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ABSTRACT

This paper describes the 2-year outcomes of one high school's implementation of an intensive 4-block schedule. The study at Angola High School (Indiana) compared schoolwide grade-point averages (GPAs), standardized test scores, attendance data, and disciplinary records to school-baseline data from the 2 years prior to implementation of the block schedule. A questionnaire was administered to teachers and students before implementation of the new schedule, 3 months into the schedule, at the end of the first year, and at the end of the second year. Findings indicate significant improvement in schoolwide GPAs for all except two departments and improvement in semester exam grades. There was an almost 8 percent increase in the percentage of students on the honor roll; an increase in American College Testing Assessment scores, the Indiana State Proficiency Exams, and Scholastic Aptitude Tests; and improved attendance. Advanced Placement scores dropped slightly. Students, faculty, and parents expressed a high level of satisfaction with the new schedule. The data also suggest that extensive planning for the schedule and aggressive staff training were instrumental in achieving the improvements. (Contains 10 references and 20 figures.) (LMI)

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4 - Block Scheduling: A Case Study of Data Analysis of One High School After Two Years

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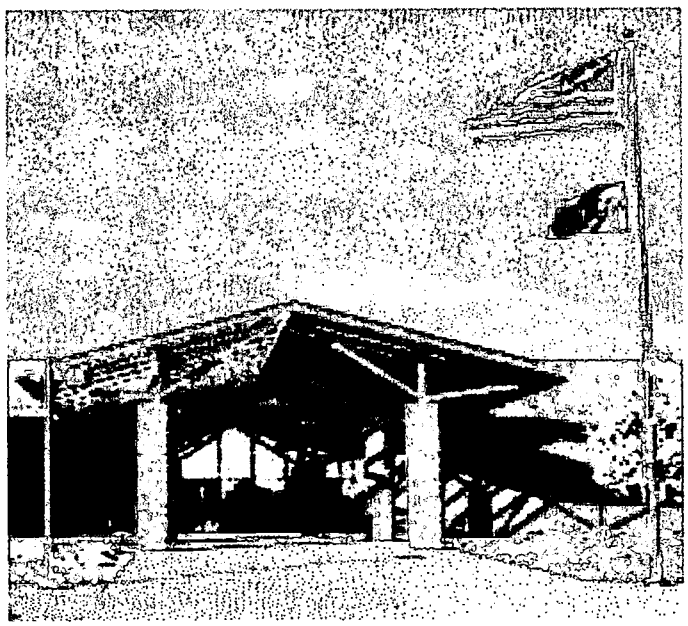
Angola High School Block Schedule Data Analysis Web Site:
http://neptune.esc.k12.in.us/steuben/scmsd/ahs/block/ahsdks.html



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Abstract

Data analysis of 4-Block scheduling in a high school was done by comparing baseline data from the previous two years. Highly significant improvements t(35,665) = 12.61 were found in school-wide grade point averages, including all departments except physical education/health and special education. Semester exams showed a similar improvement. There was a significant t(64) = 7.69 increase in percentage of students on the honor roll. American College Testing Assessments scores improved significantly t(732) = 2.99, and the Indiana State Proficiency Exams improved to some of the highest scores in the area. Scholastic Aptitude Tests have remained about the same. Advanced Placement Scores slightly dropped. Increased usage of the media center was recorded, and fewer discipline problems occurred. Attendance improved significantly t(27) = 2.20. Students, faculty, and parents were highly satisfied with the block. Analysis of the data suggests that extensive planning for the block and aggressive staff training were instrumental in making these significant improvements.

4 - Block Scheduling: A Case Study of Data Analysis of One High School After Two Years

Introduction

One of the most exciting changes in public education in recent times, has been the interest in block scheduling. Some educators believe that over 50% of the high schools in the country are presently on or studying some form of block scheduling (Canady, 1996). The trend has been an unprecedented educational movement. The goal of this paper was to serve as a case study of one high school that has been on an intensive 4-block schedule for two years and has attempted to document its effects. This paper was written from the perspective of an actively teaching staff member, who was involved with the change from its initial inquiry through the two-year period.

Evaluations of block scheduling were found in numerous unpublished documents available on Internet sites. These documents cite ratios, percentile changes, and questionnaires, with little statistical analysis. The lack of analysis hindered the validity of these studies. Reports using statistics released from the Ministry of Education in the Province of British Columbia have received attention. The most current draft report found significant differences in favor of year-long classes over semester and quarter classes (Marshall, Taylor, Bateson, & Brigden, 1995). Most of the Canadian studies have used data collected up to ten years ago at a time of teacher cut backs and budget restrictions. Decisions were from the top down with little or no teacher training to implement new teaching strategies (Rettig, 1997). This study appeared to support the theory that block scheduling by itself does not improve academic achievement.

In another large study of 371 schools in North Carolina during 1992-1995, blocked schools had scores at least equal to non-blocked schools on End-of-Course state wide tests, with blocked schools having slightly higher scores in most subjects (Robinson, 1996). This study addressed some of the problems found in the British Columbia report, namely the Carolina tests were all given immediately at the end of the

class in January or late May instead of at the end of the school year as done in the Canadian studies. However, the study did not look at how the schools implemented the new schedule or the degree of teacher in-service training.

Today's proponents of block scheduling agreed that intensive teacher training was an important factor for success (Canady, 1995, Carroll, 1994, Sturgis, 1995). Canady (1995) urged teachers to actively involve their students in the learning process. Teamwork and a common goal were critical elements if improvement was to be expected (Hackman, 1995). One of the most important factors in student achievement, according to Stock and Hottenstein (1994), was the teacher. Case studies of schools that have conducted extensive teacher preparation before implementing the block, appeared to have the best results (Winans, 1997).

Method

Angola High School, in a moderate sized public school corporation in Angola, Indiana, changed its schedule in the fall of 1995. It went from seven 55 minute periods per day to four 90 minute periods. Data were collected from the previous two years for comparison. Both quantitative and qualitative data were desired.

Quantitative baseline data were gathered from the previous two years. A total of over 16,000 semester grades were tabulated, separated into departments, and calculated as school-wide averages. Semester exam grades, as well as honor roll lists, were gathered. Media center circulation records from the previous two years were used to establish a baseline. In addition, data were pooled about the number of students assigned to in-school suspension as a comparison for disciplinary issues. State records on attendance and Indiana State Proficiency Exams (ISTEP+) were collected, as well as Scholastic Aptitude Tests (SAT), American College Testing Assessment (ACT), and Advanced Placement (AP) scores. Such data were used to compare student scores on nationally standardized testing.

A qualitative questionnaire was patterned after one used by Hatboro-Horsham High School in Hatboro, Pennsylvania. It was given to all teachers and students in the spring before beginning the 4 - Block schedule, again after three months, and at end of the first block year. An abridged version was given at the end of the second block year. A systematic random sample of parents was selected by mailing the questionnaire to every tenth parent on an alphabetical list. This served as the qualitative baseline.

Results

At the start of the 1993-94 school year, a small group of teachers, a guidance counselor and the building principal began meeting to discuss alternative ways to divide up the school day. Recent research had suggested that more productive learning could take place within larger blocks of time. The committee began a search for other high schools that had tried alternative schedules, and ones that had kept a record of changes that took place within their schools. Four schools fitting these criteria were identified, and teams were sent to study each school as well as to attend a national principals' conference on block scheduling.

After one and one-half years of study, the scheduling committee, as it was now called, presented to the staff what they thought would be a practical and beneficial

change. The proposal was accepted by an overwhelming majority (85%) of the teachers. Input was received from the community and students through a series of open meetings during the next several months. The school board officially approved the proposal with the stipulation that the schedule would not require an increase in staffing.

Starting with the initial set of grades achieved with the block schedule, data was gathered and made into easy to understand charts and shared with the students, faculty, school board, and the community. Positive results were seen immediately and these results continued to show improvement through the two years.

The two-year, baseline school-wide GPA averaged 6.88 (based on a 12 point scale) with a range of only ± 0.08 of a point. The very first set of block grades had nearly a 0.50 point increase. This improving trend was observed to continue throughout the first three-quarters of the year with only a slight drop the last quarter. By the end of the second block year, Angola High School was consistently witnessing a highly significant increase of 0.70 GPA $t(35{,}665) = 12.61$ above the baseline (Figure 1).

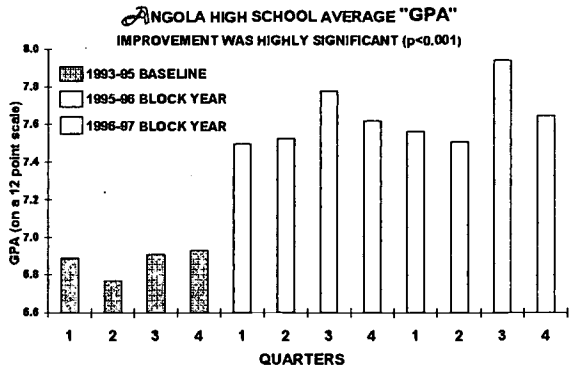

Figure 1. The school wide grade point average went up significantly with the 4 - Block schedule. These data represent more than 35,000 grades.

After the first year, all departments except special education (which had a small sample size) witnessed highly significant $t(6520 \text{ to } 791) = 7.84$ to 2.66 increases in their students' semester grade point averages. At the end of the second year, the same trends continued with the exception of the physical education/health department. This department saw more than a 50% change in staffing during the second year of block scheduling (Figure 2).

Student grades indicated improved learning took place with 30% more A's, about the same number of B's, and 11% fewer C's, D's, and F's than the baseline.

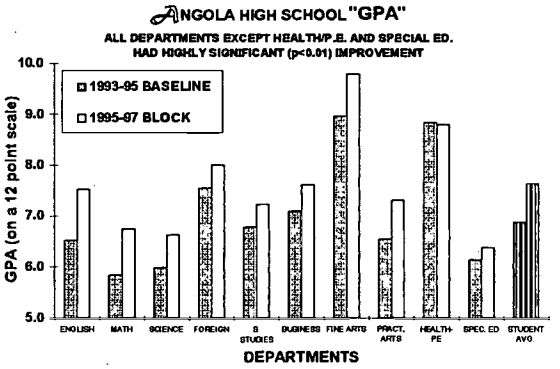

Figure 2. All departments except physical education/health, saw an improvement in their student's grades, and in most cases it was highly significant ($p \leq .01$).

There were highly significantly $t(64) = 7.69$ more students on the honor rolls each semester for all grade levels compared to the baseline of the previous two years. Individual classes were also tracked to see if there was improvement within a fixed group of students to eliminate the potential error of differences between classes. These, too, showed increased numbers of students earning honor roll status nearly every semester. The class of 1996 and the class of 1998 had highly significant $t(12) = 4.43$ & 5.77 improvement. The class of 1999 and 2000 began high school with the 4 - Block schedule and didn't have a contrasting

baseline; thus, for comparison purposes, two out of three classes had significantly more students on the honor roll with the block schedule (Figure 3).

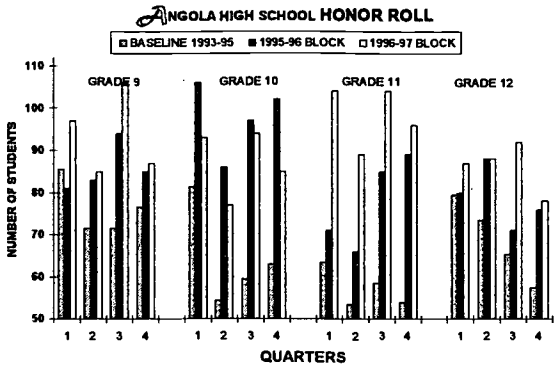

Figure 3. More students achieved honor roll status with the block schedule. This was seen consistently at all grade levels and tracked within each class.

Teachers were requested during the first year to use the same or similar semester exams, compared to what they gave prior to block scheduling. The idea was to see if the students were exiting their classes with increased knowledge, and if the teachers were effectively covering the same amount of material. Nearly a whole grade point of improvement was witnessed with the blocked semester exams, even greater than their semester grades (Figure 4).

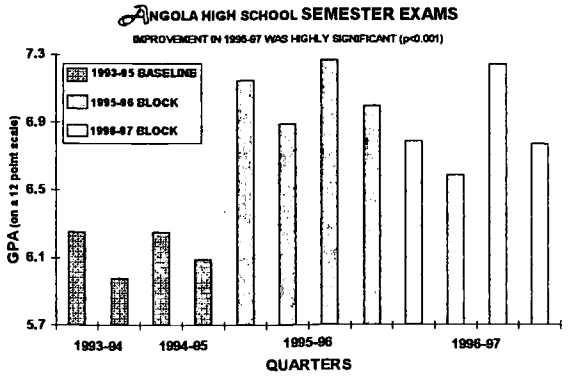

Figure 4. Final exam grades significantly ($p \leq .01$) realized an even greater improvement than the semester grades. This suggests the students were exiting classes with more content and improved understanding, with the block schedule.

This type of improvement was seen with the first set of semester grades and continued all that year. During the second year, many teachers started adjusting their exams to more clearly measure the changes that were evolving in their curriculums. All departments except physical education /health have witnessed significant $t(6535 \text{ to } 704) = 15.68 \text{ to } 2.11$ improvements in their final exam grades (Figure 5). With the block there were over nine percent more A and B grades issued, and over nine percent fewer C, D, and F grades. The greatest change was found with the increase in A grades.

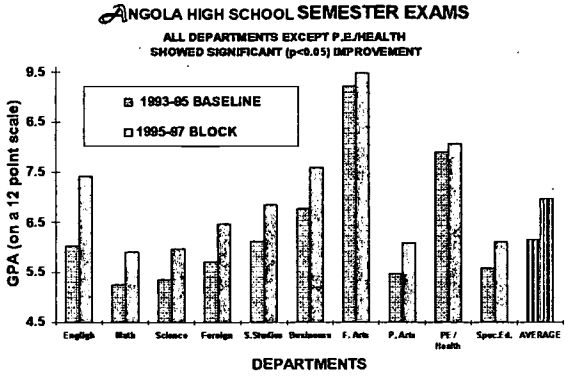

Figure 5. All departments saw improvement in their students' semester exam grades. It was found to be significant ($p \leq .05$) in all departments except in physical education / health.

It was probably too early to ascertain the affect of block scheduling on state and national examinations, but the data seemed encouraging. American College Testing Assessments (ACT) scores improved significantly $t(732) = 2.99$ with block scheduling. This test was taken by 23% of the baseline students and by 22% of the block students. Figure 6 shows that all test sections saw higher mean scores, particularly in the reading area.

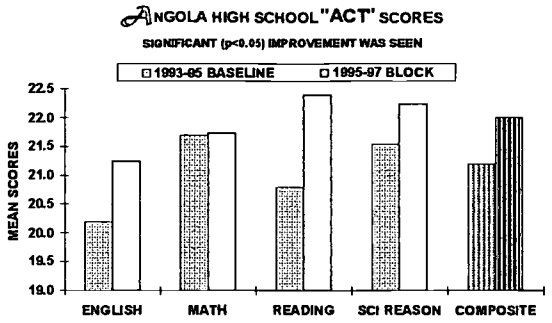

Figure 6. Significantly improved national ACT scores support the belief that improved learning was taking place with block scheduling.

The state of Indiana requires students to take proficiency exams in reading, language, and math in roughly every-other-year sequences. Grades three, six, eight, and ten are now given the tests. Prior to 1995-96, the tests were given to grade nine instead of grade ten. Figure 7 shows the baseline mean of the ninth graders during the 1993-95 school years compared to the mean of the tenth graders in the 1995-97 school year. Angola High School's Indiana State Test of Educational Proficiency (ISTEP+) scores in 1996-97 were higher than any other high school in north-eastern Indiana (Region 8). The school had not scored that high in previous years.

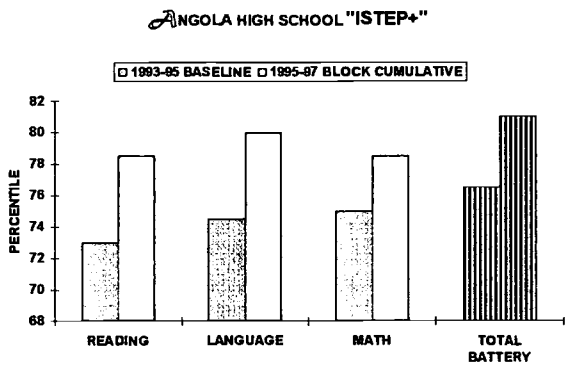

Figure 7. The data suggests the 4 - Block schedule improved state proficiency exam scores. Flexible scheduling permitted at risk students be tutored during seminars, better preparing them for the test. In 1996-97, Angola had the best high school scores in its state region.

Scholastic Aptitude Test (SAT) scores have gone up moderately since initiating the 4 - Block schedule. The tests were taken by a little over 50% of the students. Greater improvement was seen during the second block year than the first. This improvement was achieved by the 1997 class, which had two years of block scheduling experience. Though not statistically significant, the achievement was an encouraging sign (Figure 8).

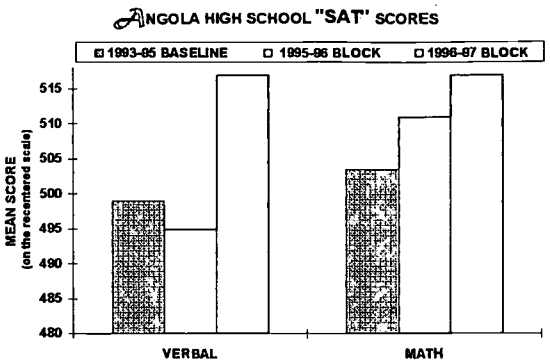

Figure 8. SAT scores had modest improvement in both math and verbal areas. The 1996-97 class with two years of block scheduling, had the greatest gains.

At this point the block schedule has appeared to slightly lower advanced placement (AP) scores. Though not statistically significant, scores of four and three were achieved by a smaller percentage of students with the block schedule as well as more scores of one and two. No modifications to the block schedule were made for the first two years. Students scheduled all their AP classes during the first half of the year, and then they waited until May to take the national exams. A concerted effort was made the second year to schedule review sessions to help prepare the students for the exam and to lessen what was forgotten. Little improvement was observed (Figure 9).

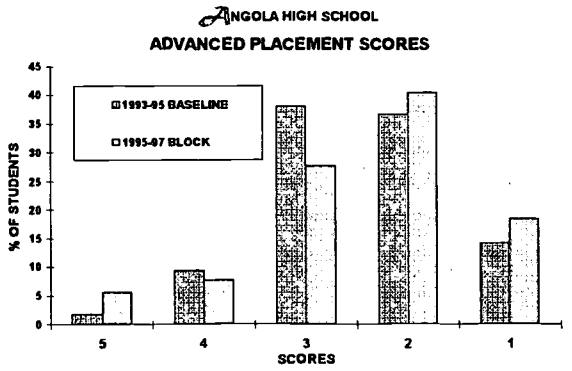

Figure 9. Though not statistically significant, Advanced Placement scores slightly dropped after two years of block scheduling. During this time students took the class the first half of the year and the test in May. (Modifications were made the third block year with most classes being offered three quarters or a modification of three quarters.)

Concern about the scores resulted in changing the schedule of most of the AP classes the third year of block scheduling. In 1997-98 three of the AP classes were meeting as a college class the second half of the year. Working in conjunction with a local university (Tri-State), students may be qualified to receive college credit for the whole year. Two other AP laboratory classes in 1997-98 were scheduled for the first, second, and fourth quarters of the year. Also, two new AP classes were added to the schedule in 1996-97 partially because teachers had fewer class preparations and were willing to take on the extra work required by these classes. The flexibility of the block schedule permitted the pursuit of these arrangements as well as a Workplace Participation program initiated for the 1997-98 year.

There was a 28% increase in usage of materials in the media center with the block. More teachers took their classes to the library to research topics for discussion, with a 237% increase in the number of reference materials used. Changes in the media center can be partially documented by comparing the number of materials borrowed (Figure 10). A more accurate picture was witnessed by observing the activity and increased traffic flow throughout the media center.

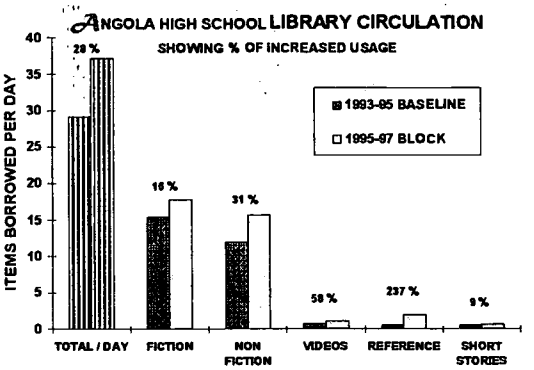

Figure 10. The media center witnessed more use from the students and faculty, especially with a 237% increase in reference materials. With the longer blocks of time, discussions and research projects were expanded and more materials were borrowed.

Within the first week of the block schedule, the hallways were quieter during passing periods. In fact, the school didn't have a single hallway fight the whole first semester, a never before recorded statistic. Not only did the students seem in less of a hurry (the five minute passing period remained the same), but students were in the hallways half as many times with the 4 - Block schedule. There was more time in class to settle conflicts. Because of these improvements, fewer students were assigned to in-school suspension (Figure 11). Though not statistically significant, the principal and assistant principal have confirmed reduced problems.

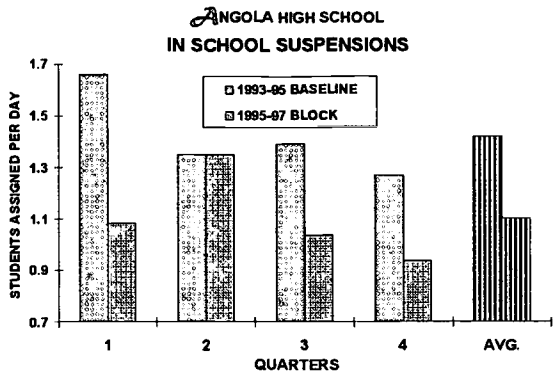

Figure 11. Fewer discipline problems arose with the 4 - Block. Students were in the hallways one-half as many times. Longer class periods appeared to help resolve conflicts.

With the block schedule, the teachers were responsible for only three classes, with nearly fifty percent fewer students at any given time and never more than three different preparations. Two preparations were the norm. The average class size remained the same as the baseline for a school mean of twenty to twenty-one students (Figure 12).

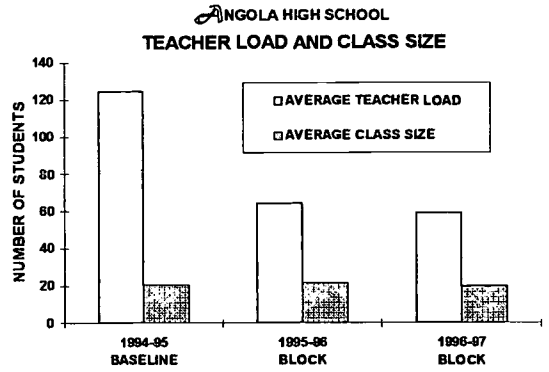

Figure 12. With a smaller teacher load, the teachers got to know the students better and help them more. Also, fewer papers were graded at any one time because there were only half as many students.

Student attendance significantly $t(27) = 2.20$ improved with the block schedule, as can be seen in figure thirteen. In seven of the nine school months, there was a cumulative increase in the percent monthly attendance rate since being on the block, with an overall mean increase of about one-half of a percent. Not as much of a drop in the attendance occurred during the end of the winter months (February - March); however, December and January had poorer attendance with the block scheduling.

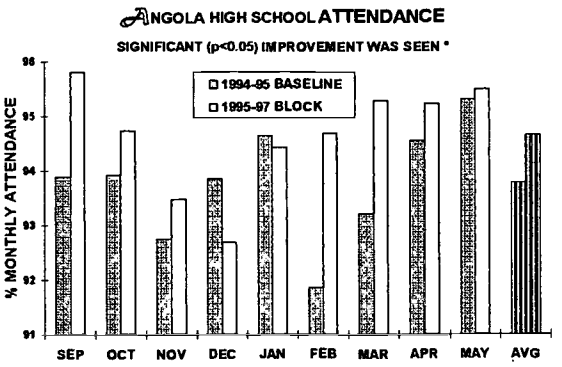

Figure 13. A significant ($p \leq .05$) improvement was seen in attendance. Several factors contributed to the improvement of this constant challenge. The block was just one more tool to use, and it had the benefit of flexibility to work with other programs. (*Data from December, 1996 was the lowest in years and was dropped for statistical tests due to new software problems initiated then.)

Baseline and first year block scheduling qualitative data were taken through a sixty-six item questionnaire. It was given in the spring prior to starting the block, once in November after being on the block about three months, and again in April, after nearly one year with block scheduling. The results revealed approval of the block by the students, teachers, and parents alike. With each succeeding questionnaire, there was also a general trend toward greater satisfaction with the schedule. There was an eighty percent return from the students, about fifty percent from the faculty, and from forty to only ten percent from the parents. Fewer returns were gotten from the parents each time the questionnaire was given. To check for consistency, some of the questions were variations of other questions. No glaring discrepancies were found, though the

length and repetitiveness of the questionnaire were believed to contribute to the lower faculty and parent return rates.

An abridged thirty-five question questionnaire was given toward the end of the second year of block scheduling, with an eighty percent return from the faculty and students and twenty-two percent from the parents. It showed a greater level of satisfaction with the schedule than the previous year's results. About eighty percent of the students, teachers, and parents agreed or highly agreed that Angola High School was providing a good education (Figure14).

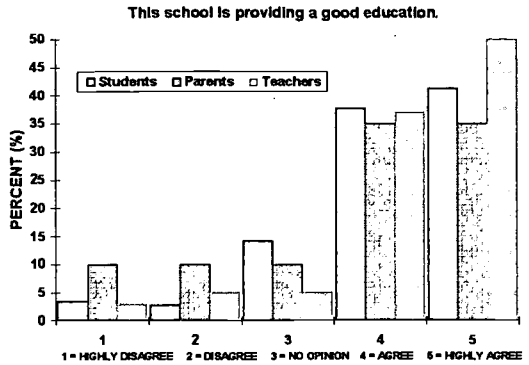

Figure 14. A great deal of satisfaction was found among the students, parents, and teachers in feeling that Angola High School was providing a good education.

Over eighty percent of the students and teachers and sixty-four percent of the parents agreed that taking only three or four class preparations at one time was better for learning than six or seven classes (Figure 15).

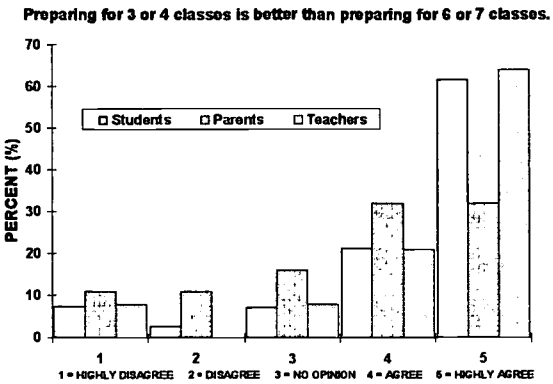

Figure 15. There was stronger agreement with fewer classes at a time being better. Students concentrated on fewer subjects and had fewer teachers to please.

Over seventy-five percent of the students and teachers and fifty-eight percent of the parents agreed that a 90 minute class period for half the year ultimately allows for greater depth of coverage of the material, compared to fifty minutes all year long (Figure 16).

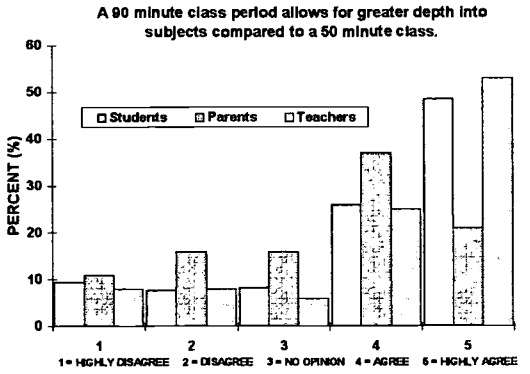

Figure 16. The questionnaires were given after two years of block scheduling. Students tend to remember more when they can apply and relate knowledge to themselves.

A majority of the students (sixty-three to seventy-two percent) agreed or highly agreed that they could be more successful with three or four classes compared to seven classes (Figure17).

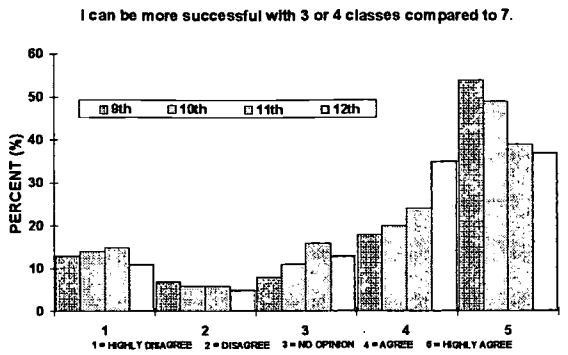

Figure 17. All grade levels agreed that they could be more successful with the block schedule. Only the 11th and 12th graders had experienced a seven period day at the high school.

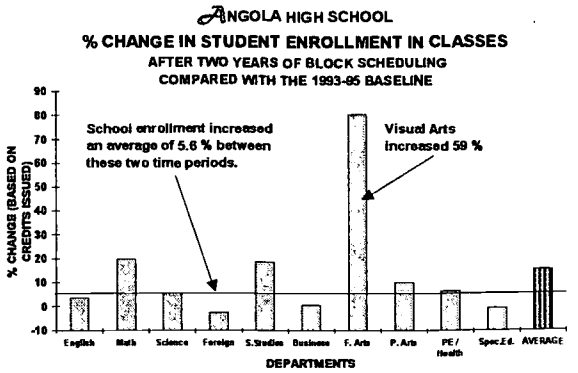

Figure 18. With block scheduling, students had opportunities to take more classes. The fine arts appeared to be the most popular classes to chose.

The majority of the teachers liked the block schedule after using it two years. Eighty-three percent agreed that they preferred the block schedule over a seven period day, and eleven percent disagreed. Seventy-one percent of teachers felt the block schedule was less stressful, while seventeen percent found it more stressful . Eighty-six percent of the teachers found increased classroom flexibility with the block schedule. About three-fourths of the faculty found it possible to effectively cover course content with the block, while nineteen percent felt they did not effectively cover course content.

Based on credits issued, there was a sixteen percent increase in student enrollment in classes during the two years of block scheduling, compared with the two-year baseline. During this time period, the school enrollment increased six percent for a net gain of ten percent. The largest change was an eighty percent increase observed within the fine arts department (Figure 18).

Within the fine arts department, the visual arts had a fifty-nine percent increase in students taking classes. The music arts classes stayed the same size, but they were able to offer a class during the school day that had previously been conducted outside of school hours. All the fine arts classes saw increased student involvement. A seminar (small study hall), built into the schedule, permitted the music arts to adapt without any loss to their year-long programs.. Vocal music students were able to meet flexibly, either for 45 minutes daily or for an entire block every other day the entire year. The instrumental music students met for an entire block in the fall during marching band season, and had the choice of meeting daily for all or half of a split block, the rest of the year. If they chose to meet all the block, they took another music class (Figure 19).

Angola High School Block Schedule SAMPLE BAND STUDENT SCHEDULE		
First Semester		Second Semester
First 9 weeks	2nd 9 weeks	
Band 90 min	Band 45 min; Jazz 45 min; Seminar	Band 45 minutes; Jazz Band 45 min; Seminar
P.E.		Science
English		Math
Computer App.	Basic Art	Foreign Language

Figure 19. The flexibility of the seminar period allowed the music arts department program to improve with the block schedule. Rehearsal time before and after school hours decreased. No loss in enrollment or program was witnessed.

Indiana high schools may issue Academic Honor Diplomas to graduates who complete a minimum of 47 designated credits in academic challenging core areas. Approximately ten percent of the baseline and first year block graduates qualified for this distinction. In the 1997 class, over 17% of the students received the Academic Honor Diploma. This class had two years of increased opportunities to take more classes with block scheduling.

The math, social studies, and practical arts departments' enrollments, each increased twenty, nineteen, and ten percent respectively. The other departments increased in the same proportion as the school enrollment with the exception of a slight drop in the foreign language and special education departments. The enrollment drop was believed to be from normal yearly fluctuations.

Twelve to eighteen months prior to changing the schedule, in-service sessions centered around active student learning strategies, were held for the teachers approximately every six weeks,. All teachers were encouraged to attend conferences that would help them build new teaching techniques. Past records of the number of professional development days used by the entire high school staff were obtained, to help measure the amount of staff training received. During the year prior to going to block scheduling, there was a thirteen percent increase in the number of professional development days taken by the high school staff, compared to the previous two years. The first year of block scheduling was very busy with the staff developing new lesson plans. During this year only a six percent increase in professional development days from the baseline was seen, and an eleven percent increase over the baseline was taken during the second year of the block schedule (Figure 20).

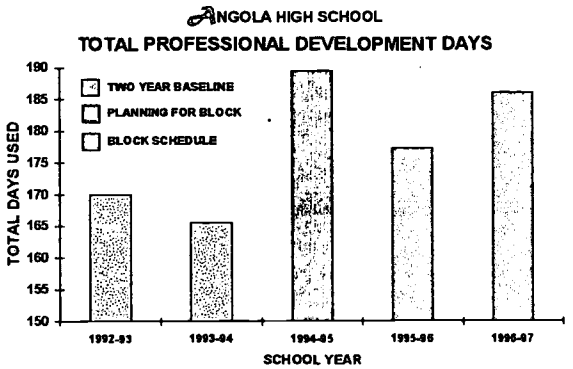

Figure 20. Staff development appeared to be the most important ingredient to successful block scheduling. The data suggests a direct correlation exists between the two.

After one semester of teaching with the 4 - Block, about one-half of the staff volunteered to meet twice a week in the morning before school for 45 minutes to introduce each other to new teaching strategies. Small faculty teams researched and tried new methods with their students

and brought that information back to the rest of the staff. Using this knowledge, the faculty then hosted a one-day workshop in the summer of 1996 for over 430 educators from Indiana, Ohio, and Michigan.

The same peer coaching strategy occurred during the second year of block scheduling, meeting once every week or two. In the summer of 1997, approximately one-third of the faculty hosted 30 small departmental workshops to 167 teachers from the Tri-state area, emphasizing block scheduling teaching strategies useful to specific departments. Over 550 teachers representing 73 schools visited Angola High School during the two years of block scheduling with the faculty hosting the guests during the school day. Numerous staff have presented in-service workshops at other schools as well.

Discussion

Mixed reviews were found in the literature involving statistical analysis of block scheduling. Significant unaccounted-for variables were likely to blame for many of the differences found. With the teacher being one of the most important criterion in modifying student successes, it was important to document any change in the teacher's presentation and style. Accurately measuring the teacher's level of adaptation to block scheduling in a large region, state, or province would be a daunting challenge at best.

It appeared that the most accurate methodology used, was that of case studies being done within classrooms, buildings or districts. The classroom teachers were the ones who directly witnessed changes taking place among their fellow colleagues. These reviews needed to have a statistical analysis of the data applied, a requirement which was sorely lacking in most block scheduling case studies.

Decisions about school improvement plans had to be based on solid research. Instincts and feelings were not good enough reasons to change. The goal of this paper was to provide the reader with a carefully analyzed small database from which to draw some inferences and direction for change. Careful data analysis supported the belief the 4 - Block schedule with aggressive staff training provided tremendous educational opportunities for those willing to change. However, with so little data available, it was imperative for blocked schools to document their changes and share them with others.

There was solid evidence that improved student learning took place at Angola High School with the 4 - Block schedule. The strongest proof was through the analysis of the student grades. Teachers using the same semester exams the first year of the block and finding student successes nearly a whole grade point higher on those exams add credence to this conclusion. Other supporting statistics are the high scores on the state ISTEP+ tests and the significant improvement on the ACT scores.

The type of learning encouraged by the block schedule helps students develop life-long learning skills. The development of these skills were seen in the increased usage of the media center where students were learning to research a variety of topics. Classroom discussions, teamwork, and cooperative learning activities occurred more frequently in a number of classrooms. Many classes were able to have time to collect "real" data and analyze and interpret it before the class period ended.

The data suggests the block schedule by itself was not the most important reason

improvement was witnessed at Angola High School. It appeared the most important ingredient was staff development. The teachers were given a great deal of ownership in the improvement plan. The vast majority of the teachers were dedicated to learn new teaching strategies and were willing to teach them to other educators. The environments in many classrooms were observed to exhibit actively involved student learning. It must be emphasized, though, the 4 - Block schedule was the means by which many improved teaching strategies were implemented. Tremendous power was found in block scheduling, power to make significant improvements in the educational process.

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