**An Evaluation of the Chess Challenge Program of
ASAP/After School Activities Partnerships**

**Dr. Joseph DuCette
Temple University**

Abstract

The present study is intended as a preliminary evaluation of the Chess Challenge Program which is the signature program of the ASAP/After School Activities Partnerships. The design was quasi-experimental with matching, and involved comparing the achievement and behavior of participants of the chess program with a matched comparison group. The target sample consisted of 151 students in grades 3 – 8 who were selected as the target group. These students were matched by gender, ethnicity, grade and school with students who had not participated in the chess program. The data investigated were the PSSA math and reading scores, as well as absences and behavior ratings. The results showed that the ASAP students outperformed the matched comparison group in both reading and math on the PSSA tests. In addition, the ASAP students had significantly fewer absences during the school year and, when compared to the Philadelphia student population as a whole, had significantly better behavior ratings. Additional analyses showed that students who had participated in the chess program for more than one year showed concomitant improvement in math and reading. Finally, students in the ASAP program gained more in reading and math from the previous school year as compared to the matched comparison group. Overall, the data indicate strong support for the Chess Challenge Program in improving the achievement and behavior of students.

An Evaluation of the Chess Challenge Program of the After School Activities Partnership (ASAP)
Dr. Joseph DuCette
Temple University

A. Introduction

The data presented in this report are intended as a preliminary evaluation of the Chess Challenge Program which is conducted under the auspices of the After School Activities Partnership (ASAP). According to its website, "Since 2004, ASAP annually organizes 200 chess clubs for more than 4,000 youth playing in schools, community centers, libraries, places of worship and homeless shelters across the city- making the Chess Challenge ASAP's centerpiece initiative". The website comments that the US Chess Federation sites numerous research studies on the importance of chess as a means to improve academic achievement, and increase patience, self-control and sportsmanship among school-aged students. ASAP's chess program has been cited in several articles in local newspapers and is widely regarded as an exemplary after-school program for Philadelphia children.

The methodology employed in this study is similar to a previous evaluation of a program administered by ASAP. This methodology will be described below. The core question that this study is designed to answer is whether participation in the after school chess program has an impact on the students' academic achievement, as measured by the Pennsylvania System of School Achievement (PSSA) tests, as well as the students' school-related behavior, as measured by the School District of Philadelphia's behavior grade and attendance.

B. Methodology for the Present Study

The design of this evaluation is essentially quasi-experimental with subject matching. This was implemented as follows: the ASAP program provided the names of a randomly selected group of students who had participated in the chess program during the 2008 – 2009 academic year. These students were then matched as closely as possible with students who did not participate in the chess program. The matching was conducted as follows: for each of the participants, a matched student was selected who was:

(1) From the same school as the participant
(2) From the same grade
(3) Of the same gender
(4) Of the same ethnicity

This matching procedure, which was conducted by the Office of Research of the School District of Philadelphia, provided a list of potential matches for each of the target students in the ASAP chess program. From this list, an additional criterion was applied by attempting to further match each target student according to the student's achievement in the year prior to the current year in which the data were collected. This was accomplished by reviewing the participant's PSSA data from the previous year, and then attempting to find a student who was as similar as possible in terms of PSSA scores. As will be noted later, this proved difficult in some cases since some students had moved into or out of the

District, or did not have PSSA data available. The extent that this matching was successful will be discussed later in this report.

C. Sample Description

Descriptive data on the students in the after school chess program who were chosen for inclusion in the present study are presented in Tables 1 – 6.

Table 1: **School Student Attended**

School	Frequency	Percent of Sample
Baldi	11	7.3
Beeber	17	11.3
Blankenburg	9	6.0
Bregy	13	8.6
Cleveland	3	2.0
Clymer	4	2.6
Emlen	3	2.0
Gideon	13	8.6
Hartranft	3	2.0
Kenderton	2	1.3
Longstreth	10	6.6
Mayfair	17	11.3
Meehan	7	4.6
Meredith	16	10.6
OEC	18	11.9
Reynolds	3	2.0
Steele	2	1.3

Table 2:   Student Age

Age	Frequency	Percent of Sample
6	1	.7
7	1	.7
8	6	4.0
9	12	7.9
10	26	17.2
11	23	15.2
12	35	23.2
13	25	16.6
14	18	11.9
15	3	2.0

Table 3:   Student Grade

Grade	Frequency	Percent of Sample
1	1	.7
2	2	1.3
3	15	9.9
4	25	16.6
5	32	21.2
6	27	17.9
7	30	19.9
8	19	12.6

Table 4:   Student Ethnicity

Ethnicity	Frequency	Percent of Sample
Asian	12	7.9
African American	94	62.3
Latino	4	2.6

White	32	21.2
Other	9	6.0

Table 5:   Student Gender

Gender	Frequency	Percent of Sample
Male	102	67.5
Female	49	32.5

Table 6:   Number of Years in Chess Program

Number of Years	Frequency	Percent of Sample
1	88	58.3
2	36	23.8
3	26	17.2
5	1	.7

As shown in Tables 1 through 6, the target students attend a variety of Philadelphia Schools, are mostly in the 9 – 14 age range in grades 3 – 7, and are primarily males who are African-American or White. With the exception of gender, this group of students is similar to the Philadelphia School population as a whole. The distribution of target students by school and grade is presented in Appendix A.

D. Results

(1) Academic Achievement

The data provided by the School District of Philadelphia for the target and matched students were the PSSA scores in Reading and Mathematics. Since these data are reported in a number of different ways, it was decided to report two forms of the data in this report. Scores from tests like the PSSA are often reported as scaled scores. Data of this type are often used to report academic performance for individual students and to report average performance for groups. In contrast to scaled scores, another way of reporting test data is through the 4-part division of "Advanced", "Proficient", "Basic" and "Below Basic". In almost all of its public reporting, the School District of Philadelphia, as well as the State of Pennsylvania, report test data this way. While this way of reporting is less sensitive than scaled scores, the Reading and Math test data will be reported this way as well since this use is so common.

The Reading and Math PSSA scores, presented as scaled scores, for the target and matched groups, by grade, are presented in Table 7 and Table 8. Since PSSA data are not available for first and

second grade, only students in grades 3 – 8 were used for this analysis. The data for all students in the Philadelphia School District are included for comparison.

Table 7:   Math Scaled Scores by Grade, for the Target and Matched Students

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
ASAP Chess Students	1383.50	1597.12	1417.59	1383.32	1518.96	1504.50
Matched Students	1345.56	1454.62	1417.95	1378.00	1433.65	1373.35
All Philadelphia	1224.56	1328.21	1331.93	1343.60	1348.70	1319.28

Table 8:   Reading Scaled Scores by Grade, for the Target and Matched Students

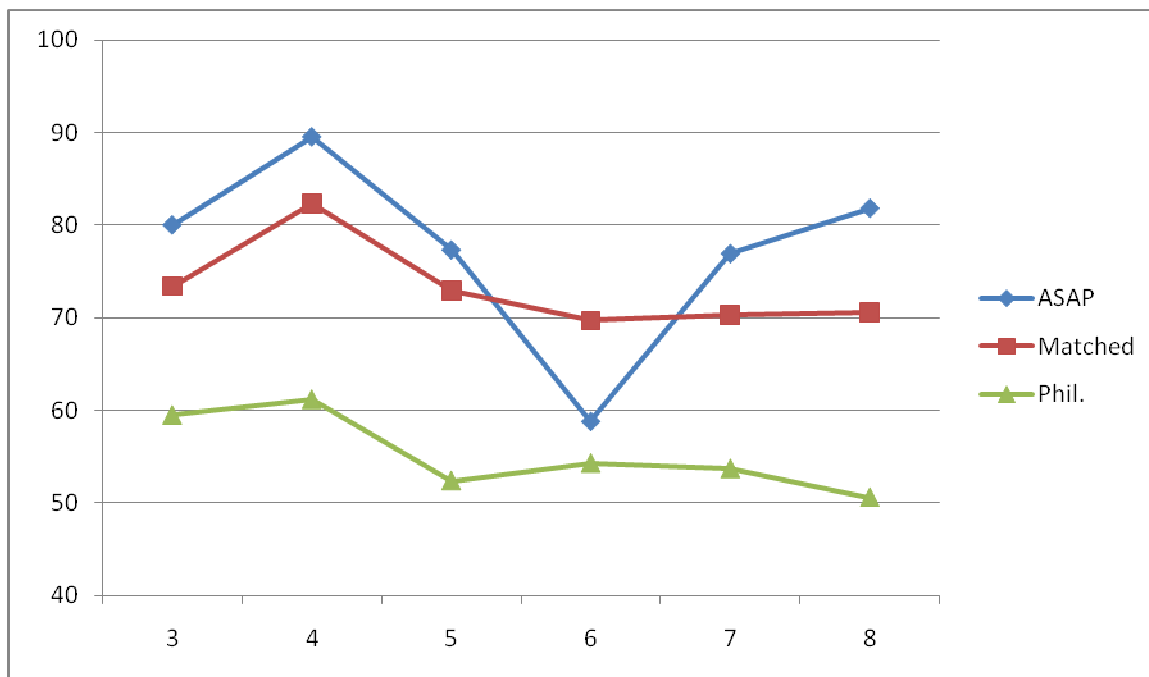|	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
ASAP Chess Students	1295.50	1463.00	1310.41	1215.84	1441.15	1526.50
Matched Students	1280.44	1345.59	1292.59	1251.39	1395.05	1405.47
All Philadelphia	1256.50	1236.13	1200.99	1240.59	1297.75	1364.64

The data in Tables 7 and 8 were analyzed by a two-way Analysis of Variance (Grade by Group). In both cases, the main effect for group was significant ($p = .002$ for Math; $p = .031$ for Reading). The effect size for Math was between medium and large, using Cohen's metric. For reading, the effect size was between small and medium. As shown in Tables 7 and 8, the ASAP students outperformed the matched students in math in all grades, although the difference was small in Grade 5. The largest differences were in Grades 4 and 8 where the ASAP students exceeded the matched controls by more than 100 scale points. It is also evident that both the ASAP and the matched students scored higher than the general Philadelphia student population at all grade levels. In Reading, the ASAP students outperformed the matched students in all grades except for Grade 6. Consistent with the results for math, the largest differences were in Grades 4 and 8.

As mentioned previously, a common way that data from the PSSA are reported is through the categorization of students into Advanced, Proficient, Basic and Below Basic. In addition, the Pennsylvania Department of Education computes what they term the "Proficiency" level which is the proportion of students in the Advanced and Proficient categories. Since this way of reporting PSSA results is so common, the math and reading data for the ASAP and matched students are reported this way below in Tables 9 and 10. As before, comparison data for all Philadelphia students are also reported this way. These data are portrayed graphically in Figures 1 and 2.

Table 9:   Percentage of Students Classified as Proficient in Math

|	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
ASAP Chess Students	80.0	89.5	77.3	58.8	76.9	81.8
Matched Students	73.4	82.3	72.9	69.7	70.3	70.6
All Philadelphia	59.5	61.2	52.4	54.3	53.7	50.6

Figure 1:   Percentage Proficient for Math

Table 10:   Percentage of Students Classified as Proficient in Reading

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
ASAP Chess Students	66.7	73.7	77.3	45.4	69.2	100.0
Matched Students	65.3	72.3	67.6	75.7	51.1	76.5
All Philadelphia	54.0	47.5	40.0	42.7	50.2	62.0

Figure 2: **Percentage Proficient for Reading**
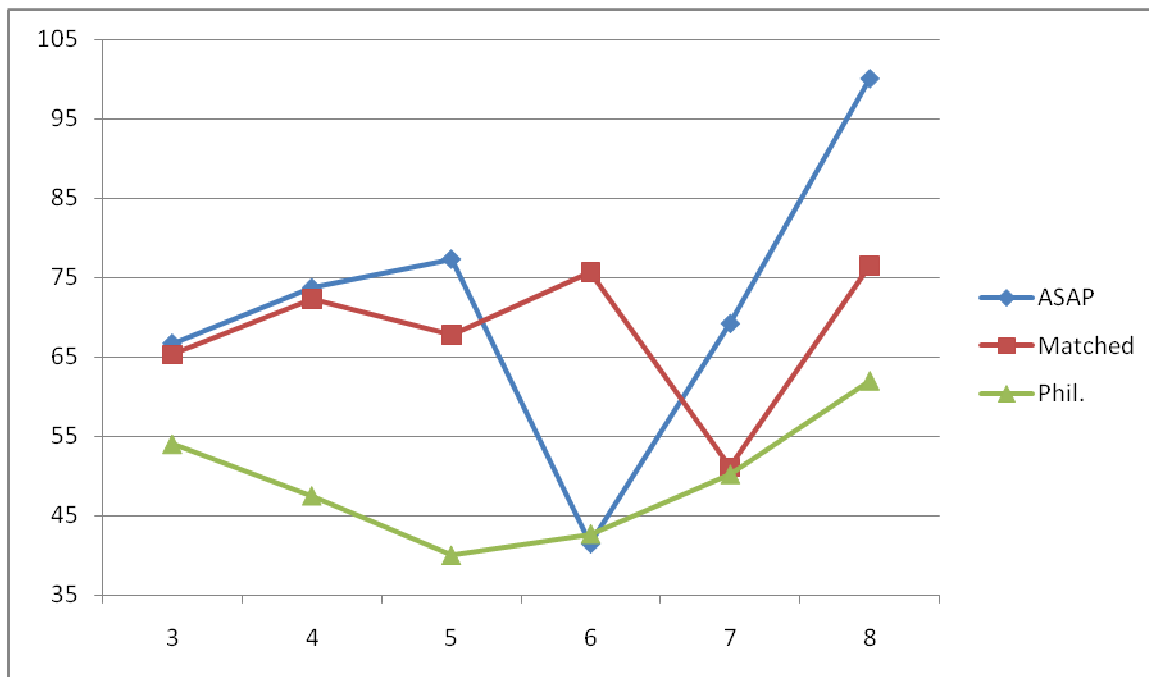
The data reported in Tables 9 and 10 and portrayed in Figures 1 and 2 present a pattern similar to the scaled score data. That is, in general, the ASAP students are performing at a higher level than the matched students. Again as before, the one grade that does not fit this pattern is the 6th where the ASAP students are performing less well than the matched students.

(2) Absences

The average number of days absent for the target and matched students, by grade, is presented in Table 11. Comparison data for all Philadelphia students are also reported in the table.

Table 11: **Absences by Grade, for the Target and Matched Students**

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
ASAP Chess Students	6.79	10.15	6.28	8.55	11.17	11.88
Matched Students	8.45	13.59	10.47	11.02	11.42	14.88
Philadelphia	12.18	12.76	11.73	12.63	13.82	13.58

As before, a two-way ANOVA was conducted on these data. Consistent with the previous analysis, the main effect for group was highly significant (p = .000). In this case the effect size was

large. As shown in Table 11, the students in the ASAP chess program are absent from school significantly fewer days than the matched students.

(3)   Behavior Grade

The Philadelphia School District assigns a grade for behavior in a number of categories. This is a three-point scale, where 1 = is the lowest (or worst) and 3 is the highest (or best). Because large amounts of this rating were not available for the matched students, it was not possible to make this comparison. There were, however, enough data on all School District of Philadelphia students to make at least a descriptive comparison. These data are contained in Table 12.

Table 12:   Behavior Data

	Rating of 1	Rating of 2	Rating of 3
ASAP Students	54.3%	35.8%	9.9%
Philadelphia	70.1%	25.8%	4.1%

A one-sample t-test was computed on these data to ascertain if the ASAP students were significantly different from the population of all Philadelphia students. This result was highly significant ($p = .000$), and the effect size was large.

(4)   Years in the Chess Program

Since the target sample contained students who had participated in the chess program for more than one year, an analysis was conducted to ascertain if student achievement increased with repeated participation. The data for the PSSA math and reading tests are contained in Table 13.

Table 13:   PSSA Data as a Function of Years in the Program

	One Year	Two Years	Three Years
Math	1448.60	1492.29	1584.43
Reading	1340.02	1402.00	1524.86

One way ANOVA's were conducted on the data in Table 13. While the scores for math increased with years of participation, the result did not reach the conventional level of significance ($p = .091$). For reading, however, the result was significant ($p = .018$). The effect for reading was between medium and large.

(5)   Improvement from Previous Year

One of the analyses that this evaluation was designed to conduct was to compare the ASAP students to the matched students in terms of PSSA performance across two years. Since data were not available beyond one year, it was decided to attempt this analysis looking only at the ASAP students who had been in the program for one year. Because the sample sizes by grade were too small to support this analysis, it was decided to conduct this analysis looking at all grades combined. Since the PSSA scaled scores cannot be directly compared across years, the analysis was conducted by computing a discrepancy score for each student which consisted of the student's scores in math and reading compared to the Philadelphia averages. These data are presented in Tables 14 and 15. Graphic presentations of the data are presented in Figures 3 and 4.

Table 14:   Comparison of ASAP and Matched Students across Two Years in Math

|	Discrepancy in 2007 – 2008	Discrepancy in 2008 – 2009
ASAP Students	+112.4	+153.2
Matched Students	+115.6	+101.4

Figure 3:   Year-to-Year Discrepancy in Math
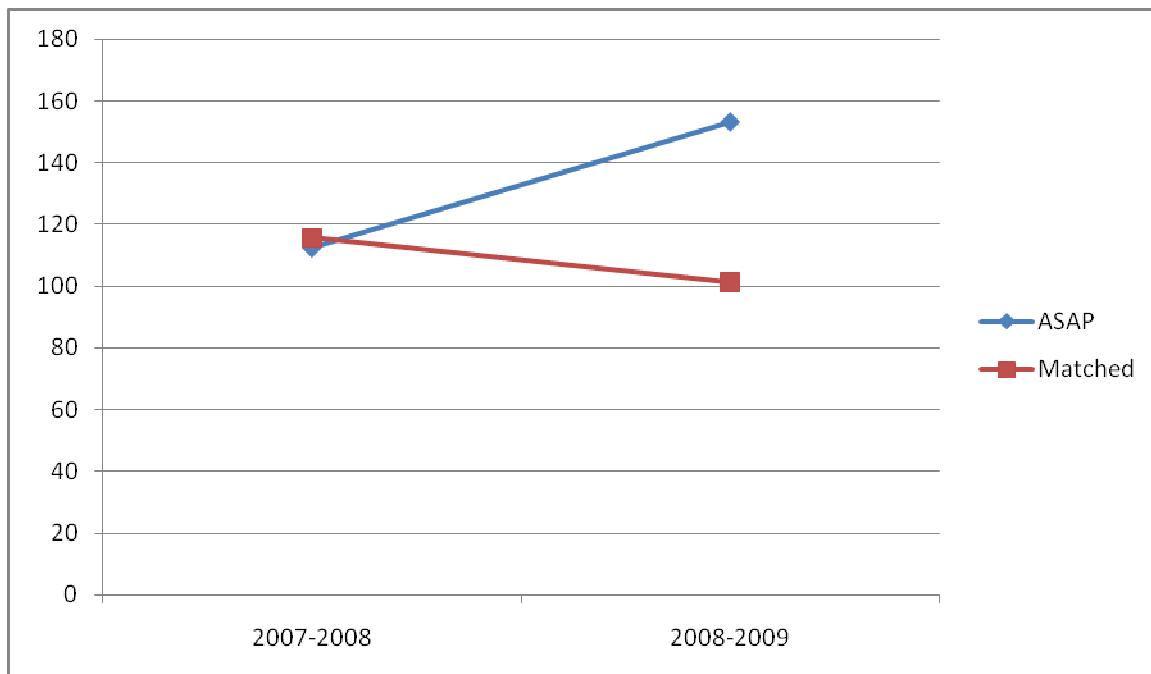
Table 15:   Comparison of ASAP and Matched Students across Two Years in Reading

	Discrepancy in 2007 – 2008	Discrepancy in 2008 – 2009
ASAP Students	+66.8	+106.9
Matched Students	+67.3	+74.5

Figure 4:   Year-to-Year Discrepancy in Reading
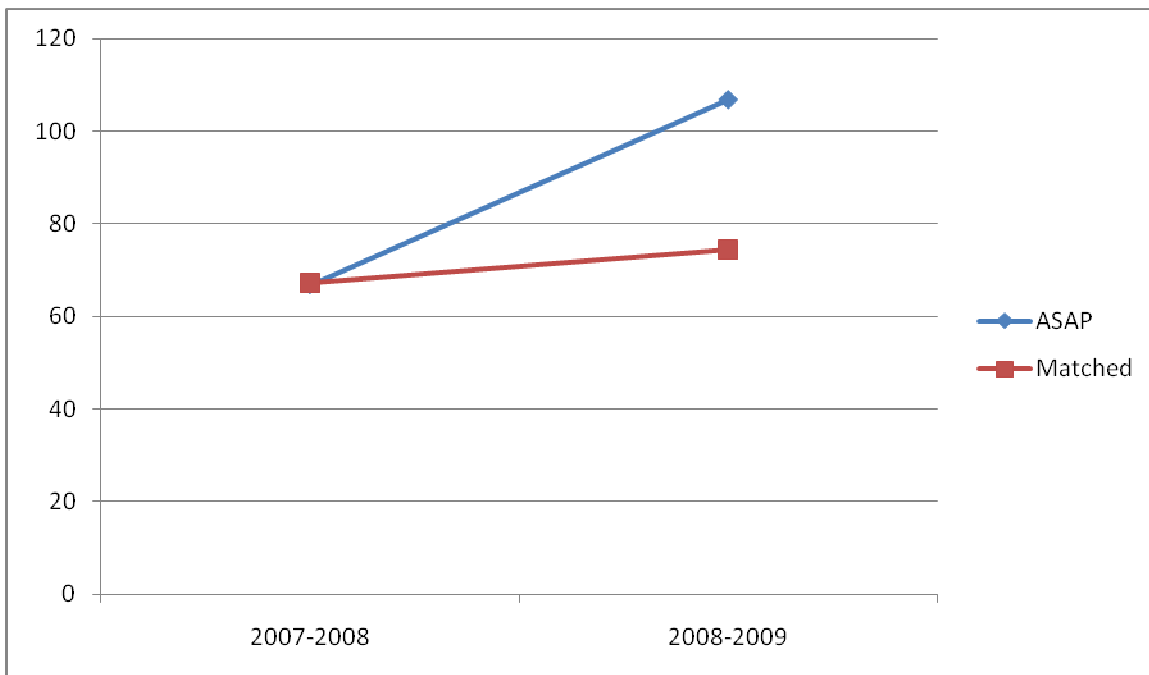
The data in Tables 14 and 15 were analyzed by a two-way, repeated measures ANOVA. For math the interaction was highly significant (p = .000) with a large effect size. For reading the interaction was marginally significant (p = .031) with a small to medium effect size. As shown in the above tables, the ASAP group improved significantly more than the matched students in both reading and math.

E.   Additional Analyses

Although not a primary concern in this study, the data were analyzed by gender and ethnicity to ascertain if these variables moderated the effects found in the data. There were no differences between male and female students in achievement. There was a moderately significant effect for absences with females having a smaller mean number of absences as compared to males. This effect, however, did not moderate the difference between the target and matched subjects. For ethnicity, the data were divided into African American, White and Other. African American students' PSSA scores were significantly lower in math and reading as compared to the other two ethnic groups. As before, however, ethnicity did not have an impact on the difference between the target and matched students. Overall, the effects described above are not related to a student's gender or ethnicity.

F.   Summary

The data presented in this report indicate that the chess program is having a significant impact on the participants both in terms of academic achievement as well as behavior. Specifically:

(1)   The ASAP students scored higher on the PSSA test as compared to the matched students in both reading and math.
(2)   The ASAP students gained more in reading and math across the two years of data analyzed in this report.
(3)   ASAP students had a significantly lower number of absences as compared to the matched students.
(4)   While the data available did not allow a comparison to the ASAP students to the matched students, the ASAP students did obtain significantly better behavior ratings as compared to the Philadelphia School District as a whole.
(5)   Students academic achievement increased as the number of years in the chess program increased.

Taken together, these data strongly support the effectiveness of the chess program in improving student achievement and behavior. These results would be meaningful in any context, but they seem even more salient in the context that the students in the chess program all attend Philadelphia public schools. The discrepancy between the achievement levels of students in under-resourced, urban schools is widely noted and acknowledged. Data reported by the Pennsylvania Department of Education show that Philadelphia students achieve at levels approximately 25 percentage points below Pennsylvania students as a whole in both reading and math proficiency levels. In 2009, for example, the students in Philadelphia public schools were at the 1st to the 5th percentile across grades 3 to 8 in math and reading with the District overall scoring at the 2nd percentile. In this context, any program that can improve and enhance the achievement of students is to be applauded. It is evident from the data provided in this report that the ASAP Chess Challenge Program is one of these exemplary programs.

Appendix A: School and Grade Distribution

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Baldi						1	1	9
Beeber						5	6	6
Blankenburg		1	2	2	1	2	1	
Bregy				1	4	1	6	
Cleveland				1		2		
Clymer					1	2	1	
Emlen				1	2			
Gideon	1	1	4	1	3	2	1	
Hartranft					3			
Kenderton			1		5			
Longstreth					1		7	2
Mayfair			3	3	5	2	2	2
Meehan							7	
Meredith				12	3		1	
OEC			5	4	3	2	4	
Reynolds					2	1		
Steel					2			