

## **Arlington Public Schools**

### **Impact of 2001 Adjustments to High School and Middle School Start Times**

#### **INTRODUCTION**

In September 2001, Arlington Public Schools adjusted the start times of its comprehensive high schools. Wakefield, Washington-Lee, and Yorktown High Schools started and ended the school day 45 minutes later than they did in previous school years. The School Board approved the change based on the understanding that a later start time may have positive effects for high school students, especially in the area of academic performance.

The evaluation of the change in start times is in response to a request by the School Board.

#### **DESCRIPTION**

In December 1999, the Advisory Council for Instruction (ACI) High School Start Time Study Committee recommended that the School Board change the starting times for high schools. The recommendation was based on review of existing research and surveys of Arlington parents. The existing research suggested that many adolescents experience daytime sleepiness and decreased morning alertness because of a shift in their biological sleep-awake cycle. In addition, there are environmental factors that come into play during the teen years: Clubs, sports, homework, work schedules and interacting with peers may influence adolescents' sleep habits. In short, many teens have a tendency to fall asleep later at night and awaken later in the morning.

The Superintendent formed an interdepartmental team to respond to the ACI recommendation. This group reviewed the research findings presented by the committee as well as the high school start times studies conducted by Fairfax County Public Schools and Montgomery County Public Schools. The process led the Arlington School Board to conclude that delaying the high school start time might have a positive impact on the academic performance of high school students.

On December 7, 1999, the Arlington School Board voted unanimously to change school start times. The change was to be implemented on the first day of school of the 2001-2002 school year. The decision also was based on the following considerations:

- First, safety is an important concern. Therefore, schools should not start before 7:50 a.m. to assure that no child is waiting in the dark for transportation.
- Second, the change in the high school start time should not significantly disadvantage any other group or school level.
- Finally, the ability of students to participate in extracurricular activities should not be compromised because of the change in high school start time.

Because of the limited availability of school buses and bus drivers, the school system could not support high schools and middle schools beginning the day at the same time. Thus, middle schools' starting time was changed to 7:50, twenty minutes earlier than the previous starting time. Because of the relationship between the start times of high schools and middle schools,

and the desire that no group be disadvantaged, this evaluation provides the same type of student data for both high school and middle school students.

**EVALUATION DESIGN**

The new school start times were adopted with the understanding that an evaluation would follow the implementation. This evaluation focuses on the year prior to the change (2000-01) and the first full year of the new start time (2001-02). It provides a snapshot of students’ and teachers’ perceptions of the impact of the change as well as student data related to absences, number of days tardy, and first period grades.

The evaluation design grid below outlines the objectives, evaluation questions, and desired results.

**Figure 1: Evaluation Design Grid: Change in High School Start Time**

*GOAL 1. The later start time will positively affect the academic performance of high school students while at the same time not adversely affecting the academic performance of students at other school levels.*

<b>Objectives</b>	<b>Evaluation Questions</b>	<b>Desired Results</b>
<p>1. The change in start times will positively affect high school students’ academic performance.</p> <p>2. The change in start times will not adversely affect the academic performance of middle school students.</p>	<p>1a: Is there an increase in the average grades for high school students during their first period classes?</p> <p>1b: Is there at least maintenance of the average grades for middle school students during their first period classes?</p> <p>1c: Is there a decrease in the number of absences and days tardy for high school students and no change for middle school students?</p> <p>1d: How do students and teachers perceive students’ readiness for school, alertness, preparation, and participation in the classroom before and after the start time change?</p>	<p>For high school students: a positive change in:</p> <ul style="list-style-type: none"> <li>• 1<sup>st</sup> Period Grades</li> <li>• Days Absent</li> <li>• Days Tardy</li> <li>• Classroom behaviors that enhance learning</li> </ul> <p>For middle school students: at least a maintenance in:</p> <ul style="list-style-type: none"> <li>• 1<sup>st</sup> Period Grades</li> <li>• Days Absent</li> <li>• Days Tardy</li> <li>• Classroom behaviors that enhance learning</li> </ul>

*GOAL 2. To change the high school starting time keeping in mind the safety of children.*

<b>Objective</b>	<b>Evaluation Question</b>	<b>Desired Results</b>
Students' safety: No child is waiting for transportation in the dark*	2: How frequently do students report waiting for the bus or walking to school in the dark?	<ul style="list-style-type: none"> <li>• APS students are not waiting for the bus or walking to school in the dark.</li> </ul>

*\*Assumption: This is an objective for home-to-school bus "runs," and does not include bus runs for games and practices.*

*GOAL 3. To change the high school start time without significantly disadvantaging any other group or school level.*

<b>Objective</b>	<b>Evaluation Questions</b>	<b>Desired Results</b>
No other group or school level is put at a disadvantage because of the change in school start.	3a: To what extent did the change in high school start time impact students at other levels? 3b: How do teachers perceive the change in start time?	<ul style="list-style-type: none"> <li>• The high school start time change will not disadvantage other groups or school levels.</li> </ul>

*GOAL 4. To ensure the ability of students to continue to participate in extracurricular activities.*

<b>Objective</b>	<b>Evaluation Question</b>	<b>Desired Results</b>
Students are able to participate in extracurricular activities to the same or greater extent as they were before the change.	To what extent has the change in school start time impacted high school students' participation in after-school activities?	<ul style="list-style-type: none"> <li>• Students continue to participate in after-school activities at the same or increased rates after the time change.</li> </ul>

## METHODOLOGY

### Data Sources

To address the first set of evaluation questions related to the academic performance, the following sources of data were used.

- Students' grades for first period courses retrieved from the Arlington Public Schools student database. Four cohorts of students were examined:
  - (1) The graduating class of 2003: Students who were in 10<sup>th</sup> grade in 2000-2001 (before the change in start times) and students who were in 11<sup>th</sup> grade in 2001-2002 (after the change in start times).
  - (2) The graduating class of 2004: Students who were in 9<sup>th</sup> grade in 2000-2001 and students who were in 10<sup>th</sup> grade in 2001-2002.
  - (3) The graduating class of 2006: Students who were in 7<sup>th</sup> grade in 2000-2001 and 8<sup>th</sup> grade in 2001-2002.
  - (4) The graduating class of 2007: Students who were in 6<sup>th</sup> grade in 2000-2001 and 7<sup>th</sup> grade in 2001-2002.
- Students' numbers of absences and numbers of times tardy arriving at school were also retrieved from the APS student database, collected from the same four cohorts of students.
- Students' perceptions of how alert and prepared they were to start the school day from a survey administered in 2002.
- Teachers' perceptions of student behavior assessed from a survey administered in 2002.

To address the second evaluation question related to student safety (that is, students should not be waiting for school buses in the dark), responses from the student survey were analyzed. Information from the *Farmers' Almanac* on sunrise times and bus schedules are also included.

The third set of evaluation questions addresses the impact of the high school start time change on other groups or school levels. Here, one source of data was examined: survey responses from middle and high school teachers.

The fourth evaluation question related to students' participation in extracurricular activities. To address this question, data from the student survey are reported.

Finally, the extent to which middle and high school students are satisfied with the change in start times is examined. Items from a survey administered to 8<sup>th</sup> and 11<sup>th</sup> grade students were analyzed.

Throughout most of the report, data from middle and high school students and teachers are reported separately. While the high schools started 45 minutes later, the middle school start time was adjusted 20 minutes earlier than previous years to accommodate the availability of buses. Elementary school start times were the least affected by the change.

The data should be interpreted with caution. It is impossible to isolate the impact of the start time change on academic performance. During this same time frame, a number of new initiatives were added to address student achievement, absences and tardiness. All changes occurred in the context of a system that operates with the goal of raising student achievement.

Also, the data were collected less than a year after the time change occurred, and changes are more likely to be evident over a longer period.

### Sample

#### *Students*

The students' grades were collected from all high school and middle school students enrolled in for-credit courses during the first period of school years 2000-2001 and 2001-2002. The data on absences and days tardy were also collected from high school and middle school students for the same two years.

The surveys, however, were not administered to all students. Rather, a sample of 11<sup>th</sup> graders and 8<sup>th</sup> graders responded to a one-page survey during the 2001-2002 school year. The survey is included as Appendix A. Characteristics of students who responded to the survey can be found in the Table 1 (below). It can be noted that a disproportionate number of 11<sup>th</sup> Grade students from homes where English is not spoken responded to the survey.

**Table 1. Characteristics of Students Responding to the Start Time Survey**

	Grade 8 Middle School Students (n=255)		Grade 11 High School Students (n=231)	
	Number	Percent	Number	Percent
<b>Gender</b>				
Male	115	45	108	47
Female	120	47	95	41
Missing	20	8	28	12
<b>Race/Ethnicity</b>				
Asian	27	11	34	15
Black	24	9	39	17
Hispanic	63	25	68	29
Native American	3	1	4	2
White	109	43	65	28
Missing	29	11	21	9
<b>Language other than English spoken at home</b>				
Yes	114	45	113	49
No	114	45	93	40
Missing	27	11	25	11

Source. School Start Time Survey—Students (2002)

#### *Teachers*

School start time surveys were given to teachers in June 2002. Of the 1,106 teachers who responded, 649 were elementary school teachers, 179 were middle school teachers, 232 were high school teachers, and 46 teachers did not fill in their school level. The responses of the middle and high school teachers are included in this evaluation and background information on these teachers can be found in Table 2. A copy of the teacher survey can be found in Appendix B. (Elementary school start times were the least impacted by the high school start time change; therefore this evaluation focuses on middle and high school students and teachers.)

**Table 2. Characteristics of Teachers Responding to the Start Time Survey**

	Middle School Teachers (n=179)		High School Teachers (n=232)	
	Number	Percent	Number	Percent
Years as APS teacher				
Less than a full year	12	7	21	9
1 to 3 years	43	24	41	18
4 to 9 years	63	35	74	32
10 or more years	56	31	94	41
Missing	5	3	2	1
Live in Arlington				
Yes	61	34	94	41
No	109	61	132	57
Missing	9	5	6	3
Teaching same 1 <sup>st</sup> period subject as last year				
Yes	114	64	145	63
No	42	24	46	25
No opinion	23	13	23	10
Missing	0	0	8	3

Source. Start Time Survey—Teachers (2002)

### *Parents*

Finally, parents were surveyed via their PTAs. Forty-five parents of elementary school children responded to the survey. Thirty-six parents of middle and high school students responded to the survey. Of these 36 parents, 18 were middle school parents and 18 high school parents. The response rate from parents is quite low and therefore results from the parent survey are not reported.

## **RESULTS**

### **I. STUDENTS' ACADEMIC PERFORMANCE**

#### Evaluation Questions

1a: Is there an increase in the average grades for high school students during their first period classes?

1b: Is there at least maintenance of the average grades for middle school students during their first period classes?

#### Background

School start times were changed on the premise that a later school day may enhance the academic performance of high school students. Therefore, the first set of evaluation questions addresses this and examines academic achievement variables as well as perceptions of conditions that support academic performance.

The rationale for looking only at first period grades is that the later start time may have a greater impact on students' performances in first period than on their overall grade point averages. Although it could also be argued that the effects of lack of sleep could be evident throughout the day, for this evaluation it seemed most reasonable to examine first period grades only, since much of the research suggests that adolescents are least alert in the morning.

It is important to note here that a variety of factors and conditions enhance—or hinder—a student's academic performance. Some of these factors are within a school system's control, such as curriculum, teacher training, textbooks, school leadership, and, it is posited here, school start time; and other factors are not controlled by the school system. For example, students' personal circumstances and home support as well as their motivation to learn are factors that also impact academic achievement. It is usually not possible to hold the many variables constant while testing the impact of only one. It is possible, however, to identify trends (e.g., better academic performance) and to posit that certain factors (later start times) influenced the results.

A second recommendation on which the change in start times was based is that the change should not disadvantage other groups or school levels. Since the only school level directly impacted by the high school change was the middle school, data for that level are reported here also.

#### Data Source

APS Student Database

#### Results: Impact on Student Performance—First Period Grades

##### *High School Students*

Students' grades were looked at solely for first period courses. The first period was held constant over the two years, not the courses nor the individual students. In other words, first period course grades were collected from 10<sup>th</sup> grade students enrolled in for-credit classes in 2000-01 and also collected for this same cohort that was enrolled in 11<sup>th</sup> grade first period classes in 2001-02. Both the courses offered during the first period and some of the students enrolled in the courses may vary from year to year.

The total number of A's, B's, etc., were counted and multiplied by the corresponding point values. A's are four points, B's are three points, C's are two points, and D's are one point. No points are assigned to failing grades. Only the five standard grades were counted in the data; P's, F's, O's, U's, and instances where students did not receive a grade were not included.

The high school students' first period grades are summarized in tables 3 and 4 below. The courses are grouped and the grades presented in three ways: (1) grades from core courses (math, science, English Language Arts, and Social Studies); (2) grades from electives (all other courses); and (3) grades from all courses.

**Table 3. High School Students' First Period Grades: Countywide Graduating Class of 2003**

Graduating Class of 2003						
First Period Courses	10 <sup>th</sup> Grade Students (2000-01) (n=1251.5)			11 <sup>th</sup> Grade Students (2001-02) (n=992)		
	Frequency	Average Grade		Frequency	Average Grade	
<b>Elective Courses</b>						
A	182.5	36.9%	Electives  <b>2.75</b>	128	40.6%	Electives  <b>2.89</b>
B	133	26.9%		92	29.2%	
C	99.5	20.1%		51	16.2%	
D	33.5	6.8%		23	7.3%	
E	46.5	9.4%		21	6.7%	
Total # of grades	495			315		
<b>Core Courses</b>						
A	143.5	19.0%	Core  <b>2.27</b>	121	17.9%	Core  <b>2.37</b>
B	213	28.2%		225	33.2%	
C	197	26.1%		176	26.0%	
D	113	14.9%		97	14.3%	
E	89.5	11.8%		58	8.6%	
Total # of grades	756			677		
<b>All Courses</b>						
A	326	26.0%	All Courses  <b>2.46</b>	249	25.1%	All Courses  <b>2.54</b>
B	346	27.6%		317	31.9%	
C	296.5	23.7%		227	22.9%	
D	147	11.7%		120	12.1%	
E	136	10.9%		79	8.0%	
Total # of grades	1251.5			992		

Source. APS Student Database

Note: Wakefield High School is on a block schedule, so periods 1 and 2 alternate as the first period of the day. Both grades were included, and the number of grades was divided by two.

General Observations:

- For the graduating class of 2003 (Table 3), there was a very slight improvement in the average of overall first period grades (“all courses”). During the 2000-01 school year, 10<sup>th</sup> grade students earned a grade point average of 2.46 in their first period classes. During the

subsequent year—after the change in starting time—these students (now in 11<sup>th</sup> grade) earned a 2.54 GPA in their first period classes, an insignificant change. A similar trend occurred in elective and core courses.

- As reported in Table 4, there was a slight improvement in the overall first period grades for the class of 2004. These students were 9<sup>th</sup> grade students in 2000-01 and 10<sup>th</sup> grade students in 2001-02.
- The 9<sup>th</sup> graders earned a 2.58 grade point average during 2000-01 in all first period courses, and the 10<sup>th</sup> graders earned 2.68 in 2001-02.
- There does not appear to be a significant difference in the impact of the start time change on elective vs. core courses.

**Table 4. High School Students' First Period Grades: Countywide Graduating Class of 2004**

Graduating Class of 2004						
First Period Courses	9 <sup>th</sup> Grade Students (2000-01) (n=1319)			10 <sup>th</sup> Grade Students (2001-02) (n=1174.5)		
	Frequency	Average Grade		Frequency	Average Grade	
<b>Elective Courses</b>						
A	197	39.2%	Electives  <b>2.91</b>	225.5	47.4%	Electives  <b>3.04</b>
B	144	28.7%		122.5	25.8%	
C	102	20.3%		75	15.8%	
D	37.5	7.5%		27	5.7%	
E	22.5	4.5%		25.5	5.4%	
Total # of grades	502			475.5		
<b>Core Courses</b>						
A	146	17.9%	Core  <b>2.38</b>	148.5	21.3%	Core  <b>2.43</b>
B	270	33.0 %		223	31.9%	
C	232.5	28.4%		177	25.4%	
D	89.5	10.9%		79	11.3%	
E	79.5	9.7%		70.5	10.1%	
Total # of grades	817.5			698		
<b>All Courses</b>						
A	342.5	26.0%	All Courses  <b>2.58</b>	374	31.8%	All Courses  <b>2.68</b>
B	413.5	31.3%		345.5	29.4%	
C	334	25.3%		252	21.5%	
D	127	9.6%		106	9.0%	
E	102	7.7%		96	8.2%	
Total # of grades	1319			1174.5		

Source. APS Student Database

Note: Wakefield High School is on a block schedule, so periods 1 and 2 alternate as the first period of the day. Both grades were included, and the number of grades was divided by two.

#### *Middle School Students*

The tables below detail the grade point average of two separate classes of middle school students over two years. As was done with the high school grades, the courses are grouped into three categories, including core courses (Math, Science, English Language Arts and Social Studies),

elective courses (all other courses), and all courses. It is important to note that the class period was held constant, not the courses or the students. Therefore, in each year we are comparing student grades in different courses and levels that occurred during first period.

**Table 5. Middle School Students' First Period Grades: Countywide Graduating Class of 2006**

First Period Courses	Graduating Class of 2006					
	7 <sup>th</sup> Grade Students (2000-01) (n=1044)			8 <sup>th</sup> Grade Students (2001-02) (n=1367)		
	Frequency	Average Grade		Frequency	Average Grade	
<b>Elective Courses</b>						
A	308	59.3%	Electives  <b>3.38</b>	503	42.5%	Electives  <b>2.69</b>
B	134	25.8%		300	25.4%	
C	53	10.2%		119	10.1%	
D	15	2.9%		32	2.7%	
E	9	1.7%		228	19.3%	
Total # of grades	519			1182		
<b>Core Courses</b>						
A	138	26.3%	Core  <b>2.75</b>	24	13.0%	Core  <b>2.48</b>
B	201	38.3%		78	42.1%	
C	120	22.9%		53	28.6%	
D	50	9.5%		22	11.9%	
E	16	3.0%		8	4.3%	
Total # of grades	525			185		
<b>All Courses</b>						
A	446	42.7%	All Courses  <b>3.07</b>	527	38.5%	All Courses  <b>2.66</b>
B	335	32.1%		378	27.6%	
C	173	16.6%		172	12.6%	
D	65	6.2%		54	3.9%	
E	25	2.4%		236	17.3%	
Total # of grades	1044			1367		

Source. APS Student Database 2002

### General Observations

- For the graduating class of 2006, students' average of first period grades declined in all three categories during the 2001-02 school year.
- Seventh grade students earned a 3.38 grade point average in electives in 2000-01 whereas eighth graders earned a 2.69 in first period elective courses during 2001-02. More than twice as many 8<sup>th</sup> graders as 7<sup>th</sup> graders were enrolled in electives, however.
- The 7<sup>th</sup> grade students also received higher grade point averages in their core courses in 2000-01 (2.75) as compared to the average in core courses among 8<sup>th</sup> graders in 2001-02 (2.48); this was accompanied by a dramatic decline in the number of students taking core courses during first period: the number of core course grades retrieved fell from 525 to 185.
- Looking at all courses, the average grade in 2000-01 was 3.07 while the average grade in 2001-02 was 2.66.

Grades from students in the graduating class of 2007 were also collected and can be found in Table 6. These students were in 6<sup>th</sup> grade in 2000-01 (before the start time change) and in 7<sup>th</sup> grade in 2001-02 (the year the change went into effect).

**Table 6. Middle School Students' First Period Grades: Countywide Graduating Class of 2007**

Graduating Class of 2007						
First Period Courses	6 <sup>th</sup> Grade Students (2000-01) (n=1205)			7 <sup>th</sup> Grade Students (2001-02) (n=1150)		
	Frequency	Average Grade		Frequency	Average Grade	
<b>Elective Courses</b>						
A	5	16.7%	Electives  <b>2.33</b>	323	54.4%	Electives  <b>3.21</b>
B	11	36.7%		140	23.6%	
C	3	10%		83	13.9%	
D	11	36.7%		31	5.2%	
E	0			17	2.9%	
Total # of grades	30			594		
<b>Core Courses</b>						
A	357	30.4%	Core  <b>2.73</b>	177	31.8%	Core  <b>2.77</b>
B	391	33.3%		176	31.7%	
C	249	21.2%		120	21.6%	
D	114	9.7%		64	11.5%	
E	64	5.4%		19	3.4%	
Total # of grades	1175			556		
<b>All Courses</b>						
A	362	30.0%	All Courses  <b>2.72</b>	500	43.5%	All Courses  <b>2.99</b>
B	402	33.4 %		316	27.5%	
C	252	20.9%		203	17.6%	
D	125	10.4%		95	8.3%	
E	64	5.3%		36	3.1%	
Total # of grades	1205			1150		

Source: APS Student Database

#### General Observations

- The opposite trend can be seen for the graduating class of 2007 than that seen for the graduating class of 2006. That is, students' average first period grades improved modestly during the 2001-02 school year. (The distinction between electives and core courses is not relevant, since only 30 students took electives during first period in sixth grade.)
- These data are difficult to interpret for a number of reasons. For example, for the graduating **class of 2006**, during first period, most students were taking electives in grade 8 (school year 2001-02) and core courses in grade 7 (2000-01). The overall grades of these students declined in 2001-2002. The opposite was found for the graduating **class of 2007**. That is, the majority of students were taking electives in grade 7 (school year 2001-02) and taking core courses during grade 6 (2000-01) and their overall grades improved. Further, for many

students, grade 8 courses may be more difficult than grade 7 courses. For example, more eighth graders than seventh graders have the opportunity to take high school-level math, social studies, and foreign language courses.

### Evaluation Question

1c: Is there a decrease in the number of absences and days tardy for high school students and no change for middle school students?

### Background

The impact of later start times is more likely to be apparent in the conditions that support improved academic performance. A study evaluating the impact of changed start times in Minneapolis shows consistent results in improved enrollment and attendance, along with a reduced drop-out rate. The expectation is that student attendance would improve and that overall classroom tardiness would decrease. Data were gathered for high school and middle school students to test the hypothesis that Arlington would see a similar favorable change at the high school level with no negative consequences at the middle school level. However, the data on tardies were considered invalid due to differences that were likely unrelated to the start-time data. To include the data would lead to false conclusions, and thus this element of the study design has been abandoned. The data on absences were more reliable, and produced interesting results.

### Data Sources

APS Student Database

### Results: Impact on Student Performance—Student Absences

Attendance rates appear to fall the longer students are in school, regardless of school starting time. As seen in Table 7, for the class of 2003, in 2000-01 when the students were 10<sup>th</sup> graders and before the starting time was changed, attendance rate was 97.8%; during the first year of the changed starting time, when the students were 11<sup>th</sup> graders, the attendance rate fell to 93.8%; it was even lower in the following year. Similar trends are evident for each cohort, for both high school and middle school students. (Complicating the picture is that the APS student information system changed, which led to some changes in attendance reporting procedures.)

**Table 7. Attendance Rates 2000-01 to 2002-03**

<b>Class</b>	<b>Year</b>	<b>Grade</b>	<b># Students</b>	<b>Attendance Rates</b>
2003	2002-03	12	1084	91.5%
	2001-02	11	1205	93.8%
	2000-01	10	1415	97.8%
2004	2002-03	11	1208	93.6%
	2001-02	10	1369	94.3%
	2000-01	9	1654	97.8%
2006	2002-03	9	1577	94.8%
	2001-02	8	1355	95.3%
	2000-01	7	1364	95.9%
2007	2002-03	8	1345	95.3%
	2001-02	7	1405	95.6%
	2000-01	6	1426	96.1%

Source. APS Student Database

### General Observations

- Because of unreliable data, it is not possible to draw conclusions about the impact of starting time on tardy arrivals.
- Based on attendance rates, it appears that student maturity, rather than starting time, has the biggest impact on attendance rates, with students more likely to be absent the higher their grade.

### Evaluation Question

1d: How do students and teachers perceive students' readiness for school, alertness, preparation, and participation in the classroom before and after the start time change?

### Data Sources

- Student survey
- Teacher survey

### Background

It can be argued that academic performance is enhanced if students are alert and ready to start the school day. To investigate the extent to which students perceived their school readiness, middle and high school students responded to a survey about the new school start times. The timing of the surveys coincided with other surveys being administered in the schools to lessen the time burden on students and staff. Therefore, surveys were given to 8<sup>th</sup> graders in March and to 11<sup>th</sup> graders in June. Other grade levels were not surveyed.

The first section of the survey included questions about the students' perceptions of their behavior and level of school preparedness during the 2001-02 school year (after the change in start times). In the second section of the survey, students were asked the same set of questions about the 2000-01 school year (before the change in start times). For example, students were

asked to indicate the extent to which they felt ready to start the school day, alert in their first period class, and prepared for their first period class; they were also asked if they participated in class discussions and activities during first period. The survey was administered to the students after the start time change had gone into effect. No data were collected prior to the change; therefore the students' responses relative to how they were feeling in 2000-01 reflect their recollections after a year had passed.

The responses to these items are reported because they provide some indication of conditions that might enhance academic performance. In short, a student who is ready to start the day, feels alert and prepared, and participates in classroom discussion is likely to get the most out of his/her schooling. The results are presented separately for high school and middle school students.

### Results: Impact on Student Performance: Students' Perceptions of Conditions that Support Academic Achievement

#### *High School Students*

Two hundred thirty-one 11<sup>th</sup> grade students from across the county responded to the survey. As illustrated in Table 8, higher percentages of these students responded "some of the time" to statements about their readiness for school and alertness in their first period classes when they were asked about the 2001-02 school year than when they were asked about the 2000-2001 year.<sup>1</sup> Interestingly, the percentages of students at the extremes (those that responded "all of the time" or "none of the time") were essentially the same on these items before and after the start time change. In contrast, when the students were asked about the extent to which they were "prepared" for their first period class, there was little difference on their responses for the 2001-02 and 2000-01 school years. However, when asked to report how often they participated in class discussions and activities, more high school students indicated that they did so "all of the time" after the change in the school start time. Also notable is the fact that students with "No Response" to survey questions dropped considerably from 2000-2001 to 2001-2002, with only one student with No Response when reporting on the current year.

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<sup>1</sup> Approximately 1% of the students did not respond to the item on the questionnaire about their readiness for school and alertness in their first period class for "this year"; a higher percentage did not respond to the question about "last year."

**Table 8. Percent of High School Students Responding to Survey Items: Conditions that Support Academic Achievement**

	Percent of High School Students (n=231)	
	2000-01 (Before Change)	2001-02 (After Change)
Ready to Start School		
All of the time	20%	18%
Some of the time	52	63
None of the time	22	18
No response	7	1
Alert during First Period		
All of the time	22%	20%
Some of the time	52	64
None of the time	18	16
No response	8	1
Prepared for First Period		
All of the time	41%	47%
Some of the time	46	49
None of the time	6	4
No response	7	1
Participated in Class Discussions		
All of the time	31%	42%
Some of the time	52	47
None of the time	10	9
No response	7	1

Source. Start Times Survey—11<sup>th</sup> Grade Students (2002)

### *Middle School Students*

The middle school sample was comprised of 255 eighth grade students. Twenty percent of these students responded that they were ready to start the school day “all of the time” in 2001-02 (after the time change), whereas 35% reported that they were always ready to start the day during the previous year. Close to 20% of these students responded “none of the time” to this statement when asked about the 2001-02 school year. In contrast, only 7% responded “none of the time” when they were asked about how they felt during the 2000-01 year. This trend held true on all of the items reported here: Fewer middle school students reported feeling alert, prepared, and participating in class discussions after the change in start times than before the change. These responses could be a reflection of how students actually felt in school, or a reflection of their dissatisfaction with the change in start times.

**Table 9. Percent of Middle School Students Responding to Survey Items: Conditions that Support Academic Achievement**

	Percent of Middle School Students (n=231)	
	2000-01 (Before Change)	2001-02 (After Change)
<b>Ready to Start School</b>		
All of the time	35%	20%
Some of the time	51	55
None of the time	7	19
No response	7	7
<b>Alert during First Period</b>		
All of the time	31%	14%
Some of the time	50	63
None of the time	12	17
No response	7	6
<b>Prepared for First Period</b>		
All of the time	62%	53%
Some of the time	30	40
None of the time	2	2
No response	7	5
<b>Participate in Class Discussions</b>		
All of the time	44%	35%
Some of the time	46	55
None of the time	4	5
No response	6	6

Source. Start Times Survey—8<sup>th</sup> Grade Students (2002)

Results: Impact on Academic Performance: Teachers’ Perceptions of Conditions that Support Academic Achievement

Middle and high school teachers were surveyed in June 2002. Teachers were asked about the extent to which they agreed with a series of statements about their students’ behavior and preparation for their first period class. The response options were “strongly agree,” “agree,” “disagree,” “strongly disagree,” and “no opinion.” Three items on the teacher survey relating to conditions that impact on academic performance are similar to items on the student survey. Those items are listed below and the distribution of teachers’ responses can be found in Tables 10 and 11. The results are reported separately for teachers of high school students and teachers of middle school students

*High School Teachers*

About half of the 232 high school teachers who responded to the survey agreed or strongly agreed that “this year” (2001-02) their first period students “are alert.” In contrast, only about a quarter of the teachers agreed or strongly agreed with this statement as it related to the previous

year's students (2000-01). Almost half of the teachers (47%) disagreed or strongly disagreed that their students were alert in their first period class during the 2000-01 school year. The same pattern of responses held for the other two items relating to conditions that support academic performance. That is, higher percentages of teachers agreed or strongly agreed that their 2001-02 students were prepared for class and participated in class discussions than their 2000-01 first period students. It is interesting to note that 60% of the high school teachers agreed that their first period students participated in discussions and activities in 2001-02 (compared to 46% in 2000-01). This is the same trend found among the high school students themselves. Forty-two percent of the students responded that they participated in class "all of the time" in 2001-02 compared to 31% who responded that they did so in 2000-2001. See Table 8 for students' responses.

**Table 10. Percent of High School Teachers Responding to Survey Items: Conditions that Support Academic Achievement**

	Percent of High School Teachers (n=232)	
	2000-01 (Before Change)	2001-02 (After Change)
First Period Students were Alert		
Strongly agree	1%	12%
Agree	25	41
Disagree	38	17
Strongly Disagree	9	11
No opinion	22	24
No response	6	5
First Period Students were Prepared		
Strongly agree	3%	10%
Agree	34	41
Disagree	28	20
Strongly Disagree	6	8
No opinion	23	16
No response	6	6
First Period Students Participated in Discussions		
Strongly agree	3%	13%
Agree	43	47
Disagree	17	14
Strongly disagree	5	4
No opinion	24	15
No response	7	7

Source. School Start Time Survey—High School Teachers (2002)

### *Middle School Teachers*

One hundred seventy-nine middle school teachers responded to the school start time survey. The pattern of their responses differed from that of the high school teachers. Higher percentages of middle school teachers indicated that their first period students were more alert, prepared, and participatory before the time change. For example, about 46% of the middle school teachers agreed or strongly agreed that their students were alert in their first period class in 2000-01 (after the time change) whereas about 60% agreed or strongly agreed that their students were alert during the previous year. Sixty-three percent of the middle school teachers agreed or strongly agreed that in 2000-01 their students were prepared for class. When given the same statement about their 2001-02 first period students (after the change in start time), only 51% agreed or strongly agreed that their students were prepared. Similarly, a higher percentage of teachers (68%) agreed that their students participated in class in 2000-01 (before the change in start time) than did so after the change (60%).

**Table 11. Percent of Middle School Teachers Responding to Survey Items: Conditions that Support Academic Achievement**

	<b>Percent of Middle School Teachers (n=179)</b>	
	2000-01 (Before Change)	2001-02 (After Change)
<b>First Period Students were Alert</b>		
Strongly agree	10%	11%
Agree	50	35
Disagree	11	17
Strongly Disagree	3	18
No opinion	25	16
No response	1	3
<b>First Period Students were Prepared</b>		
Strongly agree	8%	5%
Agree	55	46
Disagree	10	21
Strongly Disagree	1	8
No opinion	26	18
No response	1	1
<b>First Period Students Participated in Discussions</b>		
Strongly agree	10%	10%
Agree	58	50
Disagree	7	16
Strongly disagree	0	7
No opinion	24	17
No response	2	1

Source. School Start Time Survey—Middle School Teachers (2002)

*Summary: Start Time's Impact on Academic Achievement as Measured by Grades, Absences, Times Tardy and Perceptions*

- The first period grades of both cohorts of high school students—that is, the classes of 2003 and 2004—improved slightly after the start time change in 2001. The change, however, was so slight that it did not represent a change in letter grades for the students.
- Because of problems with data collected on tardiness, no conclusions have been drawn concerning the impact of the start time changes on that factor. Regarding absences, it appears that the higher the student's grade level, the more likely will absences increase; this seemed to be a more important factor than the starting time.
- The first period grades of the middle school students are more difficult to interpret. For the class of 2006, first period grade averages declined during the 2001-2002 school year, whereas the grade averages improved slightly for the class of 2007. The nature of the classes taken during first period may have an impact on performance.
- In addition to students' grades and rates of absenteeism and tardiness, students' and teachers' perceptions of factors that may influence academic performance also were examined. In general, more high school students reported feeling ready to start school and alert during their first period class after the school start time change. There were some, albeit small, differences in the percentages of students who reported being prepared for class, although this item showed the smallest difference between the two years. Finally, more students reported participating in class "all of the time" during the 2001-02 school year than during the 2000-01 school year.
- These student responses seem to be reinforced by the high school teachers' perceptions. Higher percentages of teachers agreed that their students were more alert, prepared, and participatory after the start time change than before.
- On the other hand, the middle school students' responses to these items suggested decreased alertness and readiness for school after the time change. The middle school teachers' responses also indicated the same trend, although not to the extent to which the students' responses did so.

## **II. IMPACT ON STUDENT SAFETY**

### Evaluation Question

2. How frequently do students report waiting for transportation or walk to school in the dark?

### Background

Along with the goal of improving student achievement, student safety was also a concern. The recommendation made to the School Board was based on the premise that no school should begin before 7:50 am to assure that children were not waiting for buses in the dark.

To accommodate the shift in high school start time, middle school schedules were adjusted. Consequently middle schools now have the earliest start time. The 7:50 am start time was selected for middle school to ensure that students are not waiting for buses in the dark.

The evaluation assumes that this rule applies to the main bus trips that occur during the normal school day. It does not address late buses, activity buses or other bus runs.

### Data Sources

- 2001-02 bus transportation schedule
- Old Framers' Almanac
- Student survey

### Results

According to the *Old Farmers' Almanac*, the sun rose at 6:40 a.m. on September 4, 2001, the first day of school. On the shortest day of the year, December 22, the sun rose at 7:24 a.m. Daylight savings time begins in April and ends in October. During these months, the sun rises after 6:45 a.m.

Five buses serve students who attend two countywide middle school programs. Three of the buses serve Immersion students at Gunston, and two buses pick up students for the Arts and Communication Technology program at Kenmore. Many of the students on those bus routes board a bus before 7:00 a.m. and at certain times of the year, they wait for the bus in the dark.

In addition, both high school and middle school students were asked to indicate on the survey if they waited for the morning bus in the dark “none of the time,” “some of the time,” or “all of the time” during the months of December, January, and February. Table 12 displays the distribution of responses on this item.

**Table 12. Percent of Students who Report Waiting or Walking in the Dark**

Responses	Middle School Students (n=255)	High School Students (n=231)
All of the time	21%	13%
Some of the time	34	29
None of the time	35	49
Missing	10	9

Source. Start Times Survey—Students (2002)

#### *High School Students*

Almost half of the high school students (49%) responded “none of the time” to this statement, while only 13% responded “all of the time.” Twenty-nine percent indicated that this statement was true “some of the time.” It should be noted here that these high school students were asked about walking to school and riding a bus. It is unclear how students who drive themselves to school or are dropped off by parents responded to this item on the survey.

#### *Middle School Students*

Thirty-five percent of the middle school students reported that they wait for the bus or walk to school in the dark “none of the time” whereas about 21% indicated this was true for them “all of the time.” About 34% choose the “some of the time” response option. Again, it is unclear how students who were driven to school responded to this question. In addition, students were not asked if they waited or walked to school in the dark in the year before the start time change.

#### *Summary: Student Safety*

According to the bus schedule and the sunrise times reported in the *Farmers' Almanac*, some APS students were boarding buses before daylight. In addition, over half of the middle school

students indicated that after the start time change, they wait for the bus in the dark all or some of the time during the months of December, January, and February. About 42% of the high school students reported that they did so. It is unclear how students who drive or are driven to school responded to this question.

### **III. IMPACT ON OTHER GROUPS OR SCHOOL LEVELS**

#### Evaluation Questions

3a: To what extent did the change in high school start time impact students at other levels? 3b: How do teachers and parents perceive the change in start times?

#### Background

While there were some changes to the elementary schools' schedules, these changes were not directly related to the change in the high school schedule. In fact, most elementary schools' times shifted by only 10 minutes during the 2001-2002 school year. Middle schools, however, started the school day 20 minutes earlier than they had prior to the change, and now end the day at 2:20pm. It should be noted here that since there are a limited number of buses and drivers available during the peak time of 3:15-4:00, the school system is not able to provide late buses for middle schools before 4:00. As a consequence, middle school students involved in after school activities wait 30 to 45 minutes for bus transportation home. To accommodate this lag time, middle schools divided after-school time into two activity periods, and half-time positions for activity directors were added to coordinate the after-school time.

Teachers and other staff were also impacted by the change in start times. Rush hour commuting, childcare, coaching, and other factors were raised as barriers to changing the school start times. In an effort to retain teachers, the school system provided some options to help ease the transition. Success of these initiatives should show that no teacher left the Arlington Public Schools because of issues relating to changing the start times.

#### Data Source

Teacher Survey

#### Results

To examine the impact of start times on teachers, the following statement appeared on the "School Starting Times—Teacher Survey" in June 2002. Table 16 displays the teachers' responses to this item.

- Because of school starting times, I am seriously considering (check all that apply)
  - no changes to my current position
  - teaching at another school level in Arlington
  - teaching in another county

**Table 13. Percent of Teachers Considering a Change**

<b>Responses</b>	<b>Middle School Teachers (n=179)</b>	<b>High School Teachers (n=232)</b>
No change	74%	75%
Teaching at another level	8	4
Teaching in another county	10	13

Source. Start Times Survey—Teachers 2002

About 75% of both high school and middle school teachers indicated that the change in school start times did not cause them to consider changing the level they teach or where they teach. Similarly, few teachers (under 10%) responded that they seriously considered teaching at another level. However, about 13% of the high school teachers and 10% of the middle school teachers did report that they considered teaching in another county as a result of the change. We do not know from these data if any teachers did switch positions because of the time change. According to the Department of Personnel Services, no teachers left Arlington Public Schools in 2001-2002 citing the change in start times as the reason for their departure.

Another area of concern raised before the implementation of the new start times related to high school teacher availability for after-school student assistance. Before the change, high school teachers were available after school to help students. Successful implementation of revised start times should result in no significant impact on after-school mentoring activities. In addition, student assistance should not occur before school, since the intent of changing the high school start time was for students to use this time to sleep later.

About half of the high school teachers who responded to the teacher survey indicated that they saw about the same number of students before school in 2001-02 as they did in 2000-01. About 13% indicated that they saw more students before school and about 13% indicated they saw fewer students before school in 2001-02. Twenty-five percent of the teachers reported “no opinion” on this item.

When asked about the number of students they help after school, about 35% of the high school teachers responded “about the same number of students” compared with “last year.” About 13% reported helping more students after school whereas about 38% reported seeing fewer students after school during the 2001-2002. About 12% of the teachers selected the “no opinion” response option on this item.

#### *Impact on Parents*

The point was raised before the implementation of new start times that the impact would be felt not only on students, teachers, and the school system as a whole, but also on families. For example, there was a concern that with older siblings in school later, there would be an increased demand for Extended Day or a greater demand for the after-school Check-In Program at middle schools. The concern turned out to be unfounded. Extended Day staff did not see an increase in demand for Extended Day that could be attributed to the start time change.

To further examine the impact on parents, a survey was administered to Arlington Public Schools parents, via PTAs. The response rate was low: Eighteen high school parents and 18

middle school parents returned surveys. The data from the parents is therefore not included in this report. Elementary school parents were also surveyed, though their responses are beyond the focus of this evaluation for reasons discussed previously in this report.

*Summary: Impact on Groups Other than High School Students*

In general, it appears that teachers and families adjusted to the change in school start times. Teachers did not leave the system because of the change and there was not an increased demand for Extended Day services.

#### **IV. IMPACT ON EXTRACURRICULAR ACTIVITIES**

##### Evaluation Question

4. To what extent has the change in school start times impacted high school students' participation in after-school activities?

##### Background

The final consideration built into the proposal was that the change should not adversely impact a student's potential to participate in extracurricular activities. The intention was that the same activities would be available to students at times adjusted around the new academic day.

##### Data Sources

Student Survey

Attendance data are not systematically maintained for extracurricular activities in a manner that allows for comparison between years. Therefore, the survey responses from students were analyzed to address this evaluation question.

##### Results

The student survey included an item that asked students to compare their participation in after-school activities during the 2001-02 school year versus the 2000-01 school year. Students were instructed to respond "true," "false," or "no difference" to the statement: "This year I am participating in more after-school activities than last year."

About 36% of the high school students indicated that there was no difference in their participation in after-school activities. About 29% indicated that they were participating more in after school activities in 2001-02 and 29% indicated that the statement was false. About 6% of the students did not respond to this item.

It appears from the responses of high school students that students were able to participate in after-school activities after the start time changes. That is, about 65% of the students indicated that either there was no difference in their participation or that they were participating more in 2001-02.

Similarly, about 24% of the middle school students reported that there was no difference in their after-school activities in 2001-02. In fact, about 42% of these students indicated that they were

participating in more after school activities in the 2001-02 school year than they did during the 2000-01 school year. This presumably is a reflection of the earlier dismissal time during 2001-02, more activities offered at the middle schools, and/or the addition of middle school activities coordinators.

## V. STUDENT SATISFACTION

### Evaluation Question

5. How satisfied are students with the change in start times?

### Background

In order to gauge students' satisfaction with the change in start time, questions were added to the survey administered to the middle and high school students. Students were asked to respond "true," "false," or "no difference" to the following statement: "I like the school starting time this year better than the school starting time last year."

### Data Source

- Student survey

### Results

About 44% of the high school students indicated that they liked the 2001-2002 starting time better than the 2000-2001 starting time. Twenty-one percent of the 231 students who were surveyed responded "no difference" on this item. Twenty-nine percent of the students responded that they did not like the starting time this year better than the starting time last year. About 7% of the high school sample did not reply to this item.

In contrast, 22% of the middle school students responded "true" to the statement about liking the earlier start time and 28% indicated there was "no difference." About 42% of the middle school students responded "false" when asked if they liked the 2001-2002 start time better than the 2000-2001 time. About 8% of the middle school students did not respond to this statement on the survey. See Table 17 for distribution of responses.

**Table 14. Percent of Students who Report Liking New Start Time**

<b>Responses</b>	<b>Middle School Students (n=255)</b>	<b>High School Students (n=231)</b>
True	22%	44%
False	42	29
No difference	28	21
Missing	8	7

Source. Start Times Survey—Students 2002

It is perhaps not surprising that twice as many high school students as middle school students expressed preference for the new start times. The middle school students who were surveyed were all 8<sup>th</sup> graders—most likely 13 year olds subject to the same sleep deprivation problems confronted by other teenagers.

## **VI. UNEXPECTED OUTCOMES**

Initially, there was concern about the strain on APS caused by a change in starting times for high schools. An unexpected outcome was the lack of added demand placed on Extended Day and the paucity of complaints registered by parents and families. Although not included in the data analyzed for this report, a “hotline” was set up before the start times changed to gauge the community’s attitudes about the change. Few parents called the hotline with questions or concerns.

## **VII. LIMITATIONS OF THIS EVALUATION AND DIRECTIONS FOR FUTURE**

Research suggests that adolescents’ sleep patterns differ from those of adults’ and younger children, and it seems reasonable to assume that a more well-rested student will not only perform better at school, but also be more satisfied with his/her academic experience. Yet, many factors influence students’ academic performance, and school start time is one piece of a complicated puzzle. While the data analyzed for this evaluation of school start time provide some information on trends and potential outcomes, these data should be interpreted with caution. The enrollment numbers fluctuate from year to year, so sometimes analysis compares grade averages of two different-sized groups of students. Also, the course period (first) was held constant for the analysis, which means that the data may represent both different courses and, to some extent, different students.

The data reported in this evaluation report were collected after the start time had changed. In the future, it may be advantageous to consider evaluation procedures and data collection techniques prior to the implementation of a major change.

## **VIII. POLICY QUESTIONS**

### **1. How well did we implement?**

It appears from the data that the implementation of the new start times for high schools was done reasonably well and with a minimal amount of disruption. Few parents called the APS hotline set up during the summer of 2001; and few teachers reported leaving the system to teach elsewhere because of the change to the schedule. Further, implementation allowed students to continue participating in extracurricular activities both at the middle and high school levels. For example, 66% of the 255 middle school students indicated that there was no difference in their participation or that they participated in more after-school activities after the start time change than they did before the change. Similarly, about 65% of the 231 high school students who were surveyed responded that there was no difference in their participation or that they were participating in more after-school activities following the time change.

One aspect of the implementation that did not work well relates to the recommendation that children should not be waiting for school buses or walking to school in the dark. Approximately 20% of the middle school students reported that during December, January, and February, they waited for the bus in the dark “all of the time.” Bus schedules also show that some middle school students waited for transportation in the dark at some points during the year. On the other hand,

only 13% of the high school students responded that they waited or walked to school in the dark “all of the time.”

## **2. What changes happened for the intended recipients?**

Survey data from students suggest that high school students were more ready to start school, were more alert, and participated in class discussions and activities more frequently after the change in start time than in the year prior to the change. This trend was especially apparent with regard to class participation. Forty-two percent of the high school students reported that they participated in discussions or activities during their first period class “all of the time” during the 2001-02 school year. In contrast, only 31% of these students responded in the same manner when they were asked about the 2000-01 school year.

Survey data from high school teachers seem to reinforce these findings related to students’ behavior. Higher percentages of teachers agreed or strongly agreed with the statement that their first period students were alert, prepared, and participatory in 2001-02 than agreed with the statement as it applied to their students from the previous year (before the time change).

## **3. What changes occurred in areas that were not the primary focus of the evaluation?**

The change in high schools’ start times necessitated a change in the schedules of middle schools. Middle schools started the school day 20 minutes earlier than they had prior to the change, and now end the day at 2:20pm. Since there is a limited number of buses and drivers available during the peak time of 3:15-4:00, the school system is not able to provide late buses for middle schools before 4:00. As a consequence, middle school students involved in after school activities can wait 30 to 45 minutes for bus transportation home. To deal with this lag time, middle schools divided after-school time into two activity periods, and half-time positions for activity directors were added to coordinate the after-school time.

Because of data-reporting differences, the study was not able to draw conclusions about decreases in the number of tardy arrivals at class.

## **4. If this did not work well in all locations, why?**

The data were disaggregated by school level, and it appears from these data that the change did not work as well for middle schools as it did for high schools. For example, higher percentages of both middle school teachers and students reported that more students were ready for the school day, alert, prepared, and participatory during first period classes before the change in start times than after the change.

## **5. What happened that was unexpected or unintended?**

An unexpected outcome was the lack of added demand placed on Extended Day and the paucity of complaints registered by parents and families. Although not included in the data analyzed for this report, an information telephone line was set up prior to the start time change to answer parents’ questions and gauge the community’s attitudes about the change. Few parents called the information line with questions or concerns.

## **6. How satisfied were the users and clients?**

Based on analysis of survey data, the high school students seemed satisfied with the change; and the middle school students were less satisfied. For example, 42% of the 231 high school students indicated on the survey that they liked the 2001-2002 start time better than the 2000-2001 start time. Only 22% of the 255 middle school students expressed the same preference.

Likewise, high school teachers reported dramatic increases in the number of first period students who were alert, prepared, and participatory. Middle school teachers reported somewhat more negative results from the earlier school start time for their students.

## **7. How effectively were the system's resources used to achieve the identified goals?**

The change in the school start times was a major undertaking. The Arlington Public Schools did a good job of considering alternatives and preparing the students and their families for the switch. Careful planning minimized disruptions and implementation problems. The transportation system handled the switch with minor glitches, and the school staff did an admirable job in accommodating the changes, including minimizing the impact on extracurricular activities.

## **8. How well was our approach validated?**

The school start time change was made upon the recommendation of the ACI and after considerable deliberation by the School Board and senior officials of the Arlington Public Schools. Research on the impact of school start times and adolescent behavior guided the decisions about changing the schedules, and this study concludes that the change had its desired impact on the main beneficiaries, high school students. On the other hand, the compromises that went into the switch, especially vis-à-vis middle school students, seem to have kept adverse consequences within acceptable limits.

## **9. Is this the most effective way to achieve success?**

It appears this change came at the expense of middle school students (many of whom are also adolescents), and a more effective approach might have been to shift elementary start times. Given the complications of bus schedules and parent's work schedules, this was not possible. In light of the realities of limited resources, implementation of the shift was carried out successfully.