Measuring Critical Thinking Skills in WCPSS

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February 2017

Summary

How well are our students prepared for problem-solving, scientific reasoning, and critical thinking?

- WCPSS schools out-performed both the U.S. national and international averages in each core subject of the Program for International Student Assessment (PISA): mathematics, reading, and science.

- Overall, 60% of WCPSS high school students in 2016 performed at a proficient level or above in problem-solving, scientific reasoning, and critical thinking in the College and Work Readiness Assessment (CWRA+). WCPSS juniors' overall performance in CWRA+ was near the middle point between the averages of freshmen and seniors in the national CWRA+ sample. However, the WCPSS scores on the performance task and selected-response items diverged.

DRA Report No. 16.20

Introduction

In a global economy, stakeholders need to keep themselves well informed in terms of how their local schools perform when compared with schools across the country and around the world. In doing so, they will be able to consider how well their schools are doing in a larger context and identify strengths as well as areas to target for improvement. Although different countries organize education in different ways, the Organization for Economic Co-operation and Development (OECD) has provided a tool—the Program for International Student Assessment (PISA)—to compare 15-year-old students' performance in science, mathematics, and reading every three years since 2000. In 2015, more than a half-million students from 72 countries participated in PISA, including the United States (OECD, 2016a). A small number of WCPSS students also have participated annually in a school-based version of PISA since spring 2014.

In addition to national and international comparisons, understanding how well WCPSS students are prepared in skills such as problem-solving, scientific reasoning, and critical thinking is essential. Standardized assessments typically given in North Carolina (such as End-of-Grade and End-of-Course exams) do not measure these types of skills. WCPSS has recently implemented high school level assessments, including College and Work Readiness Assessment (CWRA+), designed to measure the critical thinking skills students need to be ready for college, career and citizenship, which are at the heart of our school district's Vision 2020.

CWRA+, developed by the Council for Aid to Education (CAE), measures students' skills in problem-solving, reasoning, and critical thinking through performance tasks and items that require scientific and quantitative reasoning, critical reading and evaluation, and critique of an argument. In 2015-16, a sample of WCPSS high school students took part in CWRA+.

This report answers two questions: How do WCPSS high schools do compared with the U.S. national average and international averages? Also how well are WCPSS students prepared for problem-solving, scientific reasoning, and critical thinking? In answering these questions, the first part of this report focuses on PISA and the second on CWRA+.

What is PISA and what does it measure?

PISA is a computer-based assessment of mathematics, science, and reading. PISA measures how well 15-year-old students around the world apply what they learned to unfamiliar settings under the rationale that "modern economies reward individuals not for what they know, but for what they can do with what they know" (OECD, 2016b, p.3). OECD has published PISA international and national reports every three years since 2000. The latest results were published in 2016 based on assessments completed in 2015.[1] Samples of 15-year-olds from WCPSS participated in PISA from 2014 through 2016. Five schools participated in 2014 and in 2015, and four participated in 2016 (see Table 1).

[1] PISA results are usually published one year after the assessments are completed because it takes a year for OECD to analyze and develop the reports.

How well did WCPSS do in PISA?

Overall, WCPSS students out-performed both the U.S. national and international averages in all three participating years and in each core subject. For example, WCPSS 2015 PISA performance was higher than the U.S. 2015 averages by 28 points in mathematics, by 11 points in reading, and by 14 points in science. Compared with the 2015 international average, WCPSS in 2015 performed better by 8 points in mathematics, 15 points in reading, and 17 points in science (Figure 1).

What is CWRA+ and what does it measure?

According to the Council for Aid to Education (CAE), CWRA+ is an assessment of how well students are prepared to think critically and how capable they are in innovative ideas and problem solving when encountering complicated situations (CAE, 2016). Each student participating in CWRA+ is expected to complete two components in the assessment—a performance task and a selected-response question section (CAE, 2015). A typical performance task gives a scenario and provides related documents such as regulations, policies, and data reports. Students are expected to complete the task presented in the scenario by making use of the related documents. Selected-response items cover *Scientific and Quantitative Reasoning*, *Critical Reading and Evaluation*, and *Argument Critique* (CAE, 2015). A sample assessment can be found on the CAE website.[2] CAE also creates a composite score combining both the performance task score and selected-response score for each student.

How well did WCPSS students do in CWRA+?

At the district level, 1,942 high school students participated in the assessment in spring 2016. **Overall, 60% of the students performed at a proficient level or above** (Figure 3). Figure 2 provides the percentage of students that fall in each performance level.

WCPSS juniors' overall performance[3] in CWRA+ (composite score) was near the middle point between the averages of freshmen and seniors in the national CWRA+ sample. But there was a disparity between the performance task and selected-response items. In the selected-response section, WCPSS juniors' performance was 6 points higher than the average of seniors in the national CWRA+ sample. However in the performance task, the WCPSS juniors' scores were at the level of the average of freshmen in the national CWRA+ sample (Figure 4).

Because of the descriptive nature of the CWRA+ data, the reason WCPSS students performed higher than the national averages in the selected-response section but lower in the performance task remains unknown. Discussions regarding this question among parents, teachers, and administrators will help identify useful school practices, including what WCPSS did well and areas that need improvement.

This report aims to open discussions on how teaching can best develop students' critical thinking and problem-solving skills. As WCPSS schools are committed to the Strategic Plan—Vision 2020, promotion of critical thinking and problem-solving skills will continue.

[2] CAE. (2015). CWRA+ high school sample assessment. http://cae.org/education-professionals/k12-faculty-or-administrator/cwra-sample-instrument/

[3] The WCPSS students who participated in CWRA+ were juniors.

References

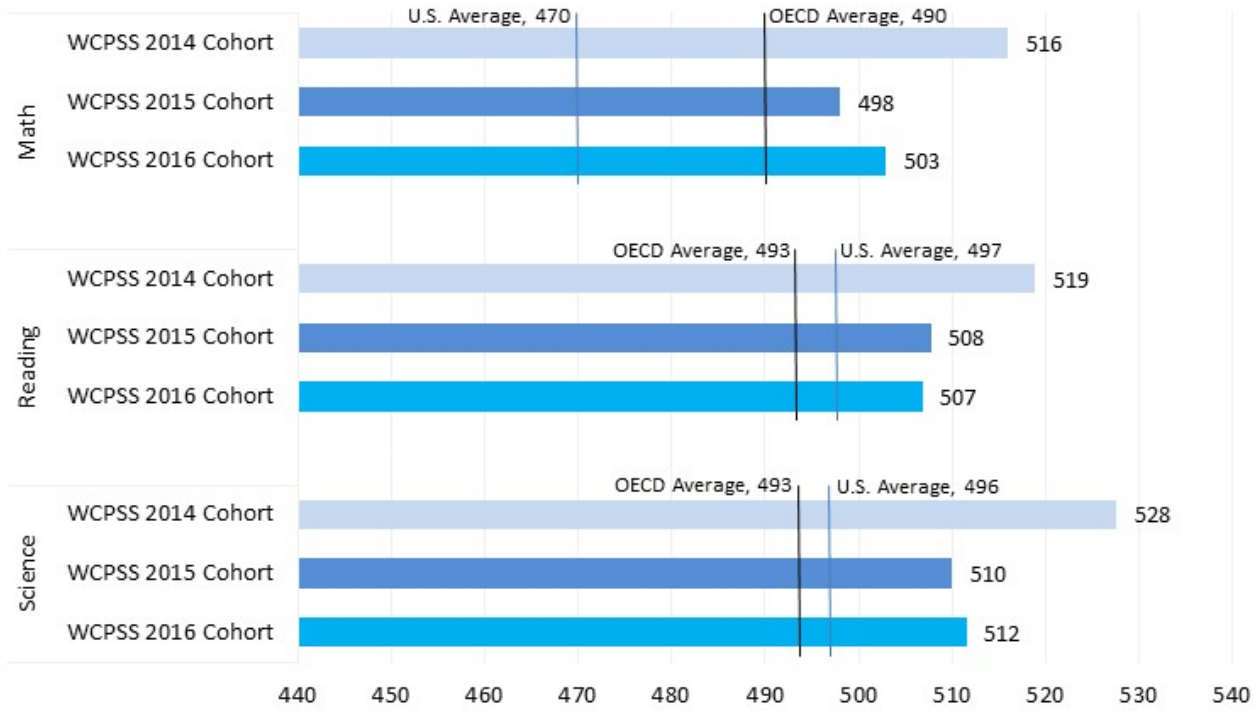
CAE. (2015). CWRA+ high school sample assessment. Retrieved from http://cae.org/education-professionals/k12-faculty-or-administrator/cwra-sample-instrument/

CAE. (2016). CWRA+ Student Guide. Retrieved from http://cae.org/students/high-school-student/what-is-cwra/

Organization for Economic Co-operation and Development. (2016a). *PISA 2015 results: Excellence and equity in education*. Paris, France: OECD Publishing.

Organization for Economic Co-operation and Development. (2016b). *PISA 2015: Results in focus*. Paris, France: OECD Publishing.

Figure 1
WCPSS Students' PISA Average Scale Scores in Comparison with the National and International/OECD Average



Note
2014 schools: William G. Enloe Magnet HS, Panther Creek HS, Holly Springs HS, Heritage HS, and Green Hope HS;
2015 schools were Apex HS, Broughton HS, Knightdale HS, Middle Creek HS, and Wakefield HS;
2016 Schools were Apex Friendship HS, Athens Drive HS, Cary HS, and Rolesville HS.

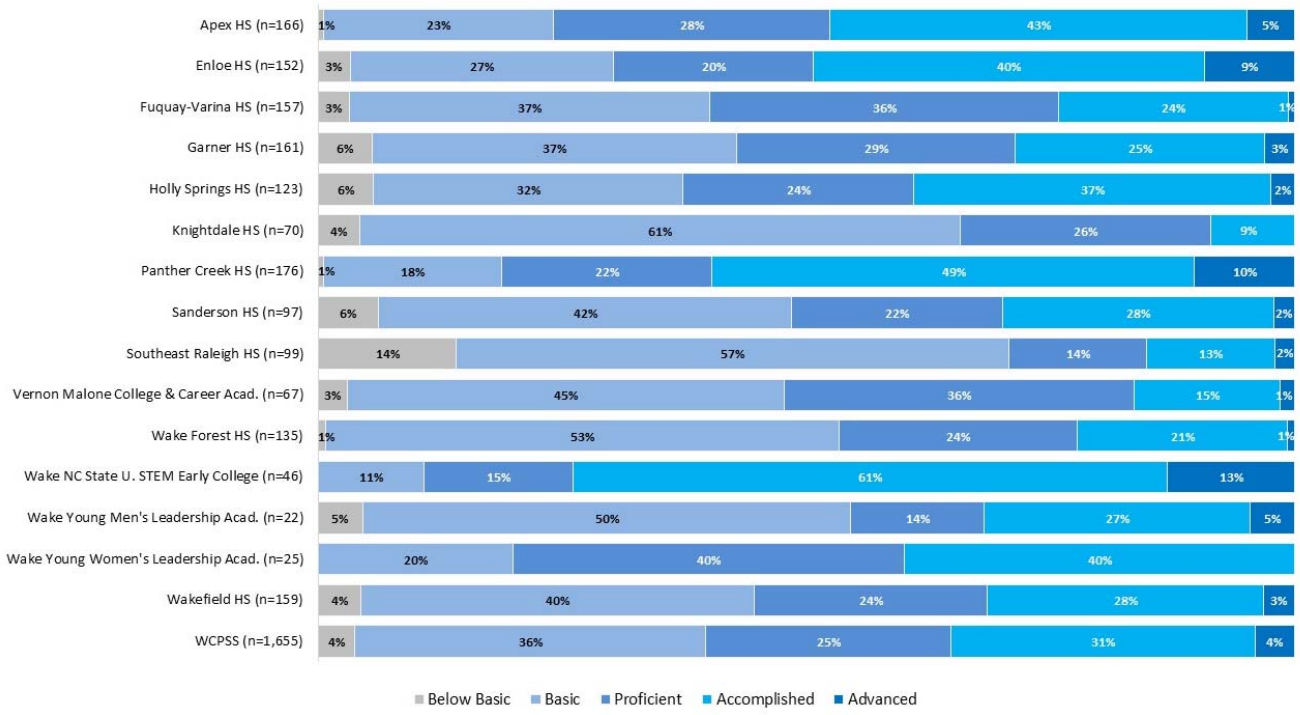
WAKE COUNTY PUBLIC SCHOOL SYSTEM

Table 1
WCPSS Students' PISA Average Scale Scores by School

School Name	Year Tested	Number of Students	Reading	Math	Science
Apex Friendship HS	2016	73	528	534	533
Athens Drive HS	2016	66	515	502	504
Cary HS	2016	73	502	499	516
Rolesville HS	2016	71	482	475	492
Apex HS	2015	54	539	538	539
Broughton HS	2015	67	500	498	513
Knightdale HS	2015	55	446	440	451
Middle Creek HS	2015	37	550	513	542
Wakefield HS	2015	76	517	504	515
William G. Enloe Magnet HS	2014	57	532	534	538
Panther Creek HS	2014	72	508	511	526
Holly Springs HS	2014	41	530	512	526
Heritage HS	2014	51	487	471	492
Green Hope HS	2014	56	541	548	553

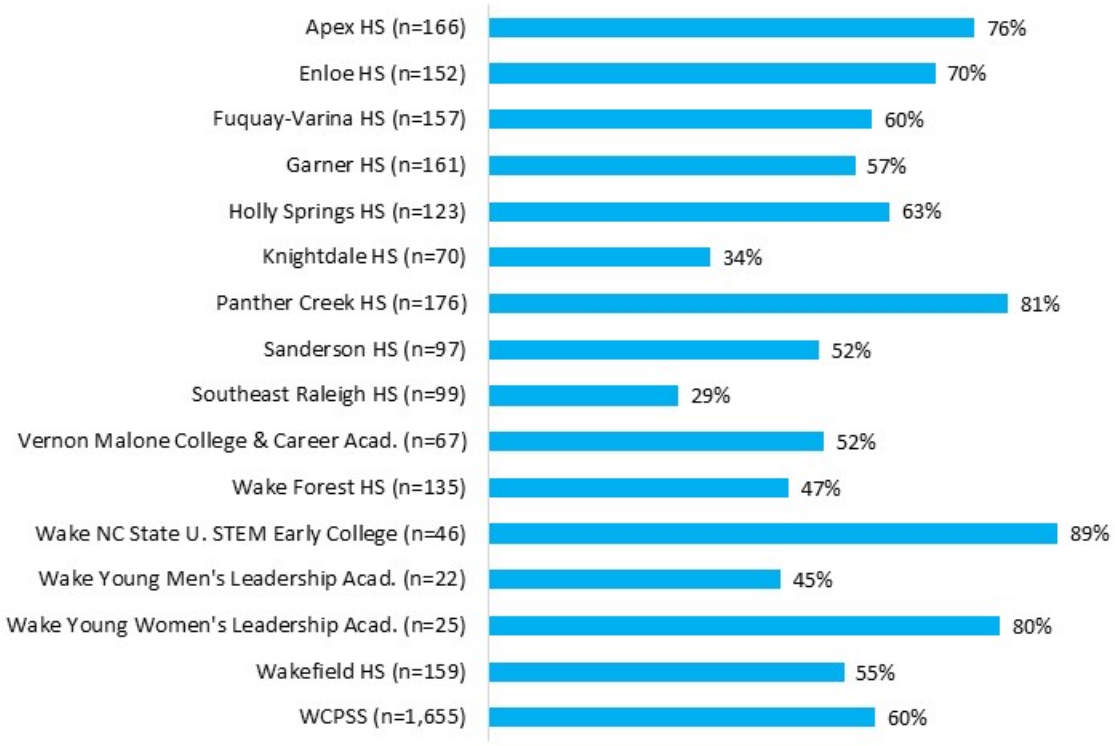
Note: Students were tested either in March or April of each year.

Figure 2
WCPSS Student Performance in CWRA+ Overall by Proficiency Level, Spring 2016



Note: “Proficient,” “Accomplished,” and “Advanced” are considered to be proficient or above.

Figure 3
Percentage of Students Proficient or Above in CWRA+ Overall Score, Spring 2016



Note: “Proficient,” “Accomplished,” and “Advanced” are considered to be proficient or above.

Figure 4
WCPSS Juniors' CWRA+ Assessment Performance Compared to the Averages of National Sample, Spring 2016