W.F. West High School
Chehalis School District

STEM Standards Alignment Study

The BERC Group, Inc.

Duane Baker is the founder and president of Baker Evaluation, Research, and Consulting, Inc (*The* **BERC** *Group*). Dr. Baker has a broad spectrum of public school educational and program experience, including serving as a high school classroom teacher, high school assistant principal, middle school principal, executive director for curriculum and instruction, and assistant superintendent. In addition, he has served as an adjunct instructor in the School of Education at Seattle Pacific University since 1996, where his emphasis has been Educational Measurement and Evaluation and Classroom Assessment.

Dr. Baker also serves as the Director of Research for the Washington School Research Center at Seattle Pacific University. He also serves as an evaluator for several organizations including the Bill & Melinda Gates Foundation, Washington Education Foundation, Washington State Office of Superintendent of Public Instruction, and others.

Members of *The* **BERC** *Group* have K–20, experiences as teachers, counselors, psychologists, building administrators, district administrators, and college professors. The team is currently working on research and evaluation projects at the national, state, regional, district, school, classroom, and student levels in over 1000 schools in Washington State and nationally.

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INTRODUCTION

The BERC Group conducted a district review for the Chehalis School District (CSD) from November 12 to November 14. As part of the study, The BERC Group analyzed the extent to which W.F. West High School's (WFWHS) Science, Technology, Engineering, and Math (STEM) Program aligns with proposed STEM national standards. This addendum report includes a description of the data sources, the context of STEM education, high school outcomes data for STEM students, the results of the review, and conclusions and recommendations.

Data Sources

Researchers used the following data sources for the STEM Education Report to triangulate the findings. These data sources are integrated throughout the report.

Interviews and focus groups
Evaluators obtained information during a site visit on November 13th. A total of 84 people, including district and building administrators, certificated and non-certificated staff members, counselors, parents, students, and a school board member participated in interviews and focus groups.

Classroom observations
Researchers conducted 44 classroom observations school-wide to determine the extent to which teaching practices aligned with Powerful Teaching and Learning™ (reform-like teaching). Additionally, for the purpose of this report, researchers disaggregated the data for STEM classrooms (n = 12: each of the six STEM classrooms were observed on two separate occasions). We used the STAR Classroom Observation Protocol® to collect data around instruction in five areas: *Skills*, *Knowledge*, *Thinking*, *Application*, and *Relationships*.

What is STEM Education?

STEM is an acronym for science, technology, engineering, and mathematics, which was coined by Judith Ramaley, the former director of the National Science Foundation (NSF) in the early 1990s. The development of STEM education is a response to the increasing number of jobs requiring knowledge and skills in STEM fields, the lack of qualified candidates, and the fact that American high school students are among the bottom of industrialized countries in academic achievement in math and science (Hanover Research, 2011).

Although definitions of STEM education vary, a common theme among definitions is that STEM education is the bridging of two or more STEM disciplines, or the combining of STEM disciplines with other school subjects, so that students can solve real-world problems by employing the knowledge and skills from a variety of content areas, rather than learning skills in isolation (Dugger, 2010; Morrison, 2006; Sanders, 2009). Further, it is important to note that STEM education is rooted in the principles of cognitive science and constructivist learning theory which emphasize a socially interactive, hands-on, learner-centered, inquiry-based, problem solving approach to teaching and learning (National Research Council, 2011; Sanders, 2009). One of the most commonly accepted definitions of STEM education is:

> STEM is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy" (Tsupros, Kohler, and J. Hallinen, 2009).

STEM education in essence creates an innovative learning environment through integrating science, technology, engineering, and mathematics into all content areas. The STEM philosophy transforms a traditional teacher-directed classroom into a facilitated learning experience characterized by exploration, discovery, inquiry, and the solving of real-world problems.

As the 21st century global marketplace continues to change, students must excel in science, technology, engineering, and mathematics to compete in the global economy. In fact, STEM-related companies have jobs they cannot fill today due to a lack of qualified candidates. As the demand for scientists, mathematicians, and engineers is projected to grow exponentially, the number of American students going into these fields is not growing at a similar rate. Therefore, there is an incredible urgency for the United States to increase the number of citizens with knowledge and skills in the areas of science, technology, engineering, and mathematics.

STEM Education in the Chehalis School District

The Chehalis School District, with the support of key community stakeholders, has a goal of becoming the premier STEM program in a comprehensive high school in Washington State. The Office of Superintendent of Public Instruction (OSPI) recognized W. F. West High School as a "Lighthouse" school because of their collaborative effort between the school district, and awarded a $19,000 grant to support STEM programs and to allow the Chehalis School District to mentor other school districts across the state in their STEM education efforts.

One of the advantages the Chehalis School District has in developing a world class STEM program is that they have developed powerful partnerships with industry leaders, community members, non-profit organizations, and other key stakeholders. Establishing these relationships and developing a common vision among all groups is a critical component of developing and sustaining successful educational programs. The Chehalis School District has received significant funding from the estate of Ray and Mary Ingwersen, the Chehalis Foundation, the Technology Alliance, and former W.F. West Bearcat graduates, James Lintott and Orin Smith to promote STEM education within its schools for the 2013-14 school year and beyond.

Thanks to the generous donations from community organizations and private donors, W.F. West High School has developed and implemented STEM programs, offering courses in robotics, molecular genetics, and advanced mathematics. In these classes, students have the opportunity to apply professional scientific computing software (MATLAB) to mathematical problems, design, build and program robots, and engage in the manipulation and analysis of DNA, as well as in genetic testing procedures used in hospitals, crime labs, and research institutions. In support of the STEM initiative, the Chehalis Foundation donated a new state-of-the-art scanning electron microscope (SEM) to W.F. West High School. The microscope is used for research in materials science, life sciences, forensic investigations, and electrotechnical engineering. It is rare that high school student have access to resources of this caliber. In fact, a representative from Eclipse Technologies said this is the first scanning electron microscope he has ever installed in a high school. The students in the Chehalis School District are very fortunate to have access this cutting edge technology.

The Chehalis School District plans to utilize the generous donations to grow their STEM course offerings at the high school, to expand STEM opportunities to the middle school, and to spark the interest of elementary students in the STEM fields. Recently, a representative from the Chehalis Foundation announced that they were committed to enhancing the 7th grade mathematics program by providing each mathematics teacher with a content expert. The Foundation will also provide every 7th grade student with a robotics kit, and fund a six-week intensive summer STEM camp for every 6th, 7th, and 8th grade student, free of charge.

HIGH SCHOOL OUTCOMES DATA

This section of the report summarizes analyses of high school course taking patterns and college enrollment and persistence data for students participating in STEM courses.

Course Taking Patterns and College Eligibility. Researchers collected transcripts for all graduating students in the 2012 and 2013 school years from W.F. West High School. A trained team of researchers, college admissions specialists, and school counselors analyzed transcripts to determine if the courses taken met the Washington State four-year college and university admission standards. Although there was some variation among colleges, the general requirements include:

- 4 years of English, which must include three years of literature
- 3 years of mathematics, which must include an introduction to trigonometry
- 3 years of social studies
- 2 years of science, which must include at least one year of laboratory science (two years of laboratory science was required in 2010)
- 2 years of foreign language
- 1 year of fine arts (required by some colleges)

Of the 2012 high school graduates who took one or more STEM classes during their senior year, 79% took the requisite courses for admission to a Washington 4-year college, while only 26% of non-STEM students met the admission requirements. This trend was very similar in 2013 with 73% of STEM students meeting the Washington 4-year college admission requirements and only 26% of non-STEM students met the same admission criteria. This means that graduating seniors taking one or more STEM classes during their senior year are much more likely to have taken the classes required to enroll in a 4-year college in Washington State than their peers who did not take a STEM class during their senior year (see Figure 1).

Students who failed to meet the requisite college preparation courses, whether they were STEM students or non-STEM students, were most likely to lack English and/or foreign language requisite credits. Non-STEM students also failed to meet math admission requisites at a high rate. (see Figure 2). A review of graduation requirements shows that W.F. West High School students are not required to complete foreign language credits. Additionally, students are only required to complete 3.0 credits of English. Finally, while students are required to take 3.0 math credits, there is no minimum level, and many students take math classes at a standard less than that required for college admittance. Overall, these results show there is a gap between the diploma requirements and the requisite college preparation.

% of Graduates Meeting High School Course Requirements for Admission to a Washington 4-Year College

Non STEM Students   STEM Students

79%

73%

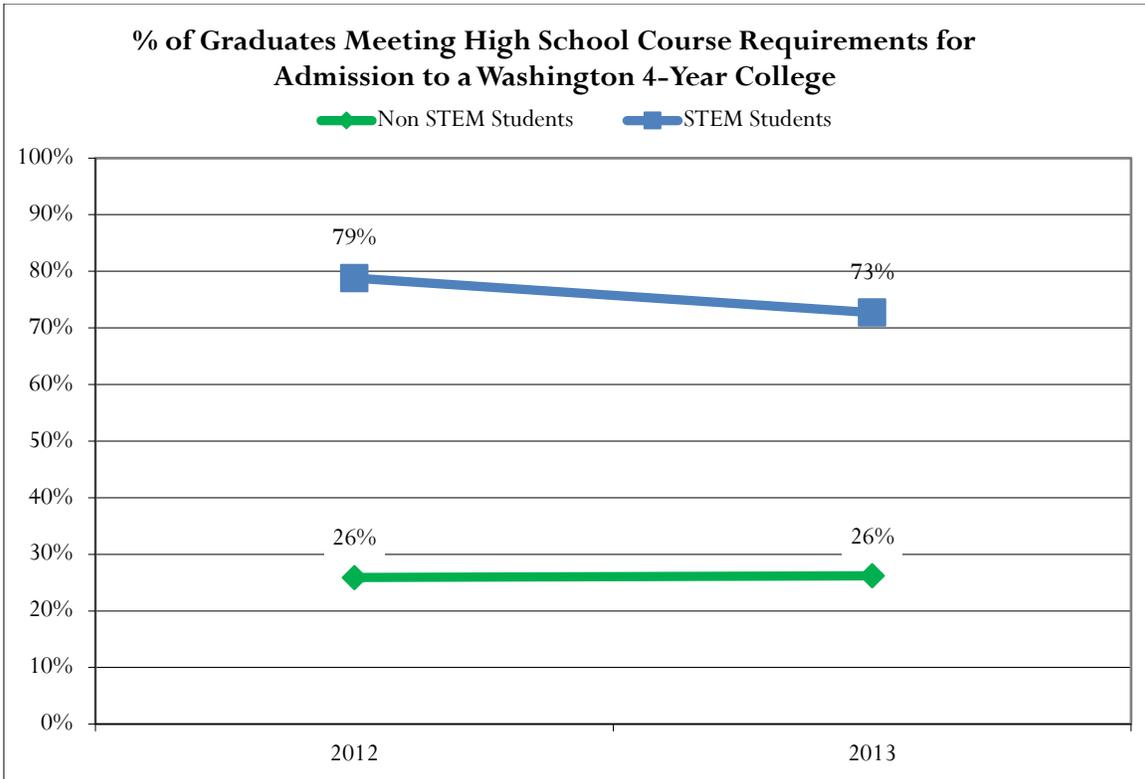26%   26%

2012   2013

Figure 1. **Percent of Graduates Meeting High School Course Requirements for Admissions to a Washington 4-year College**
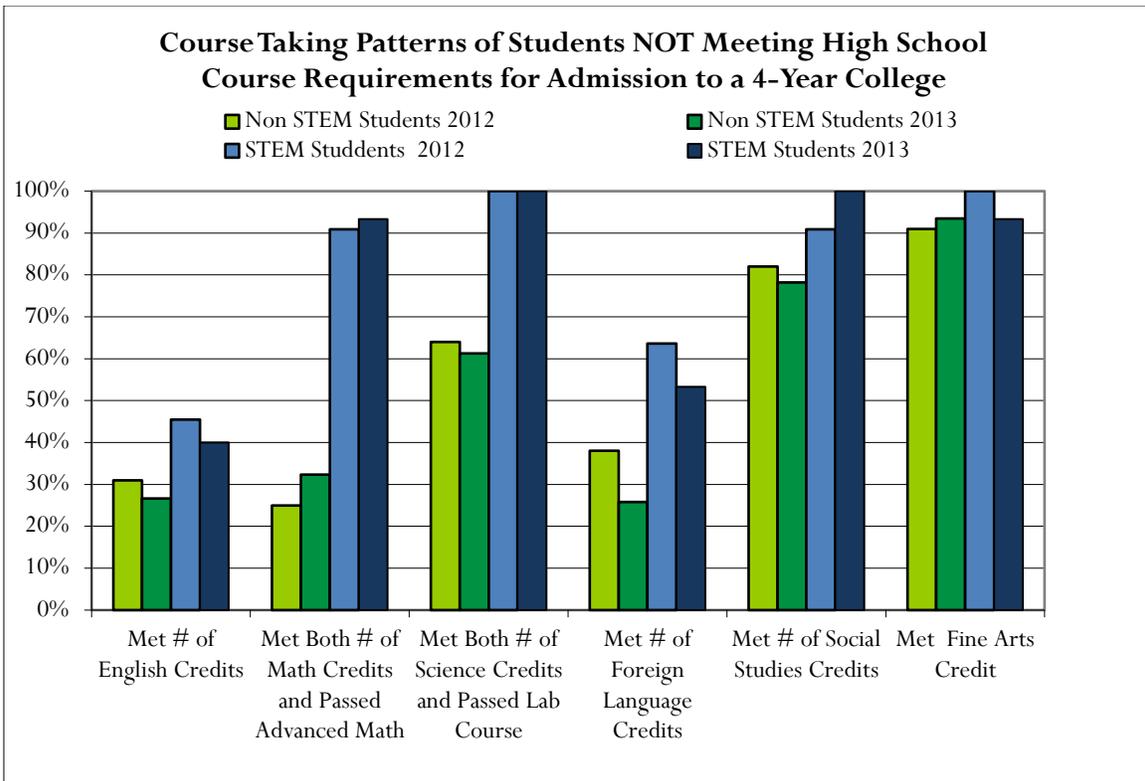
Figure 2. Course Taking Patterns of Students NOT Meeting High School Course Requirements

College Enrollment, Persistence, and Graduation Rates. The National Student Clearinghouse (NSC) was established in 1993 by colleges and universities to serve as a national repository for comprehensive enrollment, degree, and certificate records. Since its beginnings, it has grown to contain more than 65 million student records from over 2,800 colleges and universities in the United States. As of 2012, these institutions enrolled approximately 93% of the nation's college students.

Researchers obtained college enrollment and persistence data from the National Student Clearinghouse (NSC) for W.F. West High School. These researchers collected information from Chehalis for the graduating classes of 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, and 2012. Researchers submitted lists of the names, birth dates, and year of graduation, among other data, to NSC to be matched with the college reported enrollments from 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, and 2012. Researchers compiled and analyzed these yearly enrollment records to determine college enrollment persistence and college graduation rates for all W.F. West High School graduates from these years. Researchers used this data to determine college enrollment for W.F. West High School graduates who had enrolled in a STEM course their senior year compared to those who not enrolled in a STEM course their senior year. This data was only available for the 2012 graduating class.

"College direct" students are defined as high school graduates who attended college any time in the academic year immediately following their high school graduation. The college direct rates for

STEM students compared to non STEM students for 2012 is presented in Figure 3. STEM students went to college the first year after high school at a much higher rate than non STEM students.
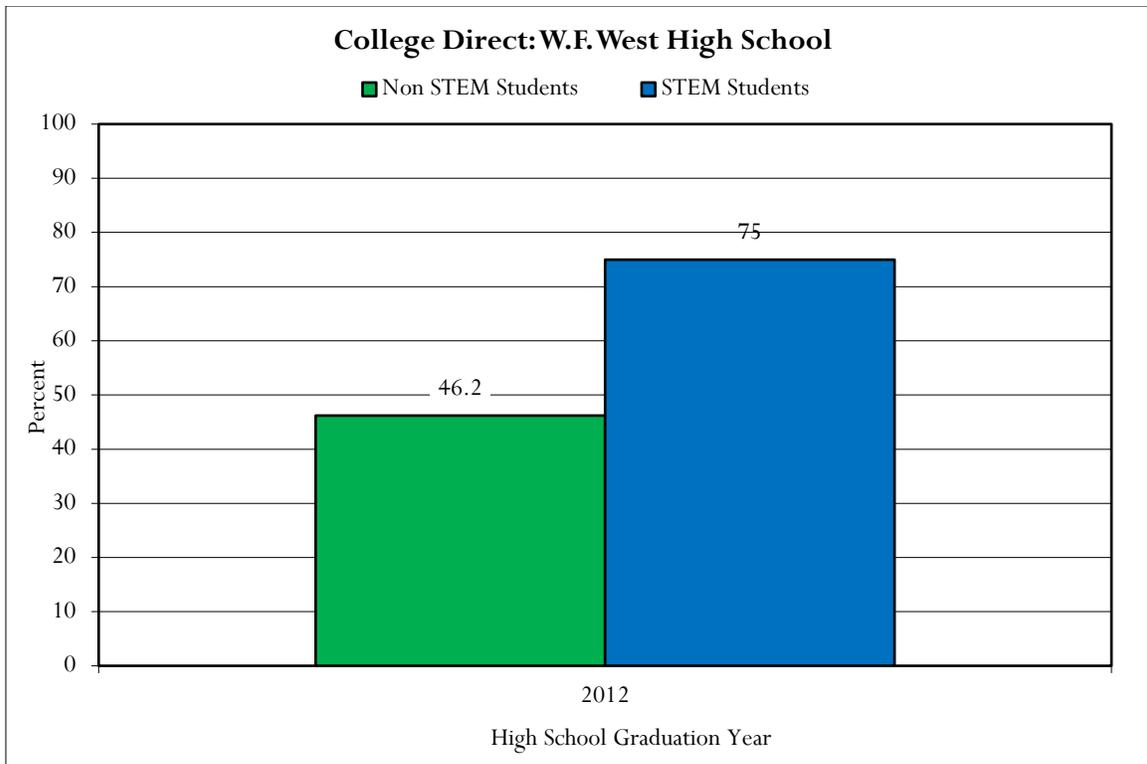
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College Direct: W.F. West High School

■ Non STEM Students   ■ STEM Students

Figure 3. **Percent "College Direct" – 2012**

Figures 4 and 5, respectively, show the percentages of graduates attending two- and four-year colleges the first year after graduating high school.[1] These data indicate a greater percentage of STEM students attend a four-year colleges, while non STEM students are more likely to attend a two-year college.

Figure 4. **Percentage of "College Direct" Graduates Attending 2-year Colleges after Graduating High School – 2012**

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[1] The percentages may total more than 100% due to dual enrollments of some students.

% college direct students attending a 4-year college first year
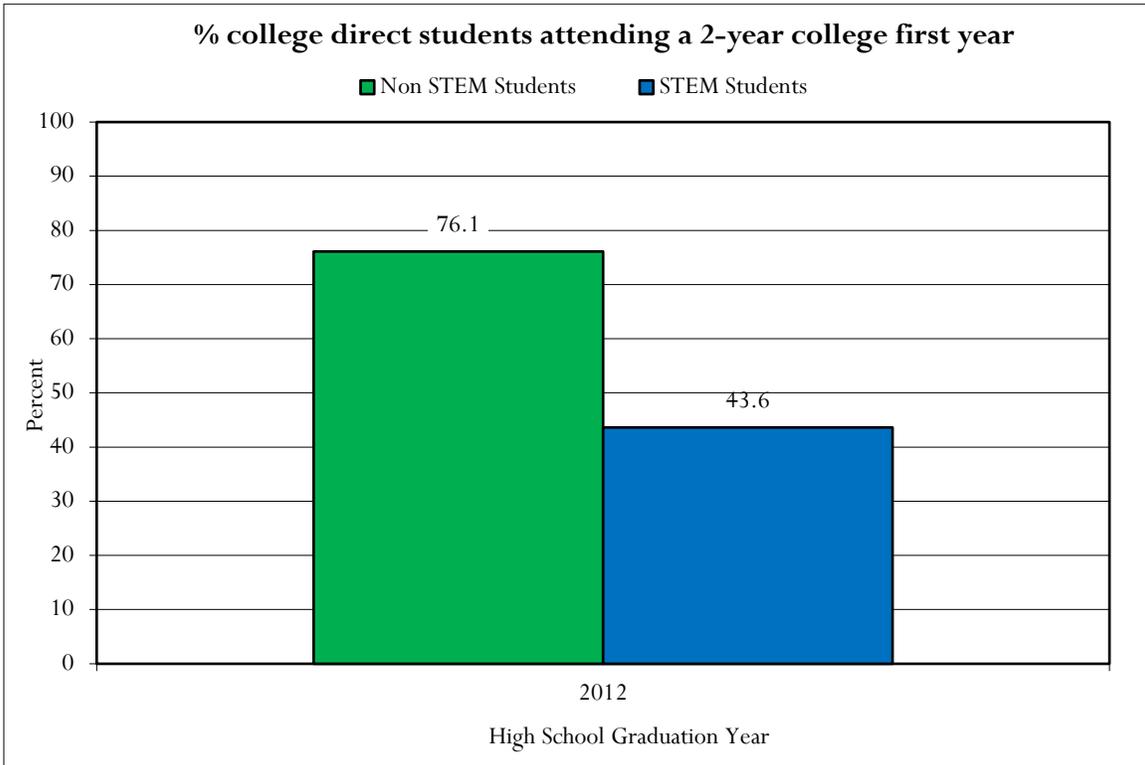
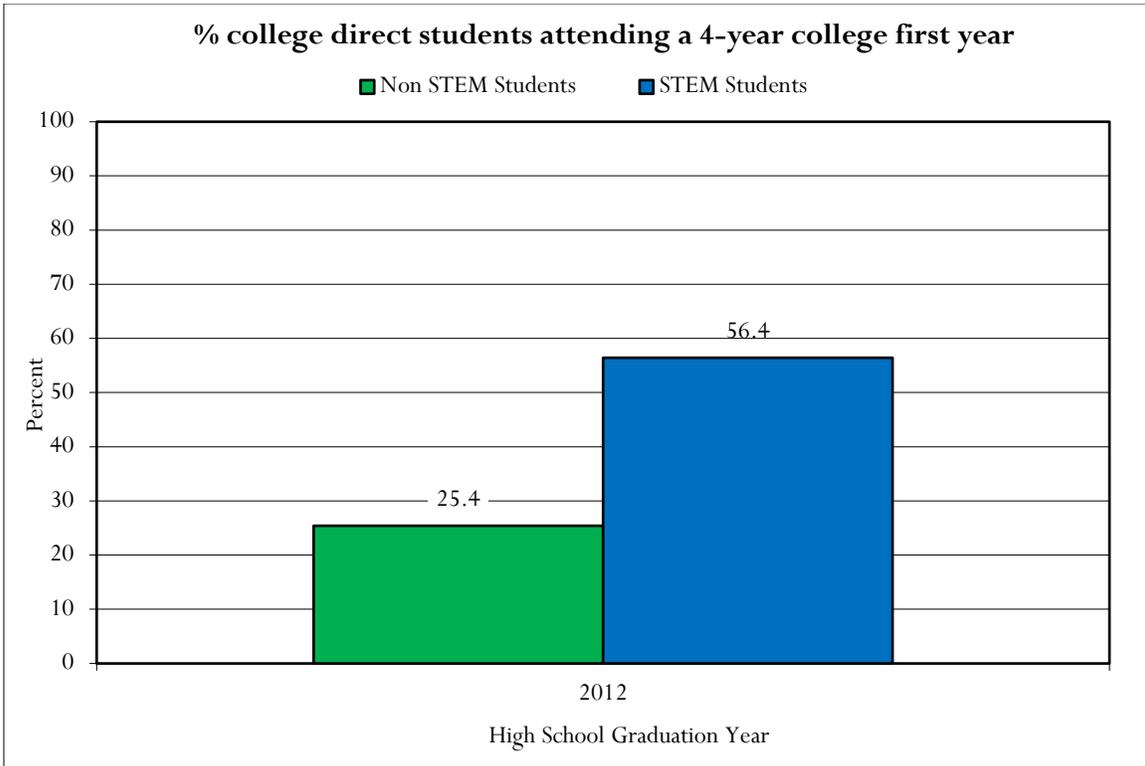■ Non STEM Students   ■ STEM Students

Figure 5. **Percentage of "College Direct" Graduates Attending 4-year Colleges after Graduating High School – 2012**

Researchers also analyzed college degree attainment for W.F. West High School graduates from 2004, 2005, 2006, 2007, and 2008 receiving four-year college degrees. More specifically, researchers coded the degree names and/or CIP (Classification of Instructional Programs) codes into STEM degree or not STEM degree. Figure 6 shows the percentages of four-year college graduates from W.F. West receiving a STEM degree.[2] These data indicate an increasing percentage of graduates receiving STEM-related degrees from 2006 to 2008. This data should be interpreted cautiously due to the small sample size for each graduating year.

% of students graduating from a 4-year college with a STEM degree
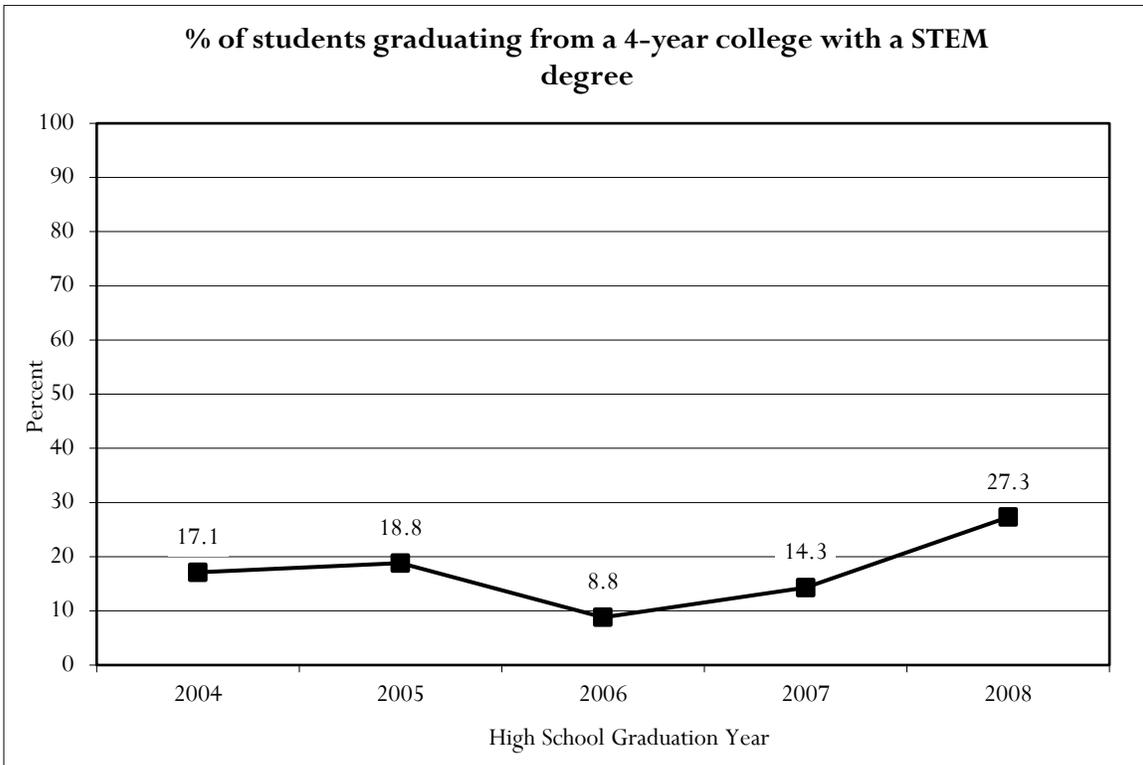
Figure 6. **Percentage of Students Graduating from a 4-year College with a STEM Degree – 2004–2008**

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[2] Data only includes students that graduated from a four-year college who have a degree name and/or degree CIP Code. Researchers used the CIP Codes listed by http://www.ice.gov/doclib/sevis/pdf/stem-list.pdf to determine if CIP Code qualified as STEM-related. Researchers were not able to include two-year colleges because often they do not use CIP Codes and degree names are general.

SCHOOL AND CLASSROOM PRACTICES

This section of the report summarizes findings from interviews, focus groups, and from the classroom observation study.

Rubric Results

Researchers organized the rubric results around proposed national STEM standards. The standards referenced in this document are a compilation of critical attributes of successful STEM programs developed by the STEM Academy through a comprehensive review of the STEM education research. A more comprehensive description of the proposed national STEM standards are available in Appendix A.

STANDARD 1: Curriculum and Instruction
STANDARD 2: STEM
STANDARD 3: Accountability and Assessment
STANDARD 4: Professional Development
STANDARD 5: Family Involvement
STANDARD 6: Stakeholders
STANDARD 7: Leadership
STANDARD 8: Organization
STANDARD 9: Sustainability

Researchers used data collected through the School and Classroom Practices Study, which is described in the Methodology section to reach consensus on scores for 9 standards organized around the proposed national STEM standards. Researchers scored each Indicator using a rubric with a continuum of four levels that describe the degree to which a school is effectively implementing the standard. The four levels are:

> 4 – Leads to continuous improvement and institutionalization
> 3 – Leads to effective implementation
> 2 – Initial, beginning, developing
> 1 – Minimal, absent, or ineffective

Indicators with a score of a 3 or above represent strengths in the school, and Indicators with a score of 2 or below warrant attention. The ultimate goal is to reach a 4, which leads to continuous improvement and institutionalization. Table 1 shows the results.

Table 1.
Indicator Scores

Indicators	Rubric Score 2013
Curriculum and Instruction	2
STEM	2
Accountability and Assessment	2
Professional Development	2
Family Involvement	2
Stakeholders	3
Leadership	3
Organization	2
Sustainability	3

Curriculum & Instruction

All students have access to the curricula and the effective instruction has been designed to meet college and career readiness.

STEM Standard 1	Rubric Score 2013
Curriculum & Instruction	2

Curriculum & Instruction. Curriculum and Instruction is at the heart of STEM education. What is taught and how it is taught are both critical to an effective STEM program. Using data to make decisions, connecting programs across content areas, making connections to student interests and the real world, high quality instructional practices, and teacher effectiveness all lead to the vision of college and career readiness.

W.F. West High School offers students the opportunity to engage in advanced level coursework. Examples of these classes are advanced mathematics, advanced physics, molecular genetics, and a recently added robotics course. However, staff members reported that students must take a particular sequence of courses before they can enroll in the STEM courses. For example, only students who take algebra in middle school can take biology as a freshman, which opens the door for them to progress all the way to molecular genetics. Students must also complete algebra II before they can enroll in physics. A staff member expressed, "The goal is that every student takes biology as a freshman, and then they can access everything." Another staff member shared, "If students have the aptitude, they can get in the robotics after school program." This limits access for all students participating in STEM, and likely the positive results from the course taking study and college attendance study may be because this student group differs from the other students at W.F. West High School.

A group of staff members agreed that one of the goals of the STEM program is to provide students with opportunities to "think for themselves and to solve open ended problems." Another staff member stated,

> When we get kids in advanced physics and molecular genetics they can design their own experiments and learn to ask the question why. They are then given the opportunity to figure out what tools they need, and then solve the problem.

Overall, researchers observed Powerful Teaching and Learning in 67% of STEM classrooms, suggesting that about one-third of observed lessons did not build on the principles of learning (see Appendix B for STAR Classroom Observation Results for STEM classrooms). According to classroom observation results, strengths for STEM classrooms are in the areas of students actively reading, writing, and/or communicating in class (*Skills*), students demonstrating conceptual understanding (*Knowledge*), and the classrooms being supportive learning environments for the students (*Relationships*). Two areas for improvement include students demonstrating thinking through reflection and metacognition (*Thinking*) and students extending their learning into relevant contexts (*Application*). At the indicator level, researchers observed students developing and/or

demonstrating effective thinking process in 58% of STEM classrooms. Additionally, researchers observed students demonstrating meaningful personal connections in 50% of STEM classrooms.

Researchers scored the area of Curriculum and Instruction at a level 2, or at the developing stage. The aforementioned goals of affording all students access to STEM courses and providing all students with high quality instruction align with the STEM standards. However, only some students have access to the higher level STEM coursework depending on their prior knowledge and experience, as opposed to allowing students with diverse histories of academic success explore the STEM disciplines by differentiating the coursework. Further, researchers recognize that W.F. West offers advanced STEM courses that have garnered national recognition, yet when observing instruction across the school, there was limited evidence of learning experiences that challenged students to develop higher-order thinking skills through processes such as inquiry, problem solving, and creative thinking.

STEM

The institution embraces STEM throughout the curriculum and appropriately supports the programming needs to ensure college and career readiness.

STEM Standard 2	Rubric Score 2013
STEM	2

STEM. STEM education is a philosophy that is infused throughout the school and purposefully integrated across content areas. To ensure all students are exposed to the STEM fields and all are ready for college and career, the structure and organization of the STEM school are intentionally designed to eliminate any barriers that prevent learners from exploring STEM fields. School leaders collaborate with business and industry leaders to align vision, mission, and goals of the school, and emphasis is placed on critical thinking, problem solving, and in-depth learning in the context of real-world connections.

Effective STEM programs purposefully integrate STEM across all content areas and organize time for teachers to collaborate to design interdisciplinary lessons. At W.F. West, some teachers work together to discuss content and pacing of lessons, but there is limited evidence of a school wide plan that encourages the integration of STEM education across the entire school. Recently, the teachers who have been in involved in STEM trainings have had the opportunity to collaborate at conferences, and use provided release time to coordinate and plan STEM activities. However, this collaboration time has been afforded to a limited number of teachers across the building. One teacher explained, "The idea behind the whole school getting involved (with STEM) has never been broached." A different teacher cited proximity and personality differences as barriers to interdisciplinary collaboration.

W.F. West High School has strong community support and has fostered relationships with local businesses, non-profit organizations and industry leaders. However, researchers did not find evidence of formal councils or committees where school officials and industry leaders meet regularly to collaborate specifically about the vision, mission, and goals of the school, as well as the direction of the STEM program in the Chehalis School District. Business and industry leaders can provide meaningful insight to the educational institution about skills and knowledge students will require to be competitive in the 21st century job market.

Researchers scored this area at a 2, because the STEM program is currently isolated to the science and math departments and is not integrated across all content areas throughout the school. One of the strengths of the STEM program at W.F. West High School is relationships with external stakeholders. Currently, the stakeholder groups predominantly assist the school through funding and providing resources. However, school leaders do not involve business and industry leaders in regular meetings to help shape the vision, mission, and direction of the school.

Accountability & Assessment

The institution's accountability and assessment practices, both formal and informal, guide and ensure teacher effectiveness and student learning.

STEM Standard 3	Rubric Score 2013
Accountability & Assessment	2

Accountability & Assessment. Effective accountability and assessment practices are critical components of STEM schools. To ensure all students are progressing toward educational and career goals, the institution embeds multiple formative and summative assessments across all content areas. Instructional staff members are provided opportunities to collaboratively analyze student-level data for instructional planning. The data is also made available to district leaders, principals, instructional staff, counselors, students, and families, allowing them to monitor and evaluate student knowledge and skills, plan for future educational programs, and adapt instruction to meet the needs of students.

Accountability and assessment is an area that is developing in the Chehalis School District. One staff member stated, "Data is available in our district. Last Spring we purchased the easyCBM assessment system and it is used kindergarten through 8th grade. This system is brand new to our district." The same staff member further explained that the elementary schools and the middle school are developing common assessments and pacing guides, while the high school currently relies on individual teacher assessments to monitor student growth.

In terms of accessing student data, teachers have access to Skyward, a student information system and Homeroom, a data management system that allows school personnel to disaggregate and view data graphically. However, one teacher stated, "Although the data is available through Skyward, it is not easily used." Another stakeholder explained, "We just purchased Homeroom this year, and teachers are asking for training on how to use it." The same stakeholder stated, "Collecting data is easy, but translating it and putting it into practice is tough."

Researchers scored the Accountability and Assessment area at a level 2. Chehalis School District is making a concerted effort to get student level data in front of school personnel and other stakeholders by utilizing on-line student information and data management systems. However, researchers agree that the district will benefit from providing data systems training and scheduling regular collaboration time for teachers to discuss strategies for analyzing student performance and for using results to inform instruction. The STEM research also recommends that school personnel develop multiple measures of student success (e.g. formative, benchmark, summative, and performance-based assessments).

Professional Development

The institution's teacher effectiveness and professional development system provides solutions for professional and pedagogical growth.

STEM Standard 4	Rubric Score 2013
Professional Development	2

Professional Development. Teachers in STEM schools are committed to continuous improvement and participate in on-going, job-embedded professional learning activities. Teachers work collaboratively in interdisciplinary teams to improve instructional strategies, to develop data analysis and interpretation skills, and to plan effective integrated lessons.

Teachers in the Chehalis School District have seven partial days scheduled for professional development throughout the school year. Four days are district directed, and the union plans the other three days. Each building determines their own professional development plan, based on their specific needs. The principal and the building leadership team are responsible for developing the plan. One stakeholder commented, "We always thought we needed more time to collaborate, but with the 1080 hour requirement, it seems that time is harder to find." A teacher stated, "We still do not have enough time to collaborate with co-workers. We used to meet to develop cross-curricular goals, but we have not done that in years. We have also lost some in-service days."

Professional development opportunities specific to STEM education have been given to teachers within the science and mathematics departments at W.F. West High School. One teacher explained, "We (the science teachers) were given the opportunity to attend the National Science Teachers Conference in Phoenix, where we were able to reflect on and discuss what we were learning at the conference. The district also sent a person to a STEM Expo in St. Louis, who brought some ideas back." Another teacher added, "The science teachers meet a lot informally. We eat lunch together and discuss what is going on in our classrooms." Other teachers across the district are aware of the STEM initiative in the district, but have not had specific STEM training.

Although there is tremendous support and excitement among staff members and external groups in regards to the STEM initiative in the Chehalis School District, some teachers have expressed some concern. One stakeholder shared,

> We have the Chehalis Foundation to provide large sums of money for professional development in STEM, and there is concern about the haves and have nots, and the science and STEM teachers getting to go to national conferences and getting materials. We don't have the money to do that for all. We hear concerns about this.

Another teacher commented, "I really do not want to hear one more thing about STEM. There is so much money being funneled into the STEM program, while other departments have outdated materials and do not have the same opportunities to receive training."

Researchers scored the area of Professional Development specific to STEM education at a 2. Although there have been concerted efforts to provide science teachers and some math teachers with professional learning opportunities in the area of STEM education, all staff members should also engage in learning opportunities that are job-embedded at the school and classroom levels, aligned to school improvement strategies and initiatives, and offered throughout the school year. Teachers need time to collaborate to improve instructional strategies, develop data analysis and interpretation skills, and plan effective integrated lessons.

Family Involvement

The institution provides positive and collaborative conditions for purposeful family involvement.

STEM Standard 5	Rubric Score 2013
Family Involvement	2

Family Involvement. STEM schools embrace a shared responsibility model to ensure student success by including families in academic decision making and planning processes. The school removes barriers to access STEM education opportunities by providing supports, wraparound services, and outreach programs to students.

Staff members in the Chehalis School District have the goal of giving all students the opportunity to gain the skills necessary to graduate high school and be college and career ready. A stakeholder added, "The culture of our district is about relationships. Because of this, there are layers of support for our students." To assist students who are skill and credit deficient, the high school adopted a Core-Flex program that provides students who have Ds or Fs with additional learning and intervention time. Student who are not struggling in their classes have the opportunity to engage in enrichment activities during this time. Core-Flex time is offered 4 days a week for 30 minutes and students are assigned to a specific core subject each month based on their performance. In addition to the Core-Flex time, students have the opportunity to make-up failed classes through NovaNet, a computer-based curriculum. Relatedly, another stakeholder described a program designed to meet the school to career transition needs of special education students stating,

> We have a transition program for 18 to 21 year olds. It doesn't lead kids to be college ready, but it is a career ready program. We know there aren't community resources for kids like that. We are working on bridging the gap and working with the community. We need to expand that (the program) so we have more community buy in and resources.

In regards to removing barriers and exposing more students to STEM education opportunities, the high school developed an afterschool robotics club for all students who are interested. A teacher explained, "Students do not need to be in the robotics program during the school day to be a member of the robotics club." Additionally, the science and math teachers collaborated with community partners to develop a summer STEM Academy. Students, in grades 9-12, in the greater Lewis County area were invited to attend. As part of the Academy, students participated in two days of molecular genetics, two days of robotics, and a day spent with college professors talking about the various STEM related programs offered in their respective colleges. Students involved in the higher level mathematics and science classes at W.F. West High School also participated and mentored the attendees. The science teachers hope to partner with the Chehalis Foundation and host another STEM Academy next summer. As a bi-product of the planning for the summer program, the science teachers planned an event where teachers and students from the high school science classes visited the 5th grade classes and engaged the 5th grade classes in a full day STEM

activity. The teachers are planning on expanding the 5th grade event to involve parents in the evening. A teacher stated, "It is important that we expose students to the STEM disciplines at an early age while they are still excited about learning." In another effort to engage all students in STEM education, the Chehalis Foundation donated money to the Chehalis School District to enhance the 7th grade mathematics program by providing each teacher with a content expert. The generous donation will also provide every 7th grade student with a robotics kit, and fund a six-week intensive summer STEM camp for every 6th, 7th, and 8th grade student, free of charge.

Researchers scored the area of Family Involvement at a 2. Although the efforts of the school and community groups to engage all middle level students in STEM activities through enhanced mathematics instruction, free STEM summer camps, and access to free robotics kits are commendable, researchers found little evidence of family-focused supports, wraparound services, and outreach that engage family members in programs and services.

Stakeholders

The institution involves school and community stakeholders to leverage their interests, skills, and resources.

STEM Standard 6	Rubric Score 2013
Stakeholders	3

Stakeholders. Partnerships and relationships between the institution, industry, and the community are fostered and nurtured to leverage the skills and resources of all stakeholders within and outside the school district, as well as enhance teaching and learning opportunities. All appropriate stakeholders are involved in critical planning and decision making meetings and have equal opportunity to provide input.

The Chehalis School District has done an exemplary job of fostering relationships with a variety of external stakeholder groups, including but not limited to partnerships with the Fred Hutchinson Cancer Research Center, the University of Washington, the Chehalis Foundation, and regional community colleges and technical programs. The district also works closely with community organizations such as the Chehalis Rotarians, the Kiwanis Club, and the United Way Board. Furthermore, the Chehalis School District has generous alumni and community members who donate thousands of dollars annually to support the educational programs throughout the district. For example, the Chehalis Foundation recently received 1.8 million dollars for the ongoing funding of STEM education in the Chehalis School District.

A stakeholder explained, "It would be impossible to fund the upper level STEM courses such as molecular genetics, robotics, and advanced mathematics without the support of the foundation and other donors." Another staff member stated, "Programs like robotics are extra-curricular and require money and outside expertise to be successful." The staff member further explained that the school partners with engineers, community college faculty and other community mentors to provide additional perspectives and expertise to the student in the robotics program.

Researchers scored the STEM program in the area of Stakeholders at a 3. It is evident that the Chehalis School District has established strong and lasting partnerships with external stakeholders, who provide financial support, as well as expertise that enhance teaching and learning opportunities. While this particular component of the STEM program is very strong, researchers indicated that this area could be strengthened by the addition of internship opportunities with local businesses and industry and the regular involvement of appropriate stakeholders in the design of improvement strategies and initiatives within the school district.

Leadership

The institution operates under leadership that facilitates the fulfillment of its stated mission through effective leadership and proficient administrative capacity.

STEM Standard 7	Rubric Score 2013
Leadership	3

Leadership. Effective leadership is critical to the successful implementation of STEM education. To ensure improved professional practice and student success, STEM leaders embrace distributed leadership, communicate a clear vision, provide necessary supports, possess instructional knowledge and skills, and are willing to take calculated risks to improve teaching and learning throughout the institution.

One message that was consistent throughout the district was that there is a mutual respect among administration, teachers, and classified staff members. When describing the leadership of W.F. West High School, one staff member said, "The administration here are approachable, and they listen, which is a wonderful change." Another staff member stated, "We feel like it is more of a team approach. We are all working together." An additional staff member stated, "They (administrators) are respectful of us. They are here to support us and they are fun." Staff members also had positive things to say about the superintendent of schools. One teacher explained, "The new superintendent is more approachable, and he actually knows who we are." Another staff member mentioned, "The new superintendent is good at reaching out to the community and establishing partnerships."

It is evident that the leaders in the district and at W.F. West High School embrace a distributed leadership style and involve teachers in the decision making process. Further, the building leadership champions innovation, and welcomes the implementation of new, relevant courses and the use of current technology in the educational process. In regards to establishing a vision for the STEM education program at W.F. West High School, an administrator stated, "We just wrote a vision statement for a STEM presentation … it had some nice input. It is about being the top STEM comprehensive high school in the state, but we want to be the top comprehensive high school in the state. We have awesome programs."

Researchers scored the area of Leadership at a 3 based on the fact that district and building leadership embrace a distributed leadership approach and foster respectful and trusting relationships with staff members. Further, district and building leaders are willing to take calculated risks to implement new programs and improve teaching and learning throughout the school. To strengthen this area further, leaders are encouraged to establish and communicate a clear vision and direction of the STEM program throughout the school and to all stakeholders, ensure effective instruction is at the heart of the professional development agenda, and provide time for teachers to regularly analyze student level data for instructional planning.

Organization

The institution ensures that the organizational and physical spaces are designed and revised to support student and instructional needs.

STEM Standard 8	Rubric Score 2013
Organization	2

Organization. High quality teaching and learning are a major focus of STEM schools. The organization of physical space and the distribution of time and resources are all allocated to support improved instruction and student learning. School facilities are maintained to provide a safe, clean, and healthy environment for all students and staff, while innovative schedules are developed and implemented to maximize student learning and provide time for teacher collaboration.

In an effort to ensure all students have an opportunity to be successful at W.F. West High School, teachers and building leaders implemented a program called Core Flex time. This program required teachers shorten class periods. However, the staff and administrators believed that building in supports and interventions during the school day would enhance student learning and were willing to move away from their traditional bell schedule. A stakeholder explained, "The Core Flex time benefits a wide range of students. It benefits students who need extra support, but also allows students who are involved in extra-curricular activities to talk with teachers about missing assignments due to leaving school early for an event."

While researchers recognized efforts to allocate extended learning time to meet the needs of the students, there was little evidence of organization structures and consistent schedules in place to support collaboration among instructional staff. One person reported, "I don't know, I feel like we are all islands unto ourselves. I can monitor and adjust what I do, but we do not communicate as a department. We don't talk about student learning ever, and we don't talk about teaching. We just don't." To provide students with high quality instruction teachers require job embedded professional development, with opportunities for practice and reflection.

Researchers scored the area of Organization at a 2, due to the limited amount of time intentionally built into the organizational structure that provide teachers with opportunities to reflect on and practice effective instructional strategies, collaboratively analyze student-level data to inform the planning of lessons, and plan for future education programs.

Sustainability

The institution identifies and commits appropriate resources for supporting continuous improvement strategies and initiatives.

STEM Standard 9	Rubric Score 2013
Sustainability	3

Sustainability. The leadership and stakeholders of STEM schools are committed to continuous improvement. To ensure that the institution has the necessary resources to meet the evolving needs of the student population, leaders develop systems to identify priorities; align budgets with the identified priorities; and secure grants, donations and other outside funding while providing opportunities for teachers and principals to continuously develop their knowledge and skills in school improvement strategies and initiatives.

As previously mentioned in the report, the leadership in the Chehalis School District has fostered strong relationships with business and industry leaders, non-profit organizations, post-secondary institutions, and other community groups. The relationships, along with the common vision of improving the Chehalis community and providing students with an education that prepares them for the 21st century has resulted in a funding stream that will support the efforts in STEM education in the Chehalis School District for many years to come. Administrators and teachers recognize that if it were not for the generous donations from alumni and other organizations, that some of their most innovative courses would not exist.

Researchers scored the area of Sustainability at a 3, as it is evident that the school leaders have done a remarkable job of fostering powerful partnerships and acquiring substantial and on-going funding to supplement their school improvement efforts generally and in the area of STEM education specifically.

SUMMARY AND RECOMMENDATIONS

The Chehalis School District is developing a STEM program to enhance the learning experiences of their students and to prepare students for college and 21st century careers. Among the strengths of the STEM program are the courses such as robotics, molecular genetics, and advanced mathematics. Other strengths of the program include partnerships and relationships between the institution, industry, and the community, as well as the district and building leadership, who work collaboratively with staff in decision making, and who are willing to take calculated risks and make necessary changes to improve teaching and learning opportunities for students across the district. Considering the results from this study, specific to the STEM program, researchers recommend focusing on the following four areas of improvement.

Recommendations

- **Curriculum and Instruction:** Researchers recommend that leadership and instructional staff ensure effective instruction that encourages critical thinking, problem solving, and in-depth learning in the context of real-world connections, is being employed across the district. This is accomplished through deliberate, job-embedded professional learning experiences, which allow teachers to collaborate, reflect upon their own instructional strategies, and practice research-based instructional techniques. It is also recommended that the STEM philosophy be infused throughout the school, by creating interdisciplinary teams and the planning of integrated activities and lessons. Finally, researchers suggest that leadership and instructional staff work collaboratively to develop structures and course sequences that eliminate barriers preventing learners from exploring STEM fields.

- **Accountability and Assessment:** To ensure all students are progressing toward educational and career goals, it is recommended that the institution embeds multiple formative and summative assessments across all content areas and develops structures that allow teachers to collaboratively analyze student-level data for instructional planning. It is also suggested that data be made available to district leaders, principals, instructional staff, counselors, students, and families allowing them to monitor and evaluate student knowledge and skills, plan for future educational programs, and adapt instruction to meet the needs of students.

- **Professional Development:** Researchers recommend that all staff members engage in learning opportunities specific to STEM education, as the STEM philosophy should be infused throughout the school, and integrated across all content areas. Effective professional development is job-embedded at the school and classroom levels, aligns to school improvement initiatives, and is offered throughout the school year. It is recommended that W.F. West High School focus their professional learning in the areas of research-based instructional strategies, data analysis and interpretation of student data for the planning of instruction, and the development of integrated, interdisciplinary lessons and activities.

- **Organization:** Researchers recommend that school leaders and instructional staff work collaboratively to develop innovative schedules to support collaboration among instructional teams, actively engage all students in the STEM curriculum, and increase opportunities for students to learn through non-traditional educational settings, such as internships and other on-the-job training to help students understand the connection between school and the real-world.

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APPENDIX A – STEM ACCREDIDATION STANDARDS FROM THE STEM ACADEMY[3]

1. **CURRICIULUM & INSTRUCTION.** *All students have access to the curricula and the effective instruction has been designed to meet college and career readiness.*

   1.1. DATA FOR DECISION MAKING. *Data and relevant background information, to inform decisions related to planning and implementing instructional strategies at the district, school, classroom, and individual student levels.*

   1.1.1.   Curriculum, instruction, and assessment are monitored and adjusted systematically in response to data from multiple assessments of student learning and an examination of professional practice.

   1.1.2.   Multiple research- and evidence-based instructional strategies are incorporated across all content areas for all students, including those with special instructional needs. (AIR 1.6)

   1.1.3.   Instruction is informed by student data across all content areas and is differentiated to meet the needs of all students. (AIR 1.8)

   1.2. CONNECTIONS.   *Innovative programs are purposefully connected across content areas and are rigorous, relevant, and engaging.*

   1.2.1.   Interdisciplinary approaches are established across all content areas to improve student engagement and achievement. (AIR 1.5) (ASN A4.2)

   1.2.2.   Multiple approaches for teaching and learning are incorporated into instructional practices across all content areas. (AIR 1.10)

   1.3. INSTRUCTIONAL PRACTICES. *High quality instructional practices are embedded in the culture of the school.*

   1.3.1.   Curriculum and instruction are aligned to district, state, and national standards that include college- and career-readiness. (AIR 1.1),(CEMSE 1.35)

   1.3.2.   Curriculum and instruction are adapted to school organizational structures to address the needs of all students. (AIR 1.4)

   1.3.3.   Curriculum and instruction are designed, modified and adjusted around student learning strengths and needs. (AIR 1.7)

   1.3.4.   Study skills are incorporated into instructional practices across all content areas. (AIR 1.11)

   1.3.5.   Instructional strategies and academic course offerings promote student curiosity, communication, service learning in the community, interpersonal skills, creativity, and innovation. (AIR 1.13), (ASN D4.9), (CEMSE 1.33)

   1.3.6.   The school has an online system for communication, student access to assignments and work submission, and teacher resources and professional development (e.g.,

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[3] See www.STEM101.org for more information.

Blackboard, Moodle, Illuminate). (ASN D4.8), (CEMSE 1.19)

    1.3.7.   School program components in which students take responsibility for managing, communicating and presenting their learning (e.g. student-led conferences). (CMSE 1.38)

1.4. TEACHER EFFECTIVENESS. *An effective teacher has an achievement-motivated personality with a strong commitment and empathy towards children.*

    1.4.1.   Teachers participate in collaborative learning communities to improve instruction and student learning.

    1.4.2.   Mentoring, coaching, and induction programs support instructional improvement consistent with the school's values and beliefs about teaching and learning.

1.5. COLLEGE AND CAREER READINESS. *The student has the knowledge and skills needed to qualify for and succeed in the postsecondary job training and/or education necessary for their chosen career (i.e. community college, university, technical/vocational program, apprenticeship, or significant on-the-job training).*

    1.5.1.   Opportunities and academic supports are provided to enable all students to succeed in rigorous courses designed for college- and career-readiness. (AIR 1.15)

    1.5.2.   The school has equitable and comprehensive educational college and career programs and learning experiences for all students. (ASN E4.18), (CEMSE 1.12)

    1.5.3.   Academic and workplace literacy skills are embedded across all content areas. (AIR 1.14)

    1.5.4.   College-and career-readiness skills are integrated across all content areas. (AIR 1.16), (CMSE 1.3)

2. **STEM.** *The institution embraces STEM throughout the curriculum and appropriately supports the programming needs to ensure college and career readiness.*

2.1. CONNECTIONS. *Innovative programs are purposefully connected across content areas and are rigorous, relevant, and engaging .*

    2.1.1.   STEM is infused in the curriculum throughout the school and is supported by administration.

    2.1.2.   The school's stakeholders recognize and support the integrated and de-siloed nature of STEM education.

    2.1.3.   Interdisciplinary projects are established where multiple content areas participate to improve student engagement and achievement through increasing student curiosity, communication, interpersonal skills, creativity, and innovation , SEE NOTE 1. (ASN A4.3)

    2.1.4.   The school has a presence of a working team(s) of teachers who teach different disciplines to the students in the school. (CEMSE 1.14)

2.2. TEACHER EFFECTIVENESS. *An effective teacher has an achievement-motivated personality*

with a strong commitment and empathy towards children.

    2.2.1.   Knowledge gained in STEM delivery is being evaluated and used to sustain persistent and skillful support of teachers and staff who are using STEM innovation effectively.

    2.2.2.   Research based professional development is provided for instructors/departments so they fully understand and integrate STEM throughout the curriculum.

2.3. ORGANIZATION. *The school is structured and managed to meet the needs all students and the community.*

    2.3.1.   The school has a plan to eliminate barriers that prevent learners from exploring STEM careers.

    2.3.2.   The school has an emphasis on acquiring STEM knowledge and skills for all learners.

    2.3.3.   The school has public/private partnerships with a focus on STEM skills.

    2.3.4.   The school has an awareness campaign for STEM careers.

    2.3.5.   Adequate resources, including funding, equipment and supplies are provided to instructors/departments for STEM programming.

    2.3.6.   The school has a clear and concise plan to eliminate gender barriers in STEM education.

    2.3.7.   The school has staff, in addition to administrators, who have a portion of their time designated for instructional leadership. (CEMSE 1.29)

    2.3.8.   Physical space devoted to design and other STEM activities. (CEMSE 1.30)

2.4. EXTERNAL RELATIONS. *The school enhances communications and fosters relationships with its varied constituents.*

    2.4.1.   The school/instructors/departments meet regularly with the Middle grade institutions and share a similar vision and mission. (CEMSE 1.22)

    2.4.2.   The school/instructors/departments meet regularly with the post-secondary institutions and share a similar vision and mission. (ASN A4.5), (CEMSE 1.22)

    2.4.3.   The school/instructors/departments meet regularly with the business/industry and the community and share a similar vision and mission. (AIR 5.1) (ASN A4.4, B4.9, E4.12), (CEMSE 1.21, 6.5)

2.5. INSTRUCTIONAL PRACTICES. *High quality instructional practices are embedded in the culture of the school.*

    2.5.1.   School assessments measure mastery in project and problem-based inquiry. (CEMSE 1.23)

    2.5.2.   The school supports the need for open-ended inquiry in the curriculum.

    2.5.3.   Core STEM courses all students must complete, in some cases prior to early college and/or electives. (CEMSE 1.7)

    2.5.4.   The teacher assists in selection of rigorous cross-curricular STEM content as the

focus of the school curriculum. (ASN C4.4)

    2.5.5. Development of STEM curriculum centered on the Common Core Mathematic and Next Generation Science Standards, 21st Century skills and STEM integration (ASN E4.2)

2.6. STUDENT EFFECTIVENESS. *Effective students understand how to communicate well, listen to learn and synthesize what they have learned to solve problems.*

    2.6.1. The student engages in critical thinking, problem solving, and in depth learning while exploring STEM topics/projects/careers (ASN D4.6)

    2.6.2. The student learns in the context of real-world connections with business/ industry with opportunity to contribute to the knowledge base. (ASN D4.7)

3. **ACCOUNTABILITY AND ASSESSMENT.** *The institution's accountability and assessment practices, both formal and informal, guide and ensure teacher effectiveness and student learning.*

3.1. MULTIPLE ASSESSMENT STRATEGIES. *Multiple and varied assessments and evaluation strategies are used appropriately and effectively.*

    3.1.1. Assessment systems are implemented across all content areas to identify student needs, to monitor student progress, and to inform instruction. (AIR 2.1) (ASN B4.5, E4.3)

    3.1.2. Formative assessments are embedded across all content areas and are aligned with standards and summative assessments. (AIR 2.4) (ASN E4.1)

    3.1.3. Multiple assessment strategies including student growth, content, skills and attitudes are implemented across all areas. (AIR 2.5) (CEMSE 1.24)

    3.1.4. The school establishes and maintains a clearly defined and comprehensive student assessment system.

3.2. CONTINUOUS IMPROVEMENT. *An ongoing effort is made to improve through a linear process or disruptive innovation.*

    3.2.1. Continuous progress monitoring for student mastery across all content areas is supported through formal and informal assessment measures. (AIR 2.3)

    3.2.2. Ongoing reviews are conducted to determine the impact of instructional and student support interventions and to modify them, if necessary. (AIR 2.10), (ASN E4.10, E4.16, E4.17)

    3.2.3. Indicators and benchmarks are used to set goals and target resources aimed at improving school outcomes. (AIR 2.14)

    3.2.4. Instructional staff members are provided opportunities to collaboratively analyze student work and other student-level data for instructional planning. (AIR 2.9), (ASN B4.1)

3.3. COLLEGE AND CAREER READINESS. *The student has the knowledge and skills needed to qualify for and succeed in the postsecondary job training and/or education necessary for their chosen career (i.e. community college, university, technical/vocational program, apprenticeship, or significant on-the-job training).*

   3.3.1.   Higher order learning skills necessary for college and career readiness are measured. (AIR 2.6)
   3.3.2.   The evaluative process includes performance assessments that allow students to demonstrate their understandings of STEM content and 21st Century skills. (ASN E4.14)

3.4. DATA FOR DECISION MAKING. *Data and relevant background information, to inform decisions related to planning and implementing instructional strategies at the district, school, classroom, and individual student levels.*

   3.4.1.   Timely and periodic access to data is provided to district leaders, principals, instructional staff, counselors, students, and families so that they can monitor and evaluate student knowledge and skills, plan for future educational programs, and adapt instruction to meet the needs of students. (AIR 2.7)
   3.4.2.   Relevant data is routinely used by school staff and students to make decisions about student progress toward college and career goals. (AIR 2.8)
   3.4.3.   Information about students who transfer, drop out, or graduate from school and information on students' post-school outcomes is used to inform decisions about school improvement strategies and initiatives. (AIR 2.11)
   3.4.4.   Longitudinal data is analyzed to inform school improvement strategies and initiatives. (AIR 2.13) (ASN E4.6)
   3.4.5.   Data systems are used to track collective and individual teacher and student data to inform school improvement strategies and initiatives. (AIR 2.15) ,(ASN E4.8)
   3.4.6.   Professional and support staffs continuously collect, analyze and apply learning from a range of data sources, including comparison and trend data about student learning, instruction, program evaluation, and organizational conditions.
   3.4.7.   Professional and support staff is trained in the evaluation, interpretation, and use of data.

3.5. EVALUATION AND ACCOUNTABILITY. *High quality evaluation systems provide the tools schools need to continuously tailor instruction, enhance practice and advance student learning.*

   3.5.1.   Data systems are used to track collective and individual teacher and student data to inform school improvement strategies and initiatives. (AIR 2.15) ,(ASN E4.8)
   3.5.2.   An instructional staff evaluation system is implemented that includes accountability provisions at the school, district, and state levels. (AIR 2.16)

4. **PROFESSIONAL DEVELOPMENT.** *The institution's teacher effectiveness and professional development system provides solutions for professional and pedagogical growth.*

4.1. TEACHER EFFECTIVENESS. *An effective teacher has an achievement-motivated personality with a strong commitment and empathy towards children.*

4.1.1. All staff members participate in a continuous program of professional learning.
4.1.2. All teachers continuously build their content knowledge and pedagogical and classroom management skills to meet the needs of all students. (AIR 3.1)
4.1.3. Knowledge of adolescent development, varied pedagogy for school students, and strategies for motivating and working effectively and empathetically with all students is developed. (AIR 3.5)
4.1.4. Professional development opportunities are targeted and based on high-quality standards for staff development and adult learning. (AIR 3.6) ,(ASN G4.3)
4.1.5. Professional development opportunities are job-embedded at the school and classroom levels, aligned to school improvement strategies and initiatives, and offered throughout the school year. (AIR 3.8) , (CEMSE 2.3)
4.1.6. All Instructors/Staff that teach or are involved with STEM programming are ASEE/STEM Certified.

4.2. DATA FOR DECISION MAKING. *Data and relevant background information, to inform decisions related to planning and implementing instructional strategies at the district, school, classroom, and individual student levels.*

4.2.1. Teachers have developed the necessary skills and tools needed to analyze and interpret data to make instructional decisions and adjustments. (AIR 3.2) (ASN E4.13)

4.3. CONNECTIONS. *Innovative programs are purposefully connected across content areas and are rigorous, relevant, and engaging.*

4.3.1. Teachers' classroom management and instructional leadership skills are developed and connected to school- wide expectations. (AIR 3.4)
4.3.2. Collaboration is achieved among teachers and instructional staff members to meet student needs by connecting instructional and support activities across all content areas and categorical programs. (AIR 3.7)

5. **FAMILY INVOLVEMENT.** *The institution provides positive and collaborative conditions for purposeful family involvement.*

5.1. STUDENT SUPPORTS. *A range of supports are provided by the school to ensure that students are fully supported, in and out of the classroom.*

5.1.1. Formal and informal guidance programs for students are provided. (AIR 4.1)

5.1.2.   Supports and opportunities for social and emotional learning are provided. (AIR 4.4)

5.1.3.   Students are supported as they transition into and out of school. (AIR 4.5)

5.1.4.   Opportunities for student leadership in the classroom, school, and community are provided. (AIR 4.6)

5.1.5.   A positive school climate is fostered, including school safety and a respectful environment. (AIR 4.7)

5.2. FAMILY SUPPORTS. *A shared responsibility model and cradle-to-career family involvement model ensures that children get access to the in-school and out-of-school learning opportunities and resources*

5.2.1.   Family-focused supports, wraparound services, and outreach that engage family members in programs and services are provided. (AIR 4.3)

5.2.2.   The strengths and resources of students' families and communities are respected and acknowledged. (AIR 4.8)

5.2.3.   Families are aware of student activity and achievement. (CEMSE 6.1)

5.2.4.   Families and students are engaged in academic decision making and planning processes. (ASN B4.6)

5.2.5.   The evaluative process includes participant and parent feedback surveys. (ASN E4.4, G4.6)

6.   **STAKEHOLDERS. *The institution involves school and community stakeholders to leverage their interests, skills, and resources.***

6.1. PLANNING. *Schools involve and value the opinion of all appropriate stakeholders in the design of improvement strategies and initiatives.*

6.1.1.   The interests, skills, and resources of multiple stakeholders within and outside the school are engaged in school improvement strategies and initiatives. (AIR 5.1) (ASN A4.4, B4.9, E4.12), (CEMSE 1.21, 6.5)

6.1.2.   All appropriate stakeholders are involved during critical planning and decision-making activities to foster buy-in and ownership for school improvement strategies and initiatives. (AIR 5.4) (ASN B4.8)

6.1.3.   The interests, skills, and resources of multiple stakeholders within and outside the school are engaged in school improvement strategies and initiatives.

6.2. COMMUNCATIONS. *Effective communication ensures that stakeholders receive information that is relevant to their needs and builds positive attitudes towards the schools initiatives or projects.*

6.2.1.   Stakeholders are effectively engaged by leadership and staff consistent with the school mission and vision.

6.2.2.   Multiple communication strategies are implemented that are culturally and linguistically appropriate and support engaged communication and conversation with all stakeholders. (AIR 5.5)

6.2.3.   School improvement needs are communicated to policy makers and leaders at state and local levels. (AIR 5.6)

6.3. INSTRUCTIONAL PRACTICES. *High quality instructional practices are embedded in the culture of the school.*

6.3.1.   PK-20 collaboration is fostered to enhance opportunities for secondary and post-secondary teaching and learning. (AIR 5.2)
6.3.2.   Partnerships with stakeholders are fostered to enhance teaching and learning opportunities. (AIR 5.3) (ASN C4.9, G4.8, G4.9)

6.4. MARKETING. *Stakeholders work collaboratively to promote school initiatives and projects.*

6.4.1.   Partner interactions focus on increasing the knowledge and visibility of the STEM school in the community. (CEMSE 6.3)

7. **LEADERSHIP. *The institution operates under leadership that facilitates the fulfillment of its stated mission through effective leadership and proficient administrative capacity.***

7.1. ADMINISTRATIVE STRUCTURE. *A well-designed system provides guidance and clear focus to team members.*

7.1.1.   The school district or overseeing body has established policies and support practices that ensure effective administration of the school.
7.1.2.   Supervision and evaluation processes for leadership and staff result in improved professional practice and student success.
7.1.3.   A distributed leadership approach is implemented to support school improvement. (AIR 6.1) (ASN B4.4), (CEMSE 1.5)
7.1.4.   All school improvement strategies and initiatives are aligned and effectively guided by a school improvement team. (AIR 6.3)
7.1.5.   Policies are implemented that have a clear focus and that support the necessary changes to address the identified strengths and needs of all students. (AIR 6.4)

7.2. LEADER EFFECTIVENESS. *An effective leader is responsive to the needs of others, communicates clearly and motivates a team through trust and calculated decision making.*

7.2.1.   The culture of the school is fostered by leadership and staff and is consistent with the school mission and vision. (ASN G4.1)
7.2.2.   School leadership embraces the continuous improvement process that supports staff, students and the bricks and mortar of the school. (CEMSE 4.1)
7.2.3.   School leaders are equipped with instructional knowledge and skills to work with instructional staff to develop strategies that meet curricular and instructional goals. (AIR 6.2) ,(CEMSE 4.2)
7.2.4.   All administrators that supervise or are involved with STEM programming are

ASEE/STEM Certified.

7.2.5. School leaders model calculated risk taking that involve an element of discomfort. This includes both intellectual and emotional chances. (CEMSE 4.3)

8. **ORGANIZATION.** *The institution ensures that the organizational and physical spaces are designed and revised to support student and instructional needs.*

8.1. INSTRUCTIONAL PRACTICES. *High quality instructional practices are embedded in the culture of the school.*

8.1.1. Instructional time, material resources, and fiscal resources are sufficient to support the purpose and direction of the school. (ASN F4.10, F4.11)

8.1.2. Students and school personnel use a range of media and information resources to support the school's educational programs.

8.1.3. Time management and scheduling approaches are implemented to enhance and/or extend learning time to better meet the needs of students. (AIR 7.3) ,(CEMSE 1.11, 1.36)

8.1.4. Organizational structures are implemented to increase opportunities to learn through nontraditional educational settings. (AIR 7.7)

8.2. FACILITIES. *Infrastructure is designed and maintained to support high quality teaching and learning.*

8.2.1. The school maintains facilities, services, and equipment to provide a safe, clean, and healthy environment for all students and staff.

8.2.2. The technology infrastructure supports the school's teaching, learning, and operational needs. (CMSE 1.39)

8.3. LEADERSHIP SUPPORTS. *Leadership supported through a variety of high quality resources and procedures.*

8.3.1. A variety of physical and operational structures that are aligned with school improvement initiatives are utilized to support effective teaching, learning, and personalization. (AIR 7.1)

8.3.2. Innovative organizational structures are implemented to distribute administrative responsibilities traditionally performed by the school administrative team. (AIR 7.4)

8.4. STAFF SUPPORTS. *Staff members are supported through a variety of high quality resources and procedures.*

8.4.1. Organizational structures to support collaboration among instructional teams are implemented. (AIR 7.2) (ASN G4.2), (CEMSE 1.120)

8.4.2. School-wide structures are implemented that support effective classroom management skills across all content areas. (AIR 7.5)

8.4.3. Organizational structures to support instructional innovations are implemented to

actively engage all students in the curriculum. (AIR 7.6)

8.4.4.   The administrative leadership provides support structures for teachers including common planning time within the school day to support data-driven, cross curricular collaboration and professional learning. (ASN B4.1) (CEMSE 1.6)

9.   **SUSTAINABILITY.** *The institution identifies and commits appropriate resources for supporting continuous improvement strategies and initiatives.*

9.1. ORGANIZATION. *The school is structured and managed to meet the needs all students and the community.*

9.1.1.   School improvement priorities are defined, and needed resources for sustainability over time are allocated. (AIR 8.1)

9.1.2.   Facilities and materials are continually assessed and upgraded to keep pace with evolving standards and technology. (AIR 8.4)

9.1.3.   Staffing patterns are aligned to support school improvement strategies and initiatives. (AIR 8.5)

9.2. RESOURCES. *School budgets and resource allocations are well designed to support the goals of the community and its stakeholders.*

9.2.1.   Appropriate time and necessary fiscal support are provided so that school improvement strategies and initiatives can be implemented and adopted. (AIR 8.2) ,(ASN G4.7)

9.2.2.   Resources and human capital are secured to implement and sustain school improvement strategies and initiatives. (AIR 8.3)

9.2.3.   The budget process includes a well-designed strategic plan to apply and manage grants, donations or outside funding. (ASN F4.9, F413, G4.10)

9.3. EXTERNAL RELATIONS. *The school enhances communications and fosters relationships with its varied constituents.*

9.3.1.   Relationships with stakeholders are cultivated to support school improvement strategies and initiatives. (AIR 8.6), (ASN G4.8)

9.3.2.   Partner interactions focus on providing financial and other materials resources to the school. (ASN F4.14), (CEMSE 6.4)

9.4. CONTINUOUS IMPROVEMENT. *An ongoing effort is made to improve through a linear process or disruptive innovation.*

9.4.1.   Cultural changes that accompany school improvement strategies and initiatives are promoted and supported. (AIR 8.7)

9.4.2.   Effective practices for school improvement are identified, implemented, and sustained. (AIR 8.8)

9.4.3.   Teachers and principals continuously develop their knowledge and skills to

incorporate school improvement strategies and initiatives within their instructional leadership practices. (AIR 8.9)

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APPENDIX B – STAR CLASSROOM OBSERVATION DATA – STEM CLASSROOMS

The Powerful Teaching and Learning STAR Instructional Framework is designed to contain all of the most important instructional language that a district may need to develop common instructional language. An instructional framework should include language from the teacher evaluation framework (Danielson/Teachscape, Marzano, CEL 5D+); from Common Core State Standards (Standards for Mathematical Practice and ELA Pedagogical Shifts); from Smarter Balanced (Argument Writing, Modeling); from Indistar School Indicators; and from other Instructional Models adopted by the district/school (GLAD, AVID, GRR, etc…). The STAR Framework includes elements of all of these and organizes them into a framework that educators can use to plan more effective lessons.

Figure 7 shows the extent to which instructional practices in STEM classroom lessons at W.F. West were aligned with Powerful Teaching and Learning during the study, combining *Somewhat* and *Very* aligned. During the most recent data collection, 67% of the STEM classrooms observed were aligned with Powerful Teaching and Learning. The STAR Average is 48% and the average for W.F. West as a whole is 41%. Figures 8-12 show Essential Component level scores. Figure 13 shows overall scores for each level of alignment: *Not at All, Very Little, Somewhat,* and *Very*. Results by Indicator are provided in Table 2.
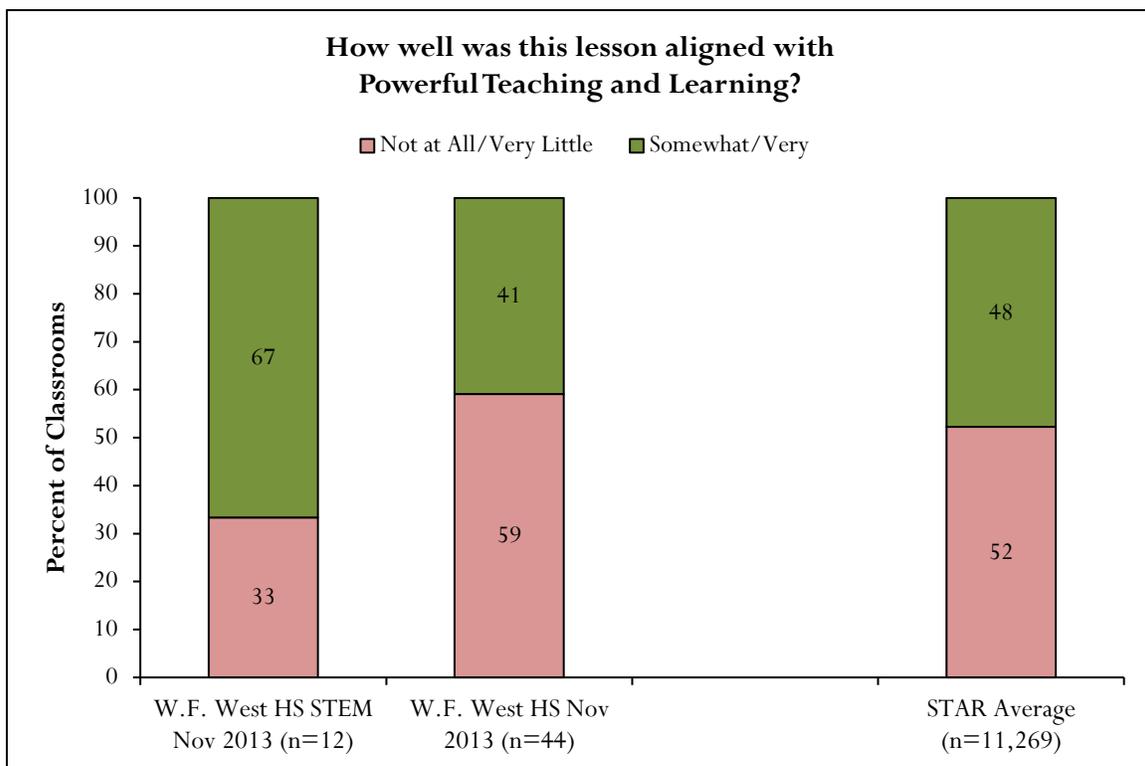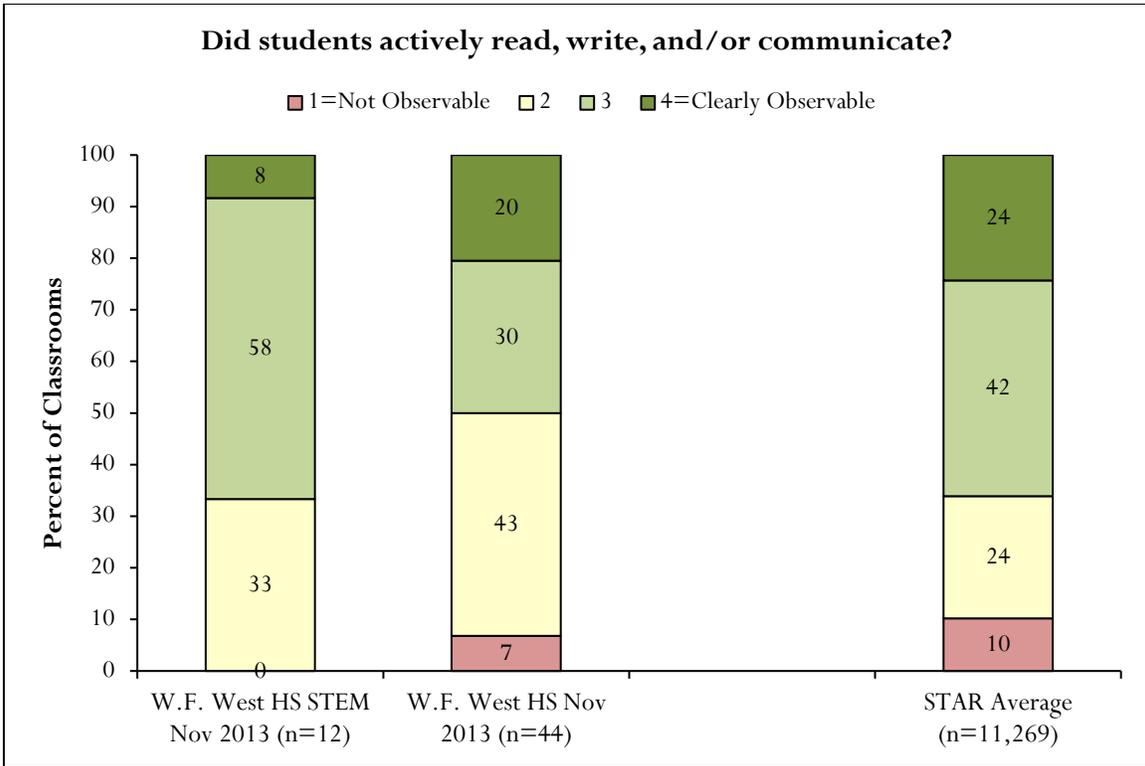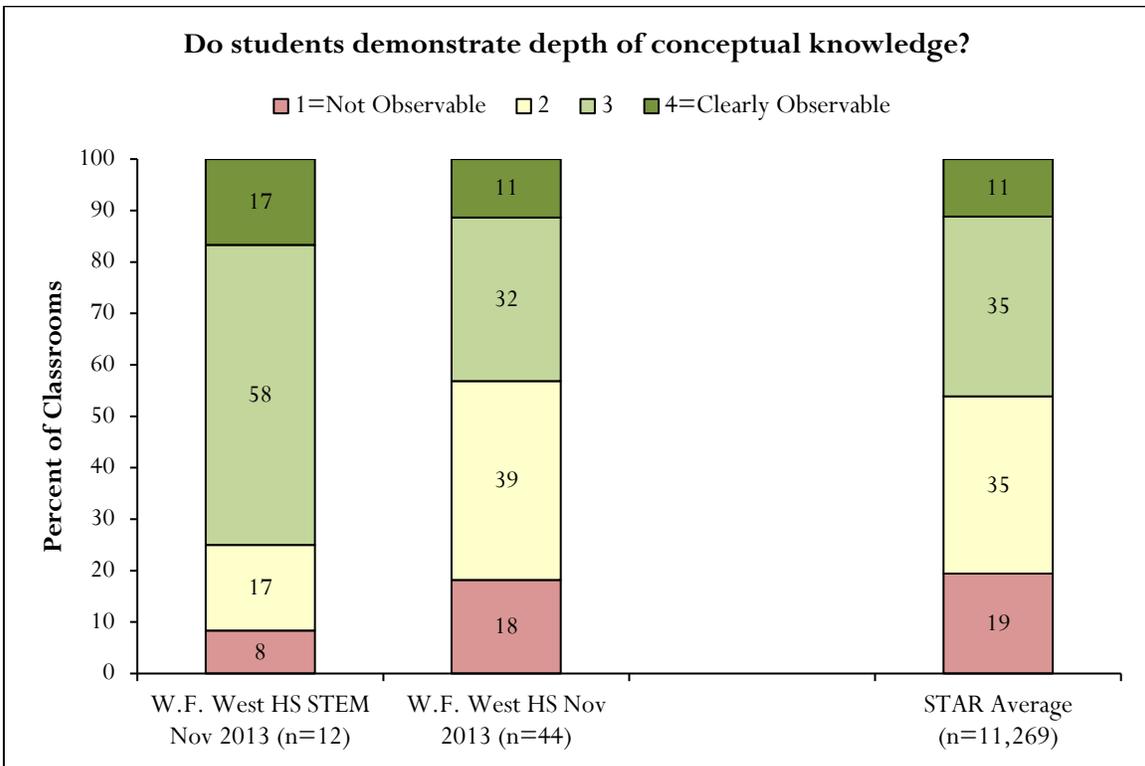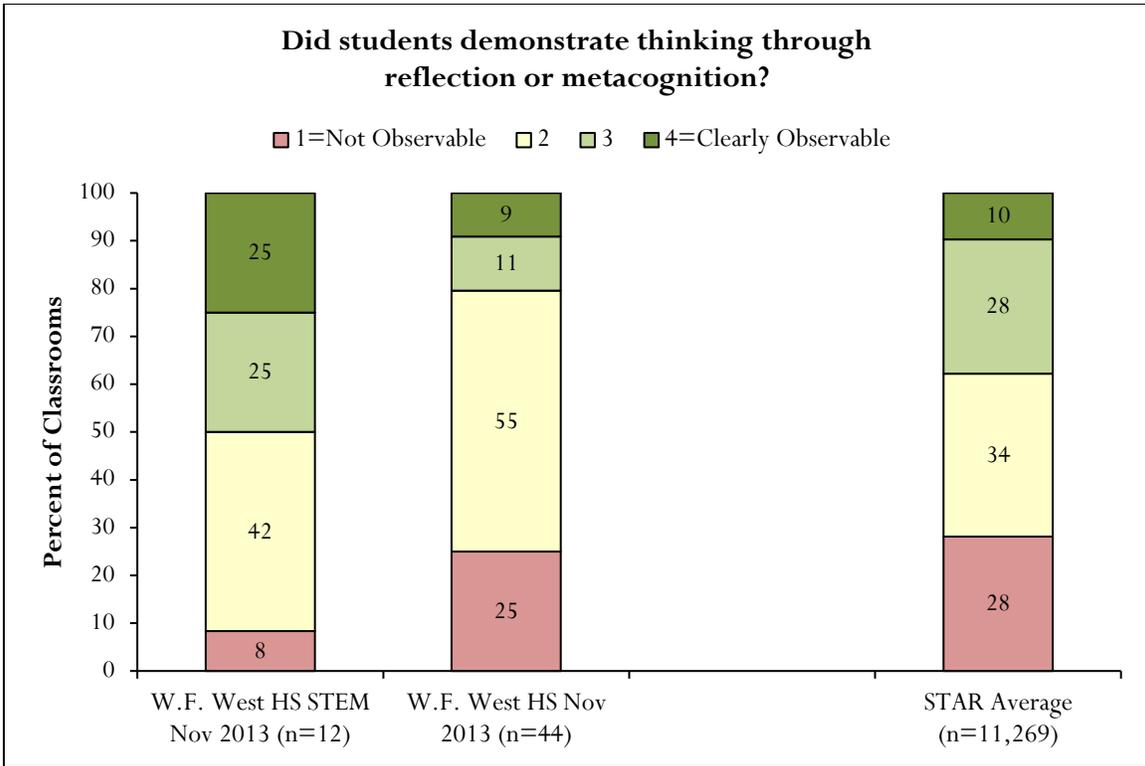

Figure 7.

Figure 8.

Figure 9.

Did students demonstrate thinking through reflection or metacognition?

Figure 10.

Do students extend their learning into relevant contexts?
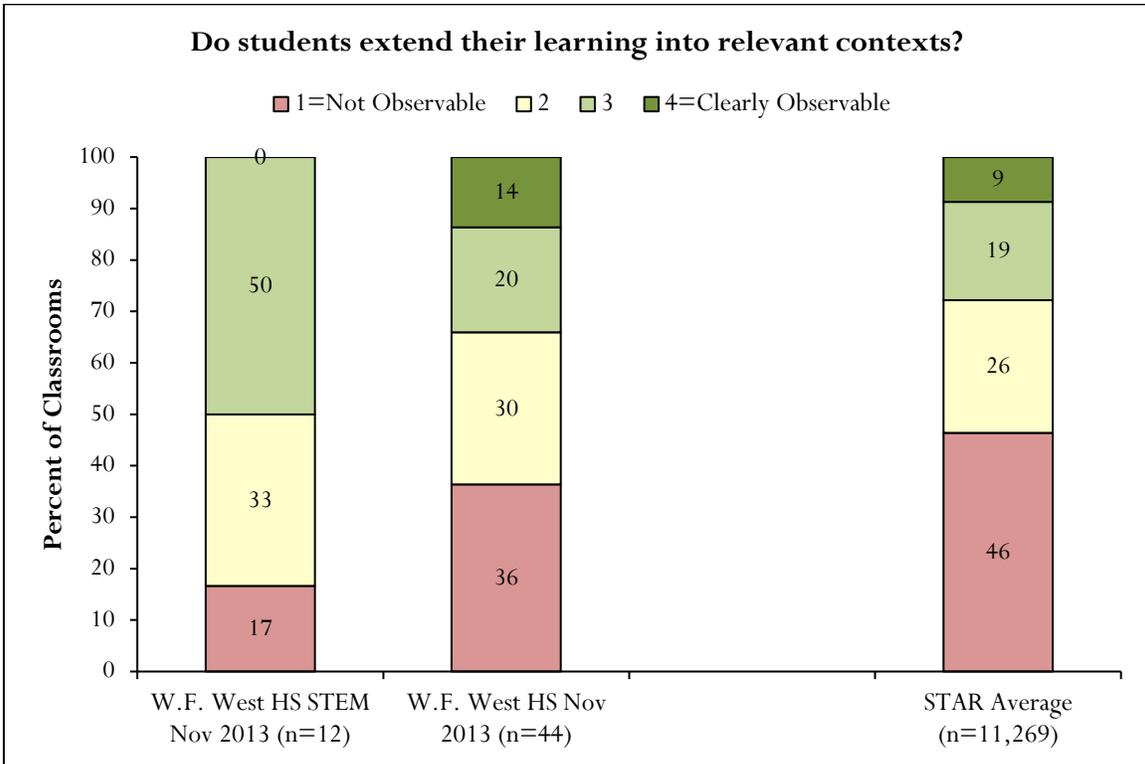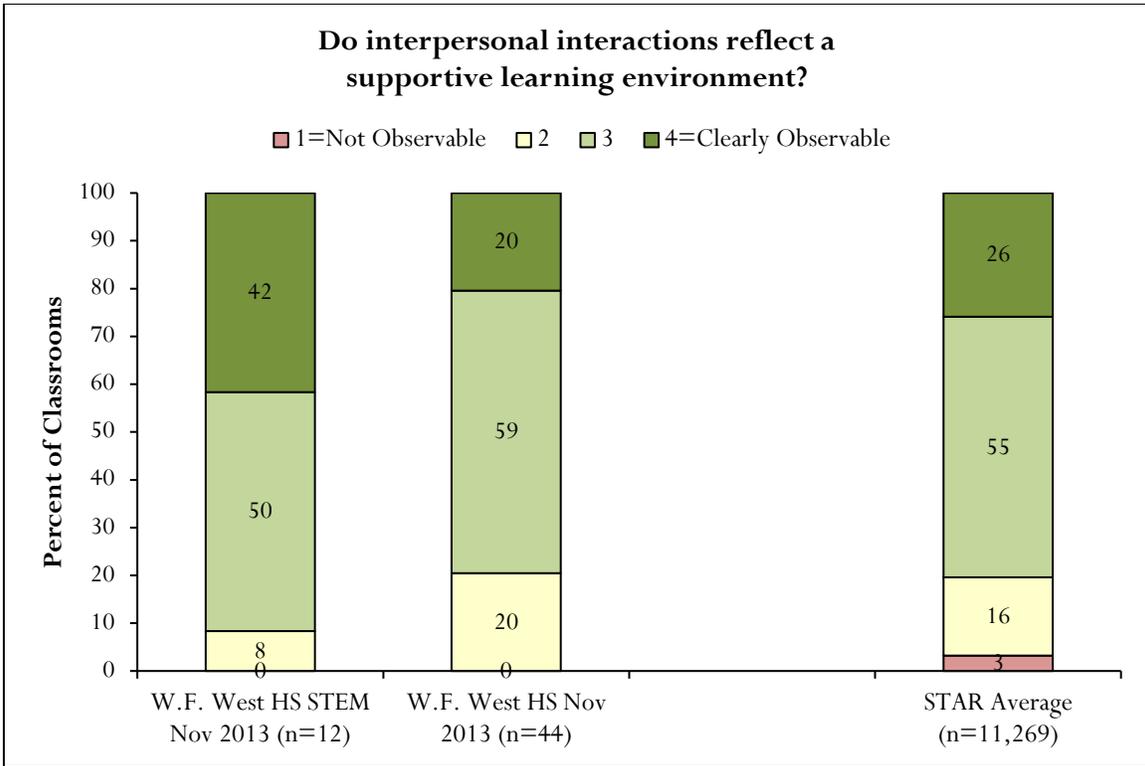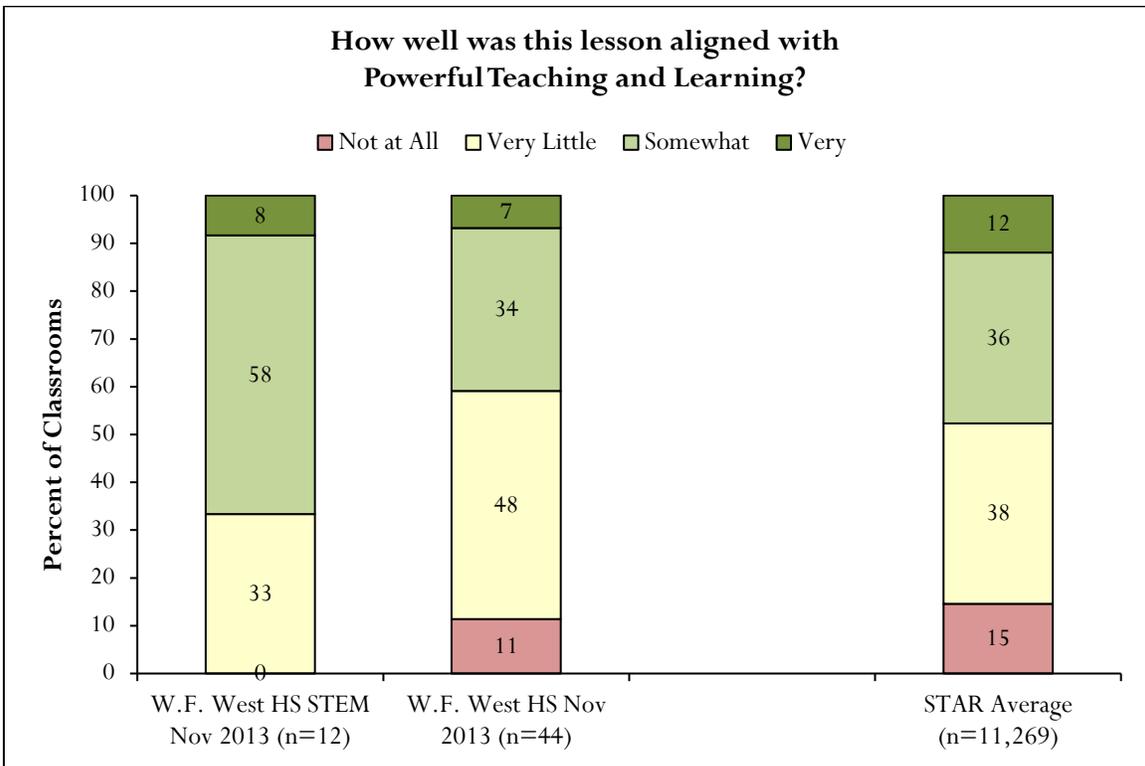
Figure 11.

Figure 12.

Figure 13.

Table 2.

Disaggregated STAR Indicator Results

Skills Indicators	1	2	3	4
1. Teacher provides an opportunity for students to develop and/or demonstrate skills through elaborate reading, writing, speaking, modeling, diagramming, displaying, solving and/or demonstrating.	8%	25%	58%	8%
			67%	
2. Students' skills are used to demonstrate conceptual understanding, not just recall.	25%	8%	50%	17%
			67%	
3. Students demonstrate appropriate methods and/or use appropriate tools within the subject area to acquire and/or represent information.	0%	17%	58%	25%
			83%	
Knowledge Indicators	1	2	3	4
4. Teacher assures the focus of the lesson is clear to all students and that activities/tasks are aligned with the lesson objective/purpose.	17%	33%	42%	8%
			50%	
5. Students construct knowledge and/or manipulate information and ideas to build on prior learning, to discover new meaning, and to develop conceptual understanding, not just recall.	8%	17%	67%	8%
			75%	
6. Students engage in significant communication, which could include speaking/writing, that builds and/or demonstrates conceptual knowledge and understanding.	17%	25%	33%	25%
			58%	
Thinking Indicators	1	2	3	4
7. Teacher uses a variety of questioning strategies to encourage students' development of critical thinking, problem solving, and/or communication skills.	17%	25%	33%	25%
			58%	
8. Students develop and/or demonstrate effective thinking processes either verbally or in writing.	17%	25%	42%	17%
			58%	
9. Students demonstrate verbally or in writing that they are intentionally reflecting on their own learning.	17%	50%	25%	8%
			33%	
Application Indicators	1	2	3	4
10. Teacher relates lesson content to other subject areas, personal experiences and contexts.	17%	42%	42%	0%
			42%	
11. Students demonstrate a meaningful personal connection by extending learning activities in the classroom and/or beyond the classroom.	33%	17%	33%	17%
			50%	
12. Students produce a product and/or performance for an audience beyond the class.	92%	0%	8%	0%
			8%	
Relationships Indicators	1	2	3	4
13. Teacher assures the classroom is a positive, inspirational, safe, and challenging academic environment.	0%	8%	25%	67%
			92%	
14. Students work collaboratively to share knowledge, complete projects, and/or critique their work.	17%	25%	25%	33%
			58%	
15. Students experience instructional approaches that are adapted to meet the needs of diverse learners (differentiated learning).	33%	25%	17%	25%
			42%	

The BERC Group, Inc.
22232 - 17th Ave. SE Suite 305
Bothell, WA 98021
Phone: 425.486.3100

Web: www.bercgroup.com