

To: School Board, Ferndale School District (WA)

From: Linda Quinn, Superintendent

Date: January 15, 2021

**Subject: 2021 Monitoring Report
Results Policy 2.3 (R-2.3)
Academic Achievement: Science**

School Board's Monitoring Notes

(To be completed by each member individually prior to discussion by the whole Board)

Board Member: _____

Total Number of Improvement Goals = 1

Number Demonstrating Reasonable Progress = _____

Number Not Demonstrating Reasonable Progress = _____

Commendations

Recommendations

Other Notes

Overall Rating: _____ Reasonable Progress _____ Not Reasonable Progress

Superintendent's Introduction

The report that follows focuses on science education in the Ferndale School District. After the year we have just lived, I feel certain all of us have a new appreciation for the importance of science. COVID-19, which has dominated nearly every news cycle for a year, has not only put science front and center, but it has also enabled our students -- and the rest of us -- to see how science, economics, and politics are interconnected. One of our overarching goals for Ferndale students is to become well-informed, active participants in the public discourse that is the fabric of our democracy. According to the CEO of the American Association for the Advancement of Science (AAAS), in order to do so they must understand that "science is a special way for separating truth from falsehood." In short, science education is critical.

When we submitted our first report on Policy R-2.3 (Academic Achievement in Science) in June of 2018, we shared that we were in a transitional period between state assessments, moving from the Measurement of Student Progress (MSP) to the Washington Comprehensive Assessment of Science (WCAS), the latter of which is fully aligned with the Next Generation Science Standards (NGSS).

Leading up to Spring 2018, our teachers were actively preparing for the new WCAS, which involved aligning their content, instructional approaches, and formative assessment practices to the new science standards. At the middle and high school levels, teachers adopted curriculum materials that support the NGSS. This did not occur, however, at the elementary level, where we were using the Science Material Center (SMC) kit program, which is not aligned with the NGSS. According to the "Ferndale School District Curriculum Review/Adoption Cycle," elementary science materials were scheduled for review during the 2020-2021 school year. But, when the levy failed in February 2020 and we had to make plans based on the assumption that we would not have levy funding for 2021, we paused all of our curriculum adoption processes.

In the Spring of 2018, our students took the WCAS for the first time. When we submitted our last report on Policy R-2.3 to you, we still hadn't gotten back the results from that assessment. While we ultimately received them, they were apples to the oranges of 2017. It's impossible to make a fair comparison between the performance of a group of students on one test one year and a completely different group of students on a completely different test a year later -- except, perhaps, to look at whether we, as a district, are performing above or below the state average.

A comparison of science scores from 2017 to 2018 shows that our relationship with the state average did not significantly change. In the charts that are part of the body of this report, you will see that our 5th graders in aggregate performed **below** the state average in spring of 2017 and **slightly above** it in spring of 2018; our 8th graders in aggregate performed **slightly above** the state average in spring of 2017 and **slightly below** it in spring of 2018; and our 11th graders in aggregate performed **below** the state average in both the spring of 2017 and the spring of 2018. So, at one grade level our standing in relationship to the state average improved, at one it got worse, and at one it stayed the same.

When we submitted our last R-2.3 Science Report to you, we said our goal was to improve aggregate student performance at all three tested grade levels by at least 10% between spring 2018 (the first administration of the WCAS) and spring 2019 (the second administration of the WCAS). As you will see in the charts that are part of the body of this report, we only met this goal at the 11th grade.

So much has changed since our students last took the WCAS in spring of 2019. As a result of the COVID-19 pandemic, all state testing was cancelled in spring 2020. So we do not have recent performance data to share.

Also because of the pandemic and the shutdown of in-person learning, we used COVID relief dollars to select and purchase new science curriculum materials specifically designed to meet the needs of remote learners -- although, because of time constraints, we did not follow a thorough curriculum review and adoption process to do so. At the elementary level, we chose Mystery Science, which, besides being designed for online learning, has the added advantage of being aligned to the Next Generation Science Standards for elementary learners. At the secondary level, we chose Edgenuity, which is also NGSS-aligned. For our teachers at both levels, this was new material. Through the summer of 2020, grade level and content teams met to determine the most essential science standards students needed to master remotely and to use the newly selected curriculum to develop a scope and sequence aligned to those standards. It is worth noting that, when the pandemic struck, several Horizon Middle School teachers were involved in a national pilot for developing Open Sci-Ed units aligned with the Ambitious Science Teaching model and NGSS, and they have managed to continue this work throughout remote learning.

At present, state testing in spring 2021 is still an unknown. Consequently, we have not established a percentage increase in standardized test performance as our improvement goal in science. Rather, we have focused our goals on (1) auditing our science curriculum to determine its alignment with NGSS, (2) increasing student participation and achievement in our secondary sciences courses, as measured in end-of-course grades, and (3) providing NGSS-focused professional development to our teaching staff.

Before launching into the remainder of the content of this report, I want to share a note about its format and organization: We have included the interpretations and monitoring indicators you approved in September 2018 in our Phase One Report for Policy R-2.3, so that you do not have to look back and forth between two documents. All of the language from the Phase One Report is written in blue. All of the new information is written in black. In addition, we have updated the achievement tables to include WCAS testing data from spring 2018 and spring 2019, neither of which were available at the time we submitted our last R-2.3 report.

Policy

All students will master the skills and demonstrate proficiency in each required discipline and electives:

Discipline: Science

Interpretation

We understand this policy expresses the School Board's expectation that all students in each grade band will demonstrate mastery of state-defined science content, concepts, and practices as measured by state and/or local assessments – or they will provide evidence they are making reasonable progress toward such mastery.

Benchmark Data

At the ELEMENTARY level, Ferndale's science program is based on a Science Material Center (SMC) kit program, which comes out of the Educational Service District 189 in Anacortes. The SMC kit program is not aligned to Next Generation Science Standards (NGSS) and does not come with a formal assessment component. Therefore, we do not at this time have reliable

science assessment data on our students in grades K-4. The first formal science assessment we administer at the elementary level is in grade 5.

Students in grade 5 took the Washington Comprehensive Assessment of Science (WCAS) for the first time in spring 2018 (the results of which have not yet been released). This assessment fulfills the federal requirement that we test students in science at least once at each level: elementary, middle, and high school. The WCAS measures student proficiency of the Washington State 2013 K-12 Science Learning Standards. Prior to this year, students in grade 5 were assessed in science using the Measurement of Student Progress (MSP), which is also based on the Washington State 2013 K-12 Science Learning Standards.

Science achievement data of grade 5 students are displayed in the following chart.

Ferndale School District GRADE 5 SCIENCE							
	Level 1 Well Below Standard	Level 2 Below Standard	Level 3 Meets Standard	Level 4 Exceeds Standard	Total Meets or Exceeds	State Average	Goal
2016-2017 (MSP)	16.7%	26.5%	33.9%	22.5%	56.4%	64%	62.0%
2017-2018 (WCAS)	25%	17%	44%	15%	58%	56%	66.4%
2018-2019 (WCAS)	22%	27%	32%	19%	51%	54%	68%
2019-2020 (WCAS)	Testing canceled due to COVID-19						

At the MIDDLE level, Ferndale students are enrolled in a science class each year, the content of which is based on the broad areas of Life, Earth, and Physical Science. Teachers evaluate student learning using classroom-based assessments aligned to the state science standards. At this time, course grades are the primary measure of student proficiency in grades 6 and 7.

Students in grade 8 took the Washington Comprehensive Assessment of Science (WCAS) for the first time in spring 2018 (the results of which have not yet been released). Prior to this year, students in grade 8 were assessed in science using the Measurement of Student Progress (MSP), which is also based on the Washington State 2013 K-12 Science Learning Standards.

Science achievement data of grade 8 students are displayed in the following chart.

Ferndale School District GRADE 8 SCIENCE							
	Level 1	Level 2 Below Standard	Level 3 Meets Standard	Level 4 Exceeds Standard	Total Meets	State Average	Goal

	Well Below Standard				or Exceeds		
2016-2017 (MSP)	10.6%	20.8%	41.1%	27.3%	68.4%	67%	75.2%
2017-2018 (WCAS)	28%	21%	35%	17%	52%	55%	78.4%
2018-2019 (WCAS)	27%	27%	29%	17%	46%	53%	62%
2019-2020 (WCAS)	Testing canceled due to COVID-19						

At the HIGH SCHOOL level, Ferndale’s science program is content-based (Biology, Chemistry, Physics, etc.). Teachers evaluate student learning using classroom-based assessments and course grades are the primary measure of student proficiency. The one exception is that students in grade 10 take the state’s Biology End Of Course assessment in the spring. As the state fully transitions to the new Washington State Comprehensive Assessment of Science (WCAS) and Next Generation Science Standards, this End Of Course Biology Assessment will be eliminated.

Science achievement data from End Of Course (EOC) Biology assessment of grade 10 students are displayed in the following chart.

Ferndale School District GRADE 11 SCIENCE							
	Level 1 Well Below Standard	Level 2 Below Standard	Level 3 Meets Standard	Level 4 Exceeds Standard	Total Meets or Exceeds	State Average	Goal
2016-2017 (EOC)	16.3%	21.4%	45.4%	16.7%	62.1%	65%	68.3%
2017-2018 (WCAS)	34%	26%	29%	12%	40%	46%	72.1%
2018-2019 (WCAS)	21%	19%	41%	18%	60%	50%	50%
2019-2020 (WCAS)	Testing canceled due to COVID-19						

Goals

Our goal for the next year is to increase the percentage of students meeting or exceeding standard in science, as measured by the Washington Comprehensive Assessment of Science (WCAS) or the End of Course Biology Assessment, by at least 10% at each grade level, which would result in the numbers in the green shaded column in the charts above. Although we recognize a 10% increase does not seem to go far enough toward closing the gap between where we currently are and the goal of ALL students achieving mastery, it is the increase

recommended by the Office of the Superintendent of Public Instruction for Washington State as reasonable progress.

***NOTE:** As our state transitions from the MSP (grades 5 and 8) and the Biology EOC (grade 10) to the new Washington State Comprehensive Assessment of Science (WCAS), we have experienced a delay in the release of 2017-2018 science scores. As a result, the scores in this report are more than a year old. The new scores, when we receive them, will likely impact our 2018-2019 Science Goal(s).

***NOTE:** The data in this report was generated by student performance on measurement tools our state is no longer employing (MSP and EOC). The new data we receive will be generated by student performance on a new measurement tool (WCAS). While all these tests are based on the same standards, we will undoubtedly need to allow for a period of calibration.

___ Has made reasonable progress
___ Has not made reasonable progress

Our goal was to increase the percentage of students meeting or exceeding standard in science, as measured by the WCAS, by at least 10% at each grade level. From 2018 (WCAS) to 2019 (WCAS), an average of 6.5% **fewer** 5th and 8th graders met standard. In other words, the percentage **decreased** rather than increasing. At the 11th grade, on the other hand, we saw a 20% **increase** in the number of students meeting standard, which **exceeded** our goal.

GOALS and NEXT STEPS

1. SCIENCE CURRICULUM ALIGNMENT

Conduct an audit of our current science curriculum materials to determine their alignment with the Next Generation Science Standards (NGSS).

Progress

The Ferndale School District had not published, maintained, or followed a K-12 curriculum adoption schedule for a number of years. During the 2018-2019 school year, we developed such a schedule in order to ensure we are refreshing our curricular materials on a ten-year cycle, which is consistent with best practice and budgetary limitations. While we had begun to implement the schedule, this process was put on hold because of the February 2020 levy failure and COVID-19. As such we have revised our curriculum audit and adoption dates.

Next Steps: Science Curriculum Alignment

We are committed to launching this work no later than fall 2021.

2. SCIENCE COURSE GRADES

Collect end-of-course grade data to determine success rates of students in all of our secondary science classes. Ultimately, get at least 80% of all students at a C course-grade without remediation beyond the classroom. By the end of the 2020-2021 school year, be able to show the pass rate of students in science in order to set numerical improvement goals for subsequent years, if needed.

Progress

We have collected course participation data for 2018-2019 and 2019-2020 at the high school level only. We confined this data collection to the high school for two reasons:

- First, students at the two middle schools are all required to take the same science coursework. They cannot opt into or out of specific science classes.

- Second, crediting begins at the high school level. Students are required to take certain classes for graduation, but they can opt into alternate science classes based on their interests.

Science participation data at Ferndale High School for the past two years is displayed in the following chart:

	9th Grade		10th Grade		11th Grade		12th Grade	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
Ocean-ography				1		30		21
Biology	284	282	10	8	2	1	2	
Chemistry			236	282	164	18	20	6
Chemistry Honors			99	46	6		1	
Physics			3		32	110	38	35
Environmental Science	55	52	1			3	3	3
AP Biology			1		13		13	
AP Chemistry						5		5
AP Physics							10	4

Next Steps: Science Course Grades

Collecting and presenting this data has raised several issues for us. First, we did not collect achievement/grade information for each science class for 2019-2020, because of the change in the way we awarded grades after our sudden transition to remote learning in the spring of 2020. Rather than the traditional A-through-F grading system, students were given either an “A” or an “I” (incomplete). Now that our teachers have returned to traditional grades, one of our next steps will be collecting information on student achievement/grades in each science class.

Second, we recognize the challenges of comparing grade data when our teachers are not using a consistent grading rubric. An “A” in one teacher’s class is not necessarily equivalent to an “A” in another teacher’s class. And the same is true of “D”s and “F”s. To understand what these grades are telling us, we will have to dig deeper into grading policies, which we

are confident will reveal the need for making our grading practices (a) more consistent and (b) more clearly aligned to learning standards.

Third, we know that in order to create greater consistency in grading practices, we will need to develop course frameworks with identified standards-based learning targets for each of the science classes we offer. This is the work we plan to take on over the course of the next two years.

Once we are able to verify within an acceptable margin that the curriculum being taught in one class is similar to that being taught in another class with the same title, and that a grade from one teacher is substantially equal to a grade from another, we will have an easier time achieving our second goal, which is to get at least 80% of all students at a C course grade level without remediation beyond the classroom. The primary strategies we will use to achieve this goal are more formative assessments and differentiated instructional strategies within our regular science classes.

3. PROFESSIONAL DEVELOPMENT FOR NGSS

Provide high-quality training to all teachers who deliver science instruction to students on the content of the Next Generation Science Standards and best practice instructional strategies for delivering that content.

Progress

The Next Generation Science Standards themselves are an improvement over the science programs that preceded them in several ways. While they cut back on the overall amount of content -- aiming for deeper study of fewer items -- they include some important but previously overlooked topics (such as climate change) and integrate new fields of study. For instance, "engineering design and technology application" are now recognized as main branches of the K-12 science curriculum, along with the physical, earth, space, and life sciences. Also, instead of treating scientific inquiry as a separate topic, the NGSS stress the value of integrating scientific practices -- such as analyzing and interpreting data, testing claims empirically, and reasoning on the basis of evidence -- into every part of the standards, so that students will learn about science by "doing" science. Finally, in addition to learning core science content by actively using scientific methods, students are also required to learn a number of fundamental concepts -- like cause and effect, energy and matter, and conservation -- that cut across the science curriculum. According to the NGSS, these three dimensions (disciplinary content, scientific practices, and core scientific concepts) are interconnected and should be taught together, not one at a time. All of this is progress!

As we mentioned earlier in this report, many members of our secondary staff and a few of their elementary colleagues have already participated in some professional development related to the Next Generation Science Standards, which have been designed to ensure consistent science education through all. Some members of our staff, like the Horizon Middle School teachers who are participating in a national pilot with the Ambitious Science Teaching model and NGSS, are quite knowledgeable about the new standards and a source of internal expertise. However, we have not launched a district-coordinated, comprehensive, science-focused professional development program for all science teachers PreK-12.

Next Steps: Professional Development for NGSS

Making a full transition to the NGSS will be a considerable task spanning years, necessitating dedicated resources, and requiring the participation of many people. Our plan

for moving forward with this transition process includes the establishment of a districtwide Science Leadership Team no later than first semester of the 2021-2022 school year. The team will include district-level administrators, building-level principals, teachers, and science experts from within the community. One of the team's charges will be to develop a plan for professional learning, including an implementation timeline and a mechanism for assessing effectiveness. The Science Leadership Team will be overseen by the Executive Directors of Teaching and Learning.

Superintendent's Final Remarks

As I said in my introduction, high quality science education for all students is perhaps more critical today than ever before in history, not just for the 10% or so who will become future scientists and engineers, but also for those who will not go on to careers in science and technology. We need to produce scientifically literate citizens who can pick up a newspaper or listen to a news broadcast and intelligently assess commentary about the sorts of science-related issues that form part of the public discourse -- global warming, stem cells, food additives, genetic engineering, new advances in medicine, and, of course, pandemics. While we definitely need to prepare our future scientists and engineers to ensure they are on the path to being career-ready when they leave us, at the same time we need to help all students develop what John Dewey called in 1910 "a scientific habit of mind" -- the understanding that causes have effects, the practice of basing judgement on fact, and the willingness to change opinions in light of new evidence -- so that all students can assume roles as active, productive citizens in our democratic society.

The process of completing this report has provided us with a deeper understanding of the current state of science programs in the Ferndale School District. It has identified places where we need to improve the data we know. To an even greater extent, it has raised questions and identified places where we need to know more.

I cannot end this report without issuing one caveat: It would be unfair to the teachers who work so diligently across our district to suggest that gaps in our knowing about science instruction and outcomes are an accurate reflection of gaps in their doing.

We need to continue to dig deeper, and we will.