

Early Childhood Enrichment Programs

**Piano Math Keys©
&
Latin Locomotive©**

Program Progress Evaluation Report

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Program Progress Evaluation Report

Overview: This Evaluation Report describes the progress of a year-long pilot program of Prospect Latin School's Piano Math Keys Program© and Latin Locomotive Program© as conducted at Louisville Latin School, Inc. (formerly Plainview School, Inc.) and various other NAEYC accredited preschools in partnership with Dr. Barbara Burns and two of her doctoral students in the Ph.D. Program at the University of Louisville. In spring, 2004, Dr. Burns was asked by the school's board to develop a research project that could provide the school with an evidence-based evaluation of two enrichment programs. The evaluation was focused on the impact of these two programs on children's developing skills.

There were multiple questions evaluated in the research project. The first question concerned the impact of the introduction of piano keyboard skills on measures of spatial abilities and mathematical skills. The second question concerned the impact of the introduction of a Latin language curriculum on measures of vocabulary, print awareness, phonological awareness, spelling as well as other literacy skills.

In order to evaluate the impact of these two enrichment programs, we also evaluated these skills in children from other preschools who were not using these enrichment programs. For each child who volunteered to participate in the research study we were able to measure how much they gained in these skills between the beginning and end of the school year. Instruments Used for Specific Assessments of Spatial and Math Skills/Language and Reading Skills were:

- Student spatial/language scores from the NEPSY (A Developmental Neuropsychological Assessment)
- Student math/reading scores obtained on the TEMA (Test of Early Math/Reading Ability)

Evaluation of Overall Changes in Skills

Figure 1 shows the number of students scoring at the 75th percentile or above in the language and visuospatial areas in fall 2004 compared to spring 2005. The number of students scoring above the expected level increased in spring 2005 with an additional 9 students at this level on the language scale and an additional 14 students on the visuospatial scale.

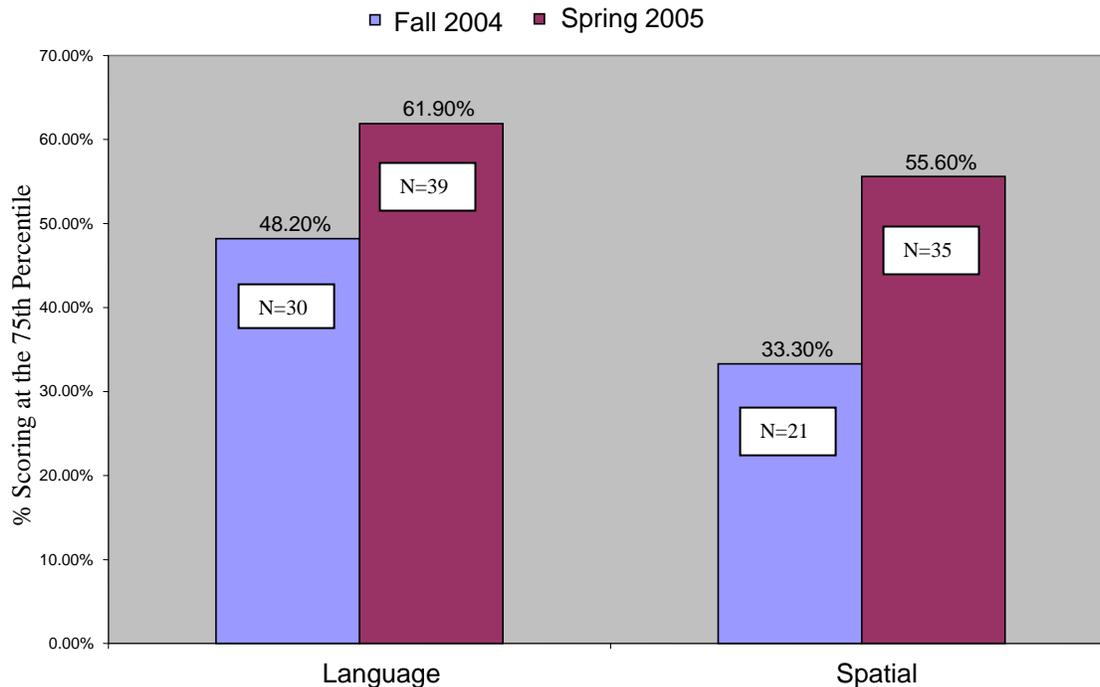


Figure 1. Percentage of students scoring above expected levels (N=63)

Evaluation of the Piano Math Keys© Program: TEMA Scores

The TEMA (Test of Early Math Abilities) was administered to the piano enrichment group and a comparison group. Students were assessed at baseline on the TEMA in fall 2004 and again in spring 2005. Gains were made by all children tested. Figure 6 shows the percentage of students in each group that scored above the 75th percentile in fall 2004 compared to spring 2005. The percentage of students scoring at the 75th percentile increased for both the piano (12.1% to 41.4%) and the comparison (21.2% to 32.3%) groups. Moreover, a paired sample t-test showed that this gain was significant for the piano group $t(32) = 3.56, p < .001$ as well as comparison group $t(32) = 3.75, p < .001$.

T-tests revealed there were no significant differences between the piano and comparison group on the TEMA. As characterized in Figure 6 below there were differences in the groups of children studied (The school, other schools) in the initial assessment. However, it is clear that the piano enrichment group at The school made significant gains across the year in their math skills. We cannot say that these gains were made due to the piano instruction only as the comparison group that we employed to try and answer this question had higher scores initially on the TEMA assessment.

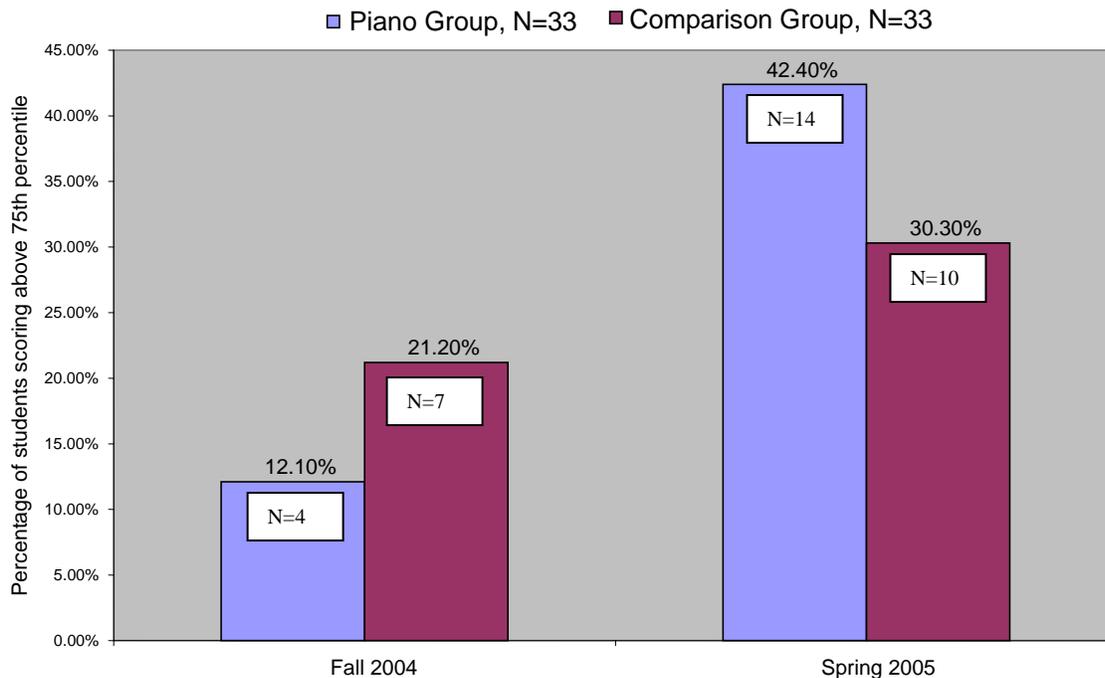


Figure 6. Percent of students scoring above expected percentile on the TEMA

Overall Evaluation of the Piano Math Keys© Program

The assessments of visuospatial/math abilities were employed to evaluate the impact of the piano enrichment on The school children. Both assessments showed significant gains in the pre and post assessments. Because the comparison group of children that were employed to assess the causal impact of the piano enrichment on visuospatial/math skills had higher scores on several of these measures at the pre assessment period and due to high variability across children in both groups we can not definitively report that the Piano Math Keys© program differentially impacted visuospatial/math skills. However, it must be noted that piano children showed significant gains in visuospatial/math abilities in the 2004-2005 school year.

Evaluation of the Latin Locomotive© Program: NEPSY Scores

Figure 8 shows the percentage of students in the Latin and comparison groups that scored above the 75th percentile on the Language scale of the NEPSY in fall 2004 compared to spring 2005. The 75th percentile can be qualitatively interpreted as “Above Expected Level.” The percentage of students scoring at or above the 75th percentile increased for the Latin group from 48.3% to 62.1%, but the comparison group showed a loss in the number of students performing at this level from 56.8% to 54.1%.

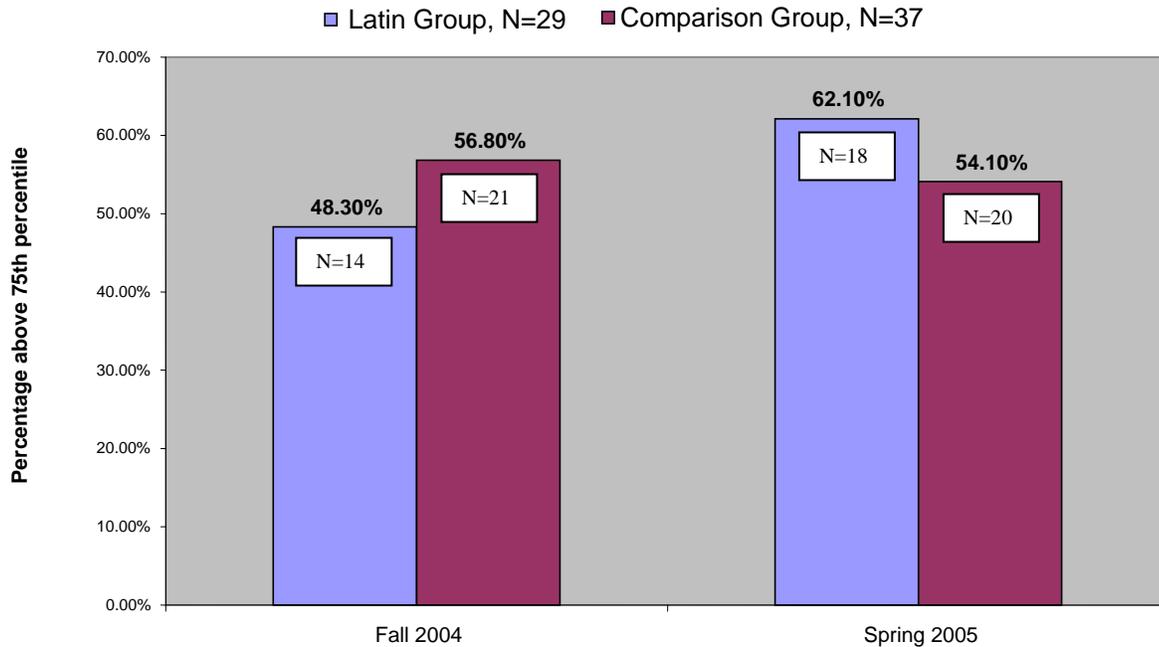


Figure 8. Percentage of students scoring above expected level on NEPSY language scales

Overall Evaluation of the Latin Locomotive© Program

Two assessments of language/reading abilities were employed to evaluate the impact of the Latin Locomotive© Program on The school children. Both the NEPSY and TERA showed significant gains in the pre and post assessments Because the comparison group of children that were employed to assess the causal impact of the Latin enrichment on language skills had higher scores on several of these measures at the pre assessment period and due to high variability across children in both groups we can not definitively report that the Latin Locomotive© Program differentially impacted language skills. However, it must be noted that Latin children showed significant gains in language abilities in the 2004-2005 school year.

Comparing Preschool Children Who Received Piano Enrichment Vs Latin Enrichment (NEPSY Scores)

Given the sample of children employed to evaluate the impact of the piano enrichment and the sample employed to evaluate the impact of the Latin enrichment proved problematic we have one more comparison that can provide some indication of the differential benefit of each program. These comparisons must be viewed with caution, as the assignment to the two types of enrichment was not made randomly but emerged as a function of the interest level of the parents. Differences in the initial fall scores as well as the subsequent spring scores may be due to activities that were engaged in at home or due to different interest levels across the families in the two groups.

Piano Vs Latin Enrichment: NEPSY Visuospatial Scores

Figure 11 shows the average gains on the Visuospatial Scale of the NEPSY for the piano group and Latin group. While, both groups showed gains on the visuospatial scale, the piano group showed the largest gains in all domains. Additionally, a paired samples t-test showed that the piano group significantly increased on the

visuospatial sum scale score $t(32) = 3.2, p = .003$, core domain score $t(32) = 3.3, p = .002$, and percentile rank $t(32) = 3.9, p < .001$. The Latin group did not approach significant gains on any of the visuospatial scores. These findings suggest that the piano enrichment may have had a greater effect on students' visuospatial skills.

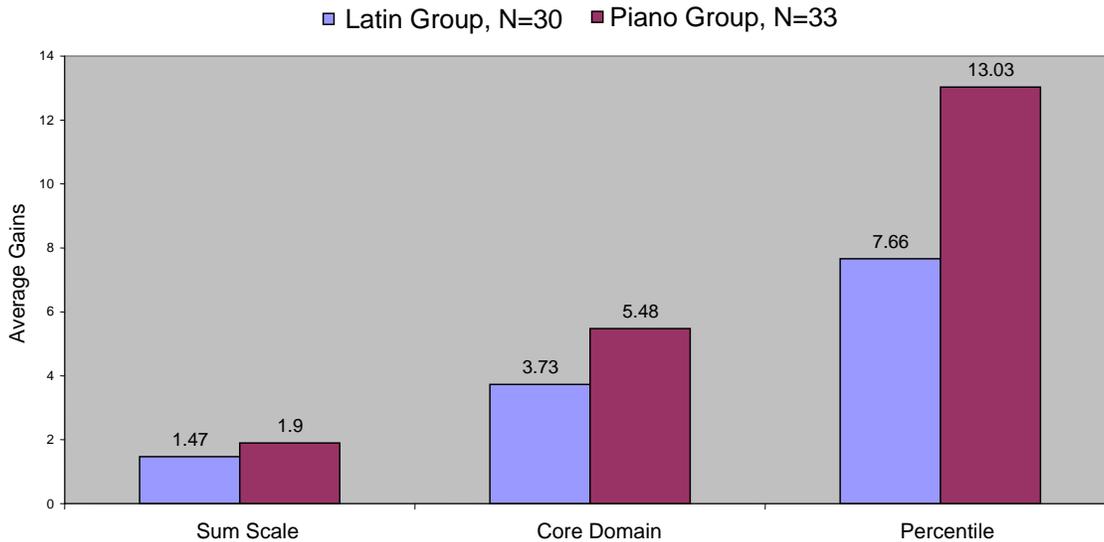


Figure 11. NEPSY Visuospatial Scale Gains fall 2004 to spring 2005

A second analysis of the changes in visuospatial skills in children support the previous analysis. Figure 12 shows the number of students scoring above expected on the Visuospatial scales of NEPSY. Both the Piano $t(17) = 3.85, p < .001$ and Latin $t(16) = 4.05, p < .001$ groups showed a significant gain in the number of students scoring above the 75th percentile at baseline compared to spring 2005. The Latin group gained an additional 8 students scoring above the 75th percentile for a total of 17 students in spring 2005. The piano group gained an additional 6 students scoring at this level for a total of 18 students in spring 2005.

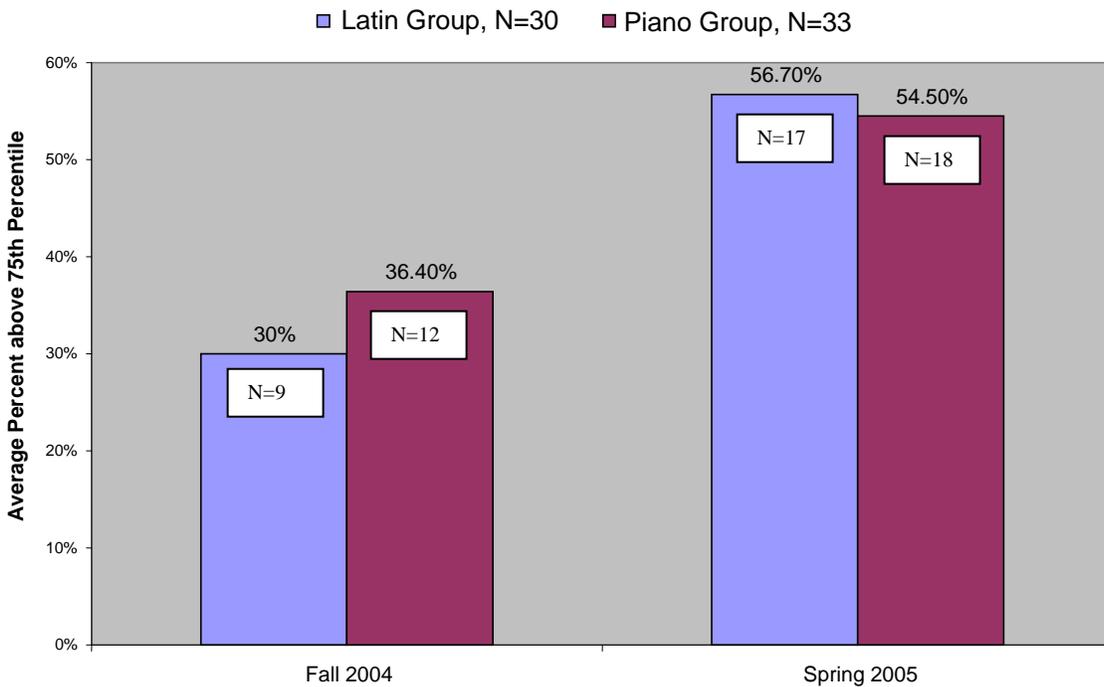


Figure 12. Students who scored above expected level on NEPSY Visuospatial Scale

Piano Vs Latin Enrichment: NEPSY Language Scores

All students participating in the Latin and piano programs were also assessed on the language scale of the NEPSY. T-test revealed there were no significant differences between the two groups on any of the language measures in the overall assessment. Figure 13 shows the gains on the NEPSY language sum scale, core domain score, and percentile for both the Latin and piano groups. Within each group, there were comparable gains on the Language scale measures however, none of these approached significance. Thus, this shows that the increases did not differ for the piano and Latin enrichment across the school year.

Figure 14 shows the number of students scoring above expected on the Language scales of NEPSY. Both the piano and Latin enrichment groups showed gains in the number of students scoring above the 75th percentile at baseline compared to spring 2005. The Latin group gained an additional 4 students scoring above the 75th percentile for a total of 19 students in spring 2005. The piano group gained an additional 5 students scoring at this level for a total of 20 students at this level in spring 2005.

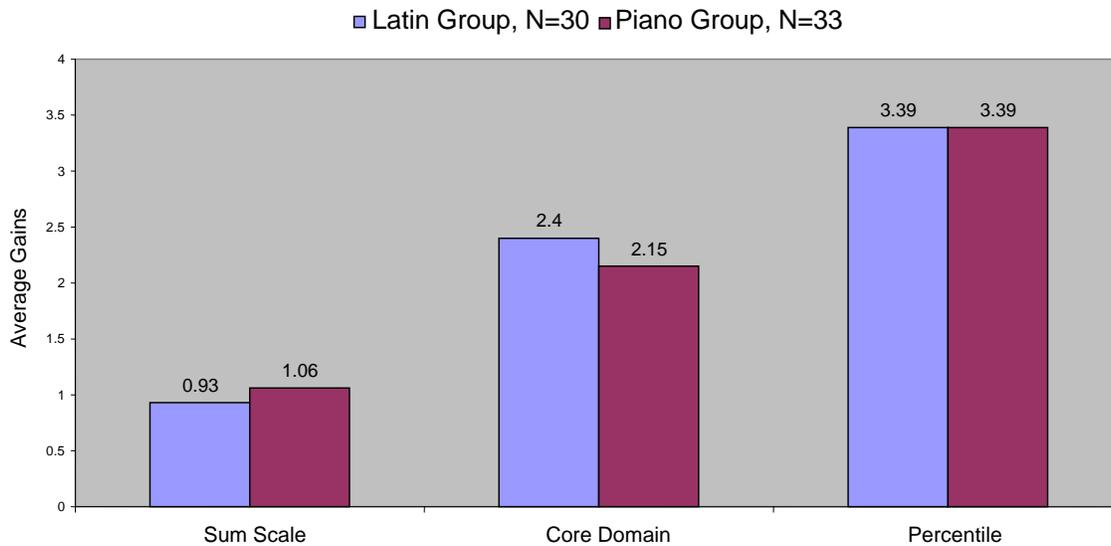


Figure 13. Language Scale Gains fall 2004 to spring 2005

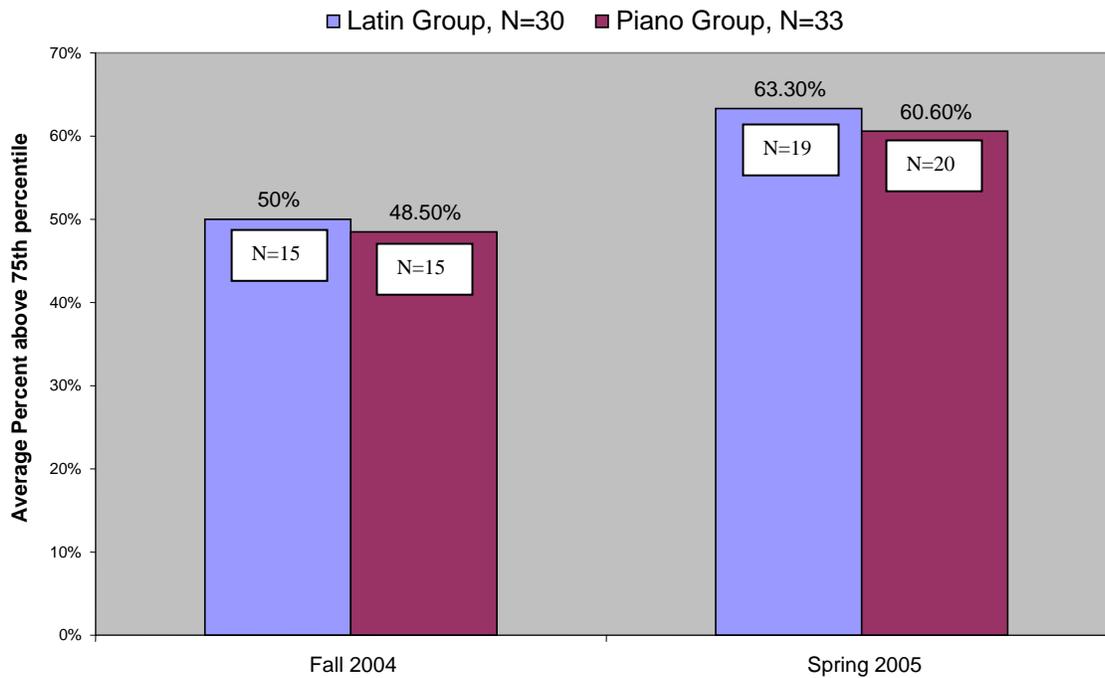


Figure 14. Students who scored above expected level on the NEPSY Language Scale

Summary and Recommendations

- (1) Children enrolled in the piano and Latin programs demonstrated significant gains in all measures assessed as part of this research project. The research shows considerable progress in the subject children between fall and spring and some differences in the Latin and piano program.
- (2) The evaluation of the specific impact of the piano enrichment program on math and visuospatial skills was problematic as the comparison children employed demonstrated higher initial scores on some of the assessments. This reflects the small sample sizes and the high variability of scores on these measures at this age range.
- (3) The evaluation of the specific impact of the Latin enrichment program on reading and language was problematic for the same reasons as listed above in (2). The comparison children employed demonstrated higher initial scores on some of the assessments. This reflects the small sample sizes and the high variability of scores on these measures at this age range.
- (4) Because the sample of "control" or comparison children differed to begin with from the subject children in some critical ways that we could measure and many critical ways that and these differences made the comparisons between subject schools and control schools problematic and not meaningful. If we had been able to employ "control" children from the same school and randomly assign children to Piano, Latin or 'no enrichment' we would have been able to make some definitive statements.
- (5) Despite these problems in interpretation, there was some evidence of particular gains on math and visuospatial skills by children in the piano enrichment program and gains on reading and language skills by children in the Latin enrichment program.

- (6) When children who enrolled in the two programs were directly compared, there was some evidence that the piano enrichment had a greater effect on developing math and visuospatial skills. There was no evidence that the Latin program had a greater effect on development of language skills.

Thing to Consider:

- (1) Many differences in the Piano and Latin enrichment program that may have played into the differential impact. These include the level of structure, the teacher-student interactions for the two groups, staff differences, etc.
- (2) The level of feedback that teachers received from the Piano and the Latin program was not known or evaluated. This may be an important factor in the impact of enrichment.
- (3) The amount of home involvement for the Piano and Latin programs may also be a factor.

Recommendations:

- (1) Despite the problems described in this report, the comparisons of Latin versus piano enrichment for children at The school may be of particular interest to the school when making decisions about continuing and/or expanding the piano and /or Latin programs. The research suggests better progress in skills for the Piano enrichment group.
- (2) It is recommended that the school continue assessment with children at the new Prospect Latin School on these measures. To this end, the research team has prepared instruction materials and manuals for the assessments that were implemented during the first year of this research project such that the school staff can continue the study in future years. Be assured that the assessments are very easy to learn and have great validity on their own for staff and students.