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ABSTRACT

There is little empirical evidence that home-school education is as academically effective as traditional education, or that average and above-average academic achievement is sustained through high school. A sample of 110 home-schooled students (59 males, 51 females, ages 5 years 3 months to 19 years 6 months) were administered the Woodcock-Johnson-Revised Tests of Achievement. In addition, a longitudinal study was conducted of 46 of these students who were given the test 2 or more years over the 6-year span of the study. Both male and female home-schooled students scored at or above the 50th percentile on all clusters of subtests. However, measures of academic achievement over time revealed that the students' performance declined with increasing grade level. The effectiveness of home-school education related to parental education and preparation for high-school level courses is discussed. (DFR)

Running Head: ACADEMIC ACHIEVEMENT IN HOME SCHOOL

Academic achievement in home school education

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Abstract

There is little empirical evidence that home-school education is as academically effective as traditional education for both male and female students, or that average and above average academic achievement is sustained through high school. A sample of 110 home-schooled students (59 males, 51 females, ages 5 years 3 months to 19 years 6 months) were administered the Woodcock-Johnson-Revised Tests of Achievement. In addition, a longitudinal study was conducted consisting of 46 of these students who were administered the test two or more years over the 6 year span of the study. Both male and female home-schooled students scored at or above the 50th percentile on all clusters of subtests. Measures of academic achievement over time revealed the students' performance on Cluster scores declined with increasing grade level. The effectiveness of home school education related to parental education and preparation to teach high school level courses is discussed.

Academic achievement in home school education

A growing number of families are educating their children at home rather in a traditional school setting. Recent surveys report that approximately 1.15 to 1.23 million American children are being taught at home (HSLDA, 1997; Ray, 1997) and the growth rate is estimated to be 15% per year (Ray, 1996). Once discouraged in many states, it is now legal in every state, although the laws and standards that regulate it vary. Since a Supreme Court decision in 1985 that ruled a home school could operate under the existing private school law, most states recognize home education as an alternative for complying with compulsory school attendance requirements (Furst, 1994).

The home-school movement is a rapidly growing educational movement and has been termed "a major educational phenomenon" (Murray, 1996). The home-schooling boom is not without controversy, however, because there is little empirical evidence that home-school education is as academically effective as traditional education, or that average or above academic performance is sustained through high school.

Why do parents choose to home-school their children? A review of the literature and recent surveys indicate that one of the most frequently cited reasons is the dissatisfaction with the public schools. Home-schooling parents stated that the public schools did not meet the academic, social, emotional, moral and/or spiritual needs of their children. Due to the inadequate academic standards, curriculum, teaching methods and control of student behavior, their children experienced chronic and often unidentified academic failure, frustration and exposure to alcohol, drugs, teasing, lewed sexual comments and laziness (Cizek, 1988; Gray, 1993; Murray, 1996).

The home-school philosophy is consistent with the principles of progressive education, which stem from the writings of John Dewey. The hallmark of the progressive movement was the full development of the potential of each child within the community (Gardner, 1991). Progressive Education models contained several key elements. One essential element was the focus on activities and projects that were meaningful to the students, carried out in appropriate context, to enhance maximum understanding. Dewey advocated a child-centered educational philosophy in which children learn best if they have the freedom to pursue study of topics that reflect their interests (Lines, 1994). Another important element to progressive education were responsible, motivated students who "educated themselves" by making the most of learning opportunities and figuring out things on their own (Gardner, 1991). A third key component was the assurance that the teachers were well trained (Gardner, 1991). The master teachers must not only have a broad knowledge base in many disciplines, but also be knowledgeable and skilled in effective, developmentally appropriate methods of transmitting knowledge to students.

Home-school education also coincides with the constructivist perspective, an increasingly influential approach to learning and teaching grounded in the ideas of Jean Piaget and Lev Vygotsky as well as the philosophy of John Dewey. The Constructivist view emphasizes the active role of learners in building their own knowledge and understanding so that new information makes sense to them (Driscoll, 1994). Constructivist models emphasize student-centered instruction in challenging learning environments through complex, "fuzzy" problems. These complex problems should be in the form of authentic situations and tasks that mimic real-life problems.

The idea of home-schooling reflects both of these educational perspectives in that it presumes skills and knowledge will be learned through daily life, social activities, and work or community service (Eaton, 1993). Advocates for home education believe that their curricula, implemented with (1) private, one-on-one instruction, (2) smaller time periods of highly focused academic learning time, and (3) an environment free from distractions, circumvents many of the problems of traditional education by giving the students the chance to learn and advance at their own pace, and enabling brighter students to learn faster (Murray, 1996; Ray, 1997).

Critics of home-school education point out that home education cannot substitute for traditional schooling because home-schooling is incompatible with the fundamental purpose of compulsory education, in which the public was expected to provide an education through cooperative exchange within a community (Lines, 1994). Moreover, some of the important elements of the progressivist and constructivist approaches are missing in home education.

One missing element essential to the acquisition of deeper understanding is cooperative interactions through group activities and cooperative discussions (Gardner, 1991). Vygotsky advocated reciprocal teaching in which a group of students read text together, initially under the guidance of a teacher, and are scaffolded toward higher levels of mastery until the students assume the role modeled by the teacher (Berk & Winsler, 1995). Many constructivists also agree with Vygotsky's belief that complex thinking processes develop through social negotiation, a learning process based on collaboration with others and respect for different viewpoints. This process is particularly important in adolescence, where students need to work together and question one another about

problems and issues that interest them. They need to reflect on their own learning processes (Piaget, 1960). Dewey further suggested that the occupations and relationships of most home schools were too few to provide a "full social enterprise that is education" (Lines, 194).

A second element in question involves the assurance that the teachers are well trained. A review of studies that looked at the relationship between the parent's formal training and certification to teach and the academic achievement of home-schooled students found that there was no statistically significant relationship between student achievement and teacher certification (Ray, 1997). However, many home-schooling parents are not trained to help students who are not benefiting from a self-paced model such as students with learning disabilities or those who are not self-disciplined, not intrinsically motivated to learn or are not independent learners. Moreover, home-school parents need in-depth knowledge and understanding of all core subjects in order to provide challenging learning opportunities for middle school and high school students. Gardner (1991) asserts, "I would not be surprised if, among teachers without explicit training and certification in a discipline . . . errors, misconception and primitive approaches were uncovered." (p. 179).

A small body of research is available on the academic effectiveness of home-school education. Most studies to date indicate that the students educated at home perform as well as or better than their peers in conventional schools on standardized achievement tests (Boulter & Macaluso, 1994; Eaton, 1993; Ray, 1988; Ray, 1997). Home educated students from grades K through 8 in Washington state consistently scored above the national average on the Stanford Achievement Test (SAT) in reading,

language, math and science, with the median score at approximately the 67th percentile on national norms (Ray, 1992). Studies in other states and nationwide studies showed that home schooled children scored higher than statewide or national averages for their age groups in each area of the SAT or CAT (Eaton, 1993; Ray, 1990). A very recent nationwide study, for example, reported the following student percentiles on standardized group academic achievement tests: total reading, 87th; total language, 80th; total math, 82nd; total listening, 85th; science, 84th; social studies, 85th; and basic battery (reading, language, math), 85th (Ray, 1997).

Some studies reported academic achievement scores on a group-administered standardized test that were not above the average of their peers. A study of home schooling in Alabama (Rakestraw, 1988) found that home educated students at the 1st and 4th grade level scored below the national average in math. Other studies reported marginal levels of performance. The Alabama study reported that some of the students at the 1st through 6th grade level scored at the 54th percentile in reading. Likewise, marginal percentiles were reported in Washington state for math (53rd) and language (56th) (Ray, 1992).

One limitation of these studies involves the range of grades sampled and the scores that are reported for the students in these grades. Most of the previous studies only sampled students at the elementary level or up through grade 8 and few included grades 9 to 12. More importantly, even those studies including high school students in the sample only reported scores for grades K through 8. Finally, few studies analyzed data for possible gender or grade level differences or for a possible grade x gender interaction.

A second limitation concerns the use of standardized group achievement tests to assess the academic achievement of home-schooled students. One of the most common research methods to assess the effectiveness and validity of home education is to measure academic achievement with standardized tests (Lines, 1987; Wright, 1988). Even though reviews of the group standardization sample demonstrate adequate reliability and validity coefficients for screening academic performance (Ebel, 1978; Wright, 1988), the content and administration procedures of the group achievement tests may not be valid and accurate reflection of an individualized curriculum (Cizek, 1988; Jenkins & Pany, 1978; Wright, 1988). Using state-mandated, traditional education assessment methods to measure individual home-schooled students' academic achievement is questionable because these measures generally are administered to compare groups (Cizek, 1991; Cizek & Ray, 1995). Studies need to be conducted using individualized assessments of academic achievement to evaluate the overall quality of home education (Mayberry, 1995).

A third limitation is the absence of longitudinal studies to track the effectiveness of home-school education at least through high school (Cizek & Ray, 1995; Ray, 1997). Little is known about the change in students' academic achievement over time. This design would complement the traditional cross-sectional studies, identify any grade-level or gender-related changes in academic achievement with increasing grade level, and determine whether academic gains made by the home-school population, in general, during the elementary years were maintained thorough high school.

The purpose of this research was to determine whether home-schooled students achieve academically as well as their grade-level peers in traditional schools. The

following predictions were derived from the literature reviewed and the results of earlier pilot studies:

1. Home-schooled students, in general, will perform at or above the 50th percentile on a standardized individually-administered test battery of academic achievement measuring reading, mathematics, writing, science, social studies and the arts.
2. There will be no true sex differences in overall academic performance or on any of the specific academic areas.
3. The home-schooled students' performance on specific subtests will decline with increasing grade level.

Method

Participants

A sample of 110 home-schooled students (59 males, 51 females, ages 5 years 3 months to 19 years 6 months) from the southwest region of North Carolina completed an end-of-grade academic assessment battery. All of the students in the sample were home-schooled by a parent and all of the parent/teachers voluntarily requested an individually-administered assessment of academic progress. All participants were assured complete anonymity and informed consent was obtained from the parent prior to testing. Demographic data were collected using portions of a survey used to conduct a nationwide study of home education (Ray, 1990). The students were all Caucasian American and from middle and upper middle-class families. The average amount of formal education completed by home-schooling parents was 13 years (12 years for the mother, 14 years for the father; range = 12 – 21 years). Approximately 32% of the mothers and 16% of the fathers had completed two or more years of post-secondary education, and 27% of the

mothers and 39% of the fathers completed 4 or more years of college. At least 75% of the formal academic teaching in the home school was completed by the mothers. Six of the parent/educators (4 mothers, 2 fathers) were certified teachers.

In order to determine any change in academic performance with increasing grade level, a subsample of students was developed consisting of students who returned for testing in subsequent academic years. Over the six-year span of the study, the academic achievement test, testing environment and test administrator remained the same but the trained assistants changed each year. Subjects for the longitudinal study consisted of 46 students who returned for end-of-grade testing at least once (range = 2 to 6 repeated testing sessions).

Materials and Procedure

The students' academic achievement was measured with the Woodcock-Johnson-Revised (WJ-R) Tests of Achievement, Standard Battery, an individually administered, norm-referenced assessment commonly used to measure the academic development of individuals from preschool through adulthood (Cummings, 1994). The Standard Battery consists of nine tests, including two reading tests (Letter-word Identification and Passage Comprehension), two mathematics tests (Calculation and Applied Problems), two writing tests (Dictation and Writing Samples), and three tests of specific content areas (Science, Social Studies and Humanities). The Humanities test measured knowledge of music, art and literature. In addition to the scores for each of the individual tests, four cluster scores were derived through analysis of certain combinations of the nine tests. Broad Reading measured reading achievement, Broad Mathematics measured math achievement, Broad Written Language measured both production of single-word responses and production of

sentences embedded in context, and Broad Knowledge measured general information achievement in the three content areas. The WR-R is considered an appropriate measure of academic aptitude and achievement for children age 2 and over, and is accepted as a research tool to measure program effectiveness and developmental change in individual abilities over wide time spans (Wodrich, 1997; Costenbader & Perry, 1990; Woodcock & Mather, 1990). Reviews of the WJ-R report adequate internal consistency coefficients for all age groups exceeding .90 for the achievement clusters and ranging from the .80's to 90's for the individual subtests (Cummings, 1994; Ebel, 1978; Salvia & Yesseldyke, 1991).

The WJ-R was administered by a qualified psychologist or a trained psychology student assistant. The student was brought to the College testing room by the parent and individual testing of each student was completed within approximately 2 hours.

Results

Academic Achievement

Analysis examining the academic achievement of home-schooled students on an individually-administered standardized test. The percentile means for the academic performance of the total sample of home-schooled students on each subtest were compared to the national average (mean) of the general nationwide population of students (i.e., the normative sample), which is the 50th percentile. In general, the home schooled students scored at or above the 70th percentile on all specific subtests (mean = 68.78; range = 54.03 to 76.96 except Dictation (54) and Humanities (55). Table 1 presents the percentile means for the students' performance on the Clusters of subtests (Broad

Reading, Broad Math, Broad Written Language and Broad Knowledge). The students, in general, scored above the 50th percentile on each of the four Clusters. In addition, Broad Reading (76.04) and Broad Math (75. 82) were significantly higher than average.

Sex Differences

Analysis examining the sex differences in overall academic performance and in specific academic areas. Calculation of mean percentiles by sex revealed that both males and females scored at or above the 50th percentile on all clusters of subtests. The females were within the High Average range of percentile scores for the cluster of subtests labeled Broad Reading (78.45). The percentiles for males on the Broad Math (79.10) Cluster was within the High Average range of scores.

A 2 (female, male) x 4 (Broad Reading, Broad Math, Broad Written Language and Broad Knowledge) analysis of variance was conducted with sex as a between factor and cluster as a within-factor. Percentile scores obtained during the first (or only) testing of each participant were used as the dependent measure. The main effect for sex was not significant, $F(1, 108) = .47$, $p > .10$. However, the main effect for cluster was significant, $F(3, 324) = 6.75$, $p < .01$, as was the sex by cluster interaction, $F(3,324) = 4.28$, $p < .01$. The students performed significantly better on the Broad Reading and Broad Math clusters than on the Broad Written Language and Broad Knowledge cluster. There were no significant differences in overall academic achievement between males and females, but the males scored significantly higher than the females on the Broad Math cluster.

Longitudinal Analysis

Analysis of changes in specific academic areas with increasing grade level. To measure change in performance over time on any of the clusters, the years between the first administration of the WJ-R and the most recent administration were correlated with the difference in cluster scores between the first and most recent testing. Mean cluster scores for each of the 46 persons in the longitudinal sample were used in the analysis. As shown in Table 2, percentile scores for all four Clusters were negatively correlated with years in home schooling. A significant decline in percentile score between testings was observed for Broad Written Language ($p < .01$) and Broad Knowledge ($p < .05$). This pattern suggests that percentiles in all four academic areas decline the longer students are home schooled, and the decline is significant in Broad Written Language and Broad Knowledge.

Discussion

Home-schooled students scored at or above the 50th percentile on all specific academic subtests and clusters of subtests, with above average performance in Reading and Math. Males were above average in math, whereas females were above average in reading. Longitudinal analysis of the difference between the first and most recent testing of students tested two or more times revealed a significant decline in Broad Written Language and Broad Knowledge mean percentiles over time.

Academic Achievement

The first hypothesis that home-schooled students, in general, will perform at or above the 50th percentile on a standardized individually-administered measure of academic achievement was supported. The home-schooled students performed as well as

or better than average students in the nation, most of whom attend public or private schools. This finding is consistent with previous nationwide and statewide studies using the general nationwide population of students as the "norm" or comparison group. The results of this and previous studies suggest that home-school education is as effective as traditional education in all the major subjects.

The overall academic achievement of males and females was not significantly different on the average. The students, in general, achieved at or above average in all academic areas, suggesting the home-school educational environment is effective for both males and females. Contrary to the prediction, however, the academic performance of males and females in specific academic areas showed sex differences. Males were stronger than females in math; females were stronger than males in reading. Although no previous investigations of home education looked at sex differences in academic performance, the evidence in this study is consistent with the findings from meta-analysis of data from developmental and academic investigations conducted for over two decades. Males traditionally perform better than females in mathematical reasoning, but females outperform males in reading and writing achievement (Berk, 1997).

The percentiles for the sample in this study for reading, math, science and social studies were from 6 to 15 percentile points lower than the scores reported in recent studies. One possible explanation for the difference is that all previous research used standardized group achievement tests to measure academic performance. This research is the first to measure the academic achievement of home-educated students using an individualized achievement test.

As predicted, the home-schooled students' performance on specific content areas, particularly in written language and the knowledge areas (science, social studies and humanities) declined with increasing grade level. A possible explanation for this trend, plus the relatively lower percentile scores described above, relates to the parents' highest level of formal education. The parents of the students in this sample averaged 13 years of education and 27% completed four or more years of college. Parents in the most recent nationwide study of home-schooled students (Ray, 1997) averaged 15 years of education (mother = 14 years; father = 15.6 years) and 32% of the parents completed four years of college. Ray reported that the parents' educational level was significantly related to the students' test scores. This data suggests that the differences in this sample's academic achievement is related to certain limitations in the parents' academic preparation to teach major content areas.

This research reaffirms the effectiveness of home school education for both males and females, and advances the knowledge of the effects of home schooling with increasing grade level. Future studies are needed that have a more geographically diverse sample of students. Annual testing of home schooled students from elementary thorough high school would provide a longitudinal exploration of academic achievement. Analyses of this longitudinal data should control for age or grade level to focus specifically on the effect of home schooling. Also, home-school research could be expanded with a matched sample of students attending public schools, measuring academic progress with the same individualized achievement test, to serve as a non-home-schooled comparison group.

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Table 1

Mean Percentiles for WJ-R Clusters of Subtests by Gender

	Clusters			
Gender	Broad Reading	Broad Math	Broad Written Language	Broad Knowledge
Female (n = 51)				
M	78.45	72.55	68.10	61.65
SD	27.30	29.87	31.49	29.07
Male (n = 59)				
M	73.64	79.10	66.42	73.86
SD	28.35	28.79	29.02	28.79
Total (n = 110)				
M	75.87	76.06	67.20	68.20
SD	27.84	29.34	30.06	28.79

Table 2

Correlations of Cluster Scores Between First and Last Testing

Variable	1	2	3	4	5
1. Years H.S.	--	- .17	- .24	- .56**	- .30*
2. Br. Reading		--	.46	.48	.47
3. Br. Math			--	.44	.60**
4. Br. Wr. Lang.				--	.51
5. Br. Knowledge					--

Note: Differences in Cluster scores between first and last testing were correlated.

H.S. = home-schooled; Br. = Broad; Br. Wr. Lang. = Broad Written Language.

n = 46

*p< .05, 2-tailed. **p,< .01, 2-tailed

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