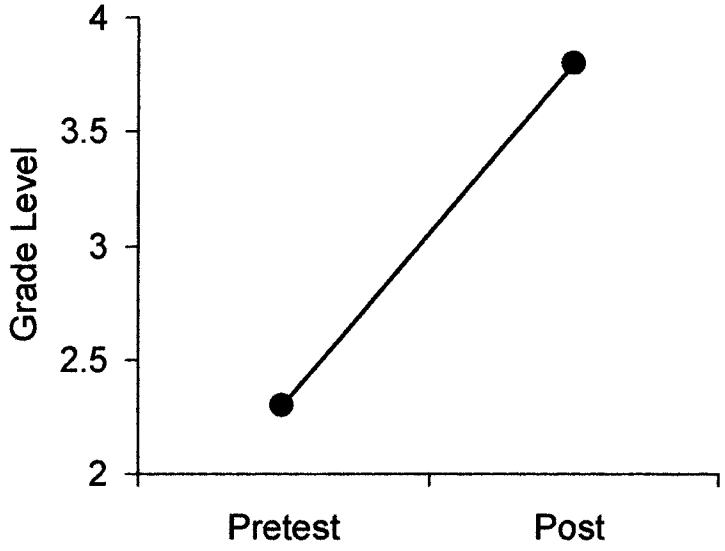
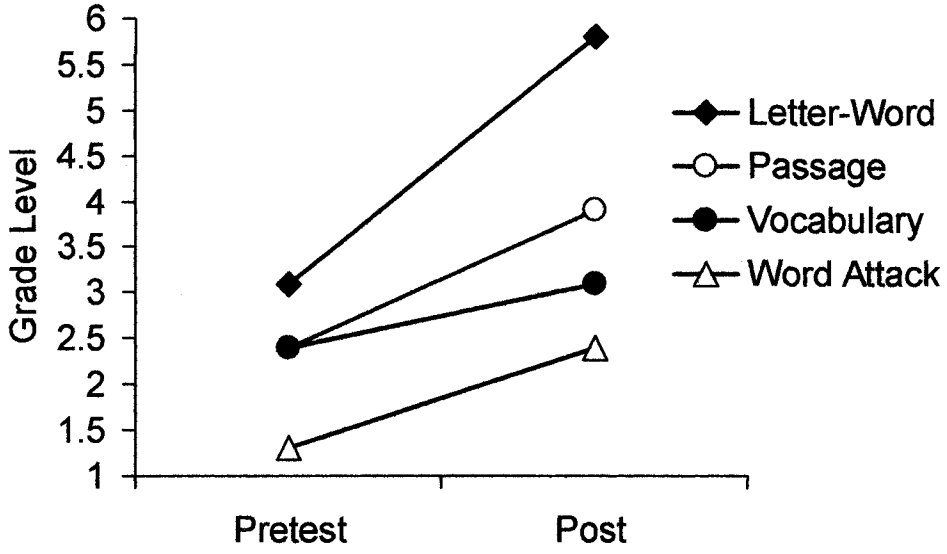


Figure 42. "Kalani:" Reading subtest performance.



REFERENCES

Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs. (1999). Health literacy: report of the Council on Scientific Affairs. *Journal of the American Medical Association, 281,* 552-557.

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders. (4th ed.). Washington, D.C.: American Psychiatric Association.

Asada, K., Samarasinghe, R., Isaacs, P., Schirmer, T., Mezo, P., & Meyer, K. (2003, May). Adult Literacy at Hawai'i State Hospital. Invited symposium presented at the 28th Annual Meeting of the Association for Behavior Analysis, San Francisco, CA.

Baker, F. M., Johnson, J. T., Velli, S. A., & Wiley, C. (1996). Congruence between education and reading levels of older persons. *Psychiatric Services, 47,* 194–196.

Baugh, J. (2000). *Beyond Ebonics: linguistic pride and racial prejudice.* New York: Oxford University Press.

Bayer, A. S. (1990). *Collaborative-apprenticeship learning: Language and thinking across the curriculum, K-12.* Mountain View, CA: Mayfield Publishing Co.

Berg, A., & Hammitt, K. B. (1980). Assessing the psychiatric patient's ability to meet the literacy demands of hospitalization. *Hospital and Community Psychiatry, 31,* 266–268.

Binder, C. (1988). Precision teaching: Measuring and attaining exemplary academic achievement. *Youth Policy, 10,* 7, 12–15.

Binder, C. (1993). Behavioral fluency: A new paradigm. *Educational Technology,* 8–14.

Christensen, R. C., & Grace, G. D. (1999). The prevalence of low literacy in an indigent psychiatric population. *Psychiatric Services, 50,* 262–263.

Coles, G., Roth, L., & Pollack, I. (1978). Literacy skills of long-term hospitalized mental patients. *Hospital and Community Psychiatry, 29,* 512–216.

Currier, G., Sitzman, R., & Trenton, A. (2001). Literacy in the psychiatric emergency service. *Journal of Nervous and Mental Disease, 189,* 56–58.

Davis T. C., Long, S.W., & Jackson, R. H. (1993). Rapid estimate of adult literacy in medicine: A shortened screening instrument. *Family Medicine, 25,* 6, 391–395.

Delpit, L., & Dowdy, J. (2002). The skin that we speak: thoughts on language and culture in the classroom. New York: The New Press.

Doak, C., Doak, L., & Root, J. (1996). *Teaching patients with low literacy skills* (2nd ed.). Philadelphia: JB Lippincott Co.

Dunn, L., & Markwardt, F. (1970). *Peabody Individual Achievement Test.* Circle Pines, MN, American Guidance Service.

Educational Resources Information Center [ERIC]. Retrieved December 15, 2003 from http://www.eric.ed.gov.

Engelmann, S., & Carnine, D. (1982). Theory of Instruction: Principles and Applications. New York: Irvington.

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology, 32,* 221–233.

Gilbert, T. F. (1978). *Human Competence: Engineering Worthy Performance.* New York: McGraw-Hill.

Grace, G. D., & Christensen, R. C. (1998). Literacy and mental health care. *Psychiatric Services, 49,* 7.

Gunning, R. (1968). *The Technique of Clear Writing.* New York: McGraw-Hill.

Haughton, E. C. (1972). Aims: Growing and sharing. In J. B. Jordan & L. S. Robbins (Eds.), Let's try doing something else kind of thing (pp.20–39). Arlington, VA: Council on Exceptional Children.

Jastak, J. F. & Jastak, S. (1984). Wide range achievement test-revised. In D. J. Keyser & R. C. Sweetland (Eds.), *Test Critiques, 1,* Kansas City, MO: Test Corporation of America.

Johnson, K. R., & Layng, T. V. J. (1992). Breaking the structuralist barrier: Literacy and numeracy with fluency. *American Psychologist, 47,* 1475–1490.

Johnson, K. R., & Layng, T. V. J. (1994). The morningside Model of Generative Instruction. In R. Gardner, D. Sainato, J. Cooper, T. Heron, W. Heward, T. Eshleman & T. Grossi (Eds.), *Behavior Analysis in Education: Focus on Measurably Superior Instruction* (pp.173-197). Belmont, CA: Brooks-Cole.

Kaufman, A. S., & Kaufman, N. L. (1983). Kaufman assessment battery for children. Circle Pines, MN: American Guidance Service.

Kaufman, A. S., & Kaufman, N. L. (1985). Kaufman test of educational achievement. Circle Pines, MN: American Guidance Service.

Keller, F. S. (1968). Good-bye, teacher. *Journal of Applied Behavior Analysis, 1,* 79–89.

King-Shaw, E., Hieronymus, A., & Scannel, D. (1989). Canadian tests of basic skills. Ontario, Canada: Nelson Canada.

Kirsch, I. S., Jungeblut, A., Jenkins, L., & Kolstad. A. (1993). Adult Literacy in America: A first look at the results of the national adult literacy survey. Washington, DC: U.S. Department of Education.

Lindsley, O. R. (1990). Precision teaching: By teachers for children. *Teaching Exceptional Children, 22,* 10–15.

Lindsley, O. R. (1994). "Point/See/Say" or "Slide/See/Say" learning channels. *Journal of Precision Teaching, 12,* 2-7.

Lindsley, O. R. (1997). Precise instructional design: Guidelines from precision teaching. In C.R. Dills & A. J. Romiszowski (Eds). *Instructional Development Paradigms* (pp. 537-554). Englewood Cliffs, NJ: Educational Technology Publications.

LoVerde, M., Prochazka., A., & Byyny., R. (1989). Research consent forms: continued unreadability and increasing length. *Journal of General Internal Medicine, 4,* 410–412.

Mezo, P., Isaacs, P., Asada, K., Samarasinghe, R., & Meyer, K. (2003, May). Social validity and the challenges of a state hospital. Invited symposium presented at the 28th Annual Meeting of the Association for Behavior Analysis, San Francisco, CA.

Miles, S., & Davis, T. (1995). Patients who can't read: Implications for the health care system. *JAMA, 274,* 1719–1720.

Morningside Academy. Retrieved November 10, 2002. from www.morningsideacademy.org.

Nieto, S. (2000). Affirming diversity: The sociopolitical context of multicultural education (3rd ed.). New York: Longman.

Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests.* Copenhagen, Denmark: Danish Institute for Educational Research.

Reference Software International. (1992). Gram.mat.ik 5 for DOS. Washington, DC: Author.

Schirmer, T. (2002). *Teaching literacy and mathematics skills to adult psychiatric inpatients: An evaluation of the Adult Literacy Program at Hawai'i State Hospital.* Master's thesis, University of Hawai'i, Mānoa.

Sentell, T., & Shumway, M. (2003). Low literacy and mental illness in a nationally representative sample. *Journal of Nervous and Mental Disease, 191,* 549–552.

Sherman, J. G., Ruskin, R. S., & Semb, G. B. (1982). *The personalized system of instruction: 48 seminal papers.* Lawrence, KS: TRI Publications.

UNESCO. (2004). *United Nations Literacy Decade: Progress Report 2003-2004.* March 2004. Paris: UNESCO.

Vygotsky, L. S. (1995). *Problemy defectologii [problems of defectology].* Moscow: Prosvecshenie Press.

Wheeler, M. S., Kern, R. M., & Curlette, W. L. (1993). Basic Adlerian scales for interpersonal success-adult form. Highlands, NC: TRT Associates, Inc.

Whimbey, A., Johnson, M., Williams, E., & Linden, M. (1993). *Blueprint for educational change: improving reasoning, literacies, and science achievement with cooperative learning.* Washington, D.C.: The Right Combination.

Williams, D., Counselman, F., & Caggiano, C. (1996). Emergency department discharge instructions and patient literacy: a problem of disparity. *American Journal of Emergency Medicine, 14,* 19–22.

Woodcock, R. W. (1978). *Development and standardization of the Woodcock-Johnson psycho-educational battery.* Allen, TX: DLM Teaching Resources.

Woodcock, R. W., & Dahl, M. N. (1971). *A common scale for the measurement of person ability and test item difficulty* (AGS Paper No. 10). Circle Pines, MN: American Guidance Service.

Woodcock, R. W., & Johnson, M. B. (1989, 1990). Woodcock-Johnson psycho-educational battery-revised. Allen, TX: DLM Teaching Resources.

Woodcock, R. W., & Mather, N. (1989, 1990). WJ-R tests of achievement: Examiner's manual. In R. W. Woodcock & M. B. Johnson, Woodcock-Johnson psycho-educational battery-revised. Allen, TX: DLM Teaching Resources.

Wright, B. D., & Stone, M. H., (1979). *Best test design.* Chicago: MESA Press.