



### Why Biology Study

Of the five required EOC courses, Biology had the 2nd largest enrollment in 2005. In 2004-05, WCPSS made expected growth in Biology but not high growth. Biology also has the largest White-Black achievement gap (in 2004-05 87.4%

of White students scored level III or IV compared to 47.2% of Black students at Level III or IV).

There were three project goals in the study (see handout below). This summary concentrates on the goal of identifying the most successful WCPSS Biology teachers, based on End of Course results.

### Methods & Analysis

Forty-three teachers who had taught Biology for 4 consecutive years from 2001-02 to 2004-05 were identified for the study.

After analysis, the 10 most effective and 10 least effective teachers were identified, based on average student residuals (see study: attachment 1 & 2). Comparisons of surveys, observations, student scores, and interview results of the top and bottom teachers were made.

### Results

Comparisons between top teachers and bottom teachers were not easy. There was variance between teachers and exceptions to every generalization made.

- ✓ Top effective teachers were in 7 schools, bottom teachers were in 7 schools, and 2 schools had top and bottom teachers.
- ✓ Top Teachers averaged 83.4% of their assigned instructional time teaching Biology while bottom teachers averaged 64.7% of their instructional time.
- ✓ Most top teachers focused class time in lecture and lab. Most bottom teachers used little lecture, more projects, and partner activities.
- ✓ Most top teachers planned their own lessons, (did not use provided activities in pacing guides) collaborated with other teachers, and used data frequently.
- ✓ Teachers with high student performance were not necessarily teachers with high student growth.

*Note: Years of experience of top and bottom teachers ranged from 6 to 30 and both groups taught honors and academic sections*

### Conclusions – with exceptions!

- ➔ It is possible to identify teachers who consistently help students achieve high growth. (Results of Biology were the same in 2005; i.e. top teachers and bottom teachers were the same.)
- ➔ **Top effective teachers based on Teacher Survey:**
  - ✓ Focused on Biology
  - ✓ Used data
  - ✓ Studied/planned with each other
  - ✓ Focused students' time on Standard Course of Study goals
  - ✓ Maximized student time; resisted other school duties
- ➔ **Observations of successful Biology teachers showed:**
  - ✓ They planned together as a group
  - ✓ They had students review selected EOC content
  - ✓ They made data driven decisions
  - ✓ They conducted frequent assessments
  - ✓ They made students aware of their progress
  - ✓ They had "year at a glance" documents
  - ✓ They were well dressed and were in a school with strong departmental leadership

### Some Possible Next Steps:

#### System

- ✓ Organize system/school-wide mandatory EOC support groups and provide structure for meetings
- ✓ Disaggregate average residuals
- ✓ Study top performing teachers

#### School Level

- ✓ Focus EOC teacher time
- ✓ Share with other schools
- ✓ Have common planning times for EOC teachers
- ✓ Study top performing teachers
- ✓ Agree on a research-based instructional strategy as a focus

#### Teacher Level

- ✓ Attend system, school, and departmental meetings/share in discussion
- ✓ Study student residual rosters
- ✓ Use teacher data by student
- ✓ Study the Standard Course of Study with other teachers
- ✓ Focus all class time on Standard Course of Study

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WAKE COUNTY  
PUBLIC SCHOOL SYSTEM

# HANDOUT

## WCPSS BIOLOGY 2002-04 A JOINT PROJECT

EVALUATION AND RESEARCH (Glenda Haynie)  
CURRICULUM AND INSTRUCTION (Michael Tally)

### WHY?

#### Project Goals:

- ◆ Pilot a Value-Added Instructional Improvement Analysis Model
- ◆ Identify the Most Successful WCPSS Biology Teachers based on EOC results.
- ◆ Collaborate with C and I to Identify and Share Best Classroom Practices.

#### Why start with Biology?

- ◆ Currently a Graduation Requirement
  - Soon all students must pass EOC (entering class 06-07)
- ◆ Largest White-Black Achievement Gap of Required EOCs
  - 40 percentage points (87.4% White Students at Level III or IV compared to 47.2% Black students at Level III or IV)
- ◆ 2<sup>ND</sup> largest in enrollment among courses with EOC tests
- ◆ District made expected, but not high growth on the Biology EOC test
  - 6 High Schools did not make expected growth
  - 6 High Schools made expected growth
  - 5 High Schools made high growth

### METHODOLOGY:

#### Subjects:

- ◆ 43 teachers who had taught Biology in 2001-02, 2002-03, 2003-04, and were teaching in 2004-05.

#### Instruments:

- ◆ Classroom observations
- ◆ Teacher surveys
- ◆ Department Interviews
- ◆ Students EOC scores

#### Analysis:

- ◆ Identified the 10 most and 10 least effective teachers based on average student residuals. Student residuals are comparisons of student performance based on their pretest scores, special program services, and free or reduced lunch status (see Attachment 1 and 2 for details).
- ◆ Compared survey, observation, student scores and interview results of top and bottom teachers.

### RESULTS:

#### Comparing Top Teachers to Bottom Teachers:

- ◆ is difficult and multifaceted
- ◆ involves much variance between teachers
- ◆ shows some generalizations ; yet there is an exception to every generalization
- ◆ is just a beginning

Top Effective Teachers were in 7 schools, bottom teachers in 7 schools, and 2 schools had top and bottom teachers.

High student performance is not always high student growth.

There were teachers in top, bottom, or middle of average student residuals (student growth) who had high or low student performance. For example, a teacher who had 99% of the students at level III or IV was ranked 20<sup>th</sup> in student effectiveness. There were 19 teachers showing higher average scores for comparable students than this teacher.

Top Teachers averaged 83.4% of their assigned instructional time teaching Biology; while Bottom Teachers average 64.7% of their assigned instructional time teaching Biology. This was a measure of how much of their teaching day was spent in EOC Biology over 3 years.

Most Top Teachers focus class time in lecture and lab. Most Bottom Teachers use little lecture, more projects, and partner activities.

Most Top Teachers plan their own lessons (i.e. write them instead of using already written ones from the pacing guide) collaboratively with other teachers.

*All* top teachers report using data

- ◆ 3 bottom teachers have **no** time for data
- ◆ 9 top teachers use data they collect
- ◆ 9 top teachers use data from administration

Top Teachers cite **Time** as main barrier to effectiveness.

- ◆ 6 cited lack of class time with students
- ◆ 2 cited lack of time to plan and meet with students (too many other duties)
- ◆ 1 thought there was too much in curriculum
- ◆ 1 thought students don't study

No Consensus among Bottom Teachers as to barriers to effectiveness.

- ◆ 7 different answers

There was no difference between years of experience found between top and bottom teachers. Both groups had teachers from 6 to 30 years of experience. Both groups had teachers teaching honors and academic sections.

MAJOR Teacher concerns from group interviews:

- ◆ Lack of Class Time and possible need for a 2 semester course.
- ◆ Class Size
- ◆ Lack of Planning Time
  - Too many other duties
- ◆ Lack of Science instruction in Middle School
- ◆ Need for System Wide Training and Support for EOC teachers before and throughout year.

## CONCLUSIONS:

- ◆ We can identify teachers who consistently enable students to achieve high growth.  
(2005 results are the same in Biology. Top teachers still top, bottom still bottom.)
- ◆ Based on Teacher Survey, TOP effective teachers are:
  - focused on Biology,
  - study and plan with SCS and each other,
  - use data,
  - resist distractions from classroom efforts,
  - maximize student class time,
  - focus all student time on SCS goals.
- ◆ **YET THERE IS AN EXCEPTION TO MOST CONCLUSIONS**

Observations of Successful Biology Teachers showed that they:

- ◆ plan together as a group,
- ◆ work on common pacing guide,
- ◆ have EOC review sessions by selected content,
- ◆ make Data driven decisions about which goals and objectives to stress or review,
- ◆ conducted frequent assessments,
- ◆ communicated to the students their progress on state standards,
- ◆ were in schools that had strong departmental leadership,
- ◆ designed a year at a glance document,.
- ◆ were well dressed.

## POSSIBLE NEXT STEPS:

System Level:

- ◆ Organize System-Wide mandatory EOC support groups and provide structure for meetings.
- ◆ Focus EOC teacher time.
- ◆ Report teacher performance to principal and teacher in WCPSS context.
- ◆ Study top performing teachers.
- ◆ Disaggregate average residuals.

School Level:

- ◆ Organize School-Wide mandatory EOC support groups and provide structure for meetings.
- ◆ Focus EOC teacher time.
- ◆ Use School Effectiveness and Student Residual rosters in planning.
- ◆ Study top performing teachers, use them as leaders(yet do not pull them away from class time).
- ◆ Share with other schools
- ◆ Engage in discussions of Biology Study Results.
- ◆ Have Common Planning Times for EOC teachers.
- ◆ Agree on a Research-Based Instructional Strategy as a Focus.

Teacher Level:

- ◆ Attend system, school, and department meetings. Share in discussions.
- ◆ Focus your time on EOC.
- ◆ Study your student residual rosters.
- ◆ Use Teacher Data by Student.
- ◆ Study the Standard Course of Study (SCS) with other teachers.
- ◆ Focus all class time on SCS.

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# **Attachment 1**

## **How To Interpret Effectiveness Index Information**

### **Effectiveness Index Scores for a School**

Effectiveness Index scores for a school are z- scores—statistical measures of how far (in standard deviations) the average for a group of students is from the statistical average for our school system. A z-score of zero represents average growth, and the standard deviation of scores for all schools is one. Therefore, a school that receives an index of 0.010 on 5<sup>th</sup> grade mathematics is close to zero, which means the 5<sup>th</sup> grade students in that school showed gains in mathematics about equal to the average gain showed by students countywide.

If the Index z-score is above +1.0, the school is among the top 16% of schools in the system serving that grade level. If the z-score is below -1.0, the school is among the bottom 16% of schools. Thus, subjects and grades in which a school showed a z-score of less than -1.0 might be targets for school improvement efforts. Z-scores above +1.0 might mean that a grade-level team is implementing practices that should be documented and shared with other schools or other grade levels.

### **Student Residuals**

Effectiveness Index z-scores are calculated by averaging all of the student residual scores for a particular test (e.g. 4<sup>th</sup> grade reading EOG, 5<sup>th</sup> grade math EOG, or Biology EOC) at a particular school and then comparing the school's average to the averages for other schools in the district. Residual scores are generated when a student's scale score is compared to the average scale score achieved system wide by similar students. The residual is the difference in scale score points between a student's actual score and the score predicted for that student by a statistical method called multiple regression. The regression equation takes into consideration the student's pretest score, the student's special education services, and the student's free or reduced lunch status and calculates the score a student should have been expected to achieve based upon the predictor variables.

When a residual score is near zero, a student scored close to the average for similar students across the district that took the same test. The standard error of measurement for a single student on the EOG or EOC test is given at the bottom of the student roster. Individual residuals above +1 standard deviation or below -1 standard deviation may be worthy of closer examination. Reviewing individual residuals can help teachers identify patterns of student success or failure that may be related to the instructional methods used with those students.

Averaging residual scores for groups of students greatly reduces the impact of standard error of measurement and is a more powerful way to analyze results. Looking at average residual scores for groups of students can indicate whether a group of students in a school showed achievement comparable to, below, or above the achievement shown by similar students served in other schools across our district. Since residuals compare student performance to that of similar students it is a good way to determine whether instructional efforts are succeeding or are in need of modification as our district strives to achieve high growth for all student subgroups.

**Attachment 2**  
**EOG and EOC Teacher Average Residual Cut points**  
**Based on 04-05 results**

The tables below gives teachers a guide to the average value of student residuals above which or below which 25% of all teacher student averages fall. For example, if you are an Algebra 1 teacher whose average student residual value is 2.75, your student residual average is among the top 25% of student residual averages for all Algebra 1 teachers in Wake County Public Schools. If you are a Geometry teacher whose average student residual value is -1.75, your student residual average is among the bottom 25% of student residual averages for all Geometry teachers in Wake County Public Schools.

Student residual rosters are given to principals for all EOC and EOG courses by teacher and section. Averages are printed at the bottom of each roster. The values below were calculated for teachers across **all** sections. A teacher may have a high student residual average but still have one class that had a low average and vice versa. Remember that averages are positively or negatively influenced by very large or small residuals. Teachers should have at least 15 students to use the values below.

EOC Subject	Bottom Quartile	Top Quartile
Algebra 1	< -2	> +2
Geometry	< -1	> +1
Algebra 2	< -2	> +2
English 1	< -0.8	> + 0.6
Biology	< -1	> +1
Chemistry	< -2	> +1.5
Physics	< -1	> + 1.5
Physical Science	< -0.7	>0.9

EOG Subject	Bottom Quartile	Top Quartile
Grade 3 Reading	< -1.1	> 1.2
Grade 4 Reading	< -0.8	> 0.9
Grade 5 Reading	< -0.8	> 0.8
Grade 6 Reading	< -0.5	> 0.5
Grade 7 Reading	< -0.4	> 0.5
Grade 8 Reading	< -0.5	>0.4
Grade 3 Math	< -1.3	> 1.1
Grade 4 Math	< -1.2	> 1.2
Grade 5 Math	< -1.2	> 1.2
Grade 6 Math	< -1.1	> 1.1
Grade 7 Math	< -1.1	> 0.7
Grade 8 Math	< -1.0	> 1.2