

Interview & Survey Findings of Southwest Washington STEM Initiatives

**A summary of strengths, gaps and opportunities for SW
Washington STEM Programs**

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Prepared by Scruggs & Associates LLC

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Clark College, along with the Southwest Washington Workforce Development Council (SWWDC) commissioned a study of the region's science, technology, engineering, and mathematics (STEM) programs to accomplish two goals. The first goal was to inventory existing STEM programs to understand the breadth and depth of initiatives reaching students and teachers. (This inventory is included in a separate document) The second goal was to identify key gaps and opportunities in order to enhance regional capacity and effectiveness of STEM efforts.

From June to August, 2008 more than eighteen interviews were conducted with various STEM programs ranging from K-12 to community colleges and universities, to nonprofit organizations. In addition, twenty programs completed an on-line survey about their program and needs. This document summarizes these findings and highlights the four primary opportunities that were consistently recommended by the region's programs. The comments from interviews are divided into five key areas:

- ♦ Interest: Getting students interested in STEM courses and careers
- ♦ Preparation: Curriculum and teacher development that supports strong STEM course work
- ♦ Participation: Connecting to and engaging employers and mentors
- ♦ Alignment: Aligning STEM curriculum and workplace expectations
- ♦ Performance: Tracking progress and establishing continuous improvement systems

Interest: Getting students interested in math & science and STEM careers through career exploration and hands on experiences

There is a clear consensus from interviews that grades 5-10 are key years for truly engaging students in STEM courses and careers.

This interest must include a wide array of activities that are "beyond just the classroom." Students benefit from an understanding of how the STEM material they are learning applies in "the real world" and translates to a variety of careers. While there were examples of hand-on experiences for students (many targeted underserved populations), interviews noted the need for expansion and coordination of activities. Examples of just some of the region's hands-on efforts include:

- ♦ Washington Science Olympiad: 11 middle schools and 17 teams from 9 high schools participated in the 2006 SW Washington Regional competition.
- ♦ Saturday Academy courses

- ◆ Do the Math
- ◆ Robotics competition and PaCE academy
- ◆ LCC's connection to high schools where junior and seniors are brought to LCC along with industry professionals and instructors to explore the math & science aspects for various fields or careers; last session was forensics. (would like to target younger students)

Career Information: Most schools have career/guidance counselors and career centers, yet research and hands on experience tell us that a student interest in STEM careers begins with their teachers (and parents) and then is supported by counselors and others. While many STEM efforts included some career exploration component, many interviews noted a lack of comprehensive information about careers, especially newer job titles. A common response was "There are so many new jobs that were not available when I exploring career options, so I can only explain what I know: it would be nice to be able to have more up-to-date career tools."

Interviews also exposed the difficulty for career information getting to the classroom. With testing and curriculum standards, and changing state requirements, the majority of professional development and extra time is spent on required issues which leave little time for teachers or coordinators to find career information. Some noted that while their school had a career center, there was not a regular interface between teachers and counselors to share career information.

There are programs in the region, such as WSU Extension Center for Youth Workforce Preparation, that help middle and high school students explore STEM and related health careers. Yet issues like cuts in funding for field trips or lack of a region-wide network to communicate opportunities to students limits the reach of these highly regarded programs.

Preparation: Curriculum and Teacher Development that supports strong STEM course work

Most interviews reported that the strongest aspect of STEM efforts in SW Washington were curriculum and teacher preparation. Most teachers and some administration staff are involved in state and national STEM programs and with associations that provide funding, curriculum and student activity guides for a wide array of STEM fields. Faculty at university and community colleges also noted that they attend conferences and read multiple academic and professional journals to keep up to date. District wide coordinators and informal working groups provide consistency and focus to STEM programs.

Teacher preparation: Almost all school districts are participating in some type of program to enhance the qualifications and professional development of their STEM teachers. These efforts include a variety of activities from SMERC as well schools that have received grants for teaching training and professional development from state and national organizations and foundations.

Throughout SW Washington SMERC has partnered with K-12 schools and industry to create exemplary teaching and learning environments. SMERC programs focus on curriculum and teacher development and include:

- ◆ Leadership and Assistance for Science Education Reform (LASER)

- ◆ Science and Math Advancement Reachout for Teachers Conferences (SMART)
- ◆ Partnership in Reform in Secondary Science & Mathematics (PRiSSM)
- ◆ Great Explorations in Math & Science (NW GEMS)
- ◆ Math Helping Corp
- ◆ NO LIMIT!

Even though most programs regarded STEM preparation as a strength, they also had suggestions for improvement.

- ◆ The need to share information among regional programs and activities: *“too many separate groups and no relationships.”*
- ◆ A lack of consensus from educational leaders and employers on the desired math and science outcomes for schools. Different schools diving toward different goals. While approaches or tools may vary among districts, overall STEM goals or outcome could be more consistent.
- ◆ The lack of professional development time for teachers to fully integrate the array of STEM information available to them.

STEM & CTE Integration. Nationally, significant advances have occurred in integrating STEM academic standards into career technical education (CTE) programs. As the degree of science and math knowledge increases in a wide array of careers, national best practices appear to be taking the approach that STEM standards apply to all education pathways.

Most interviews of SW Washington programs noted that the integration of STEM to CTE programs (including apprenticeships) was not well developed yet thought this was an important aspect of getting more students interested and engaged in STEM careers. While there is an obvious connection to engineering, information technology and health care, other states and regions have expanded STEM standards into business, agriculture, media and other career pathways.

Participation: Connecting to and engaging employers and mentors

Findings from interviews indicate that connections between schools and industry are currently hit and miss: some do this well, others are less effective.

Most STEM efforts brought in professionals to speak in classrooms. This was mostly at the high school and community college level, however most interviews reported a need to introduce careers at middle schools.

Industry volunteered as instructors in summer academies and career exploration programs (e.g. Do the Math). Industry professionals were also involved as coaches in robotics and science competitions, and several programs used employers as mentors to students (e.g. MAPS), although this was not widespread. In addition, industry helped to review curriculum and assist with professional development of teachers (e.g. SMERC).

An issue noted by STEM coordinators was the resource intensity to find, cultivate and maintain these employer connections. Outreach to employers was largely based on the individual connections within each program rather than any formal coordinated or wholesale effort. They also reported that employers received multiple contacts from various STEM programs, and at times felt overwhelmed with uncoordinated requests and were less apt to participate in any program. Some suggest that the region should extend

the MAPS model on a larger scale in terms of a single point of contact for multiple employers & schools.

Method of outreach: Very few programs worked through industry associations or professional groups that could help them identify and reach targeted employers (there were a few exceptions to this). While programs noted a limited number of "industry associations" to work with, this appears to be a lack of information rather than a shortage of associations. Even though SW Washington does have a high tech council, most STEM related companies have broad national and international markets and therefore are members of state level associations in both Oregon and Washington.

Industry Support: Some STEM interviews reported a hesitation by employers to be involved in mentoring or coaching type activities for grades 5-9 because they did not have ideas for this age groups or "did not know how to communicate with young students." Industry participants need ideas, and tapping into other national programs and having a catalog of activities for industry volunteers would be very helpful. Some suggested the region develop a short training for employers (an industry version of what SMERC does for teachers) on learning aspects for math & science.

Alignment: Aligning STEM curriculum and workplace expectations

There are a growing number of activities related to aligning middle school, high school and college math & science related curriculum. In addition, community colleges, WSU-V and local school districts have an array of informal efforts. This is definitely an area that has momentum- yet release time for teachers to fully integrate these efforts into individual curriculum continues to be an issue. A few examples include:

The Transition Mathematics Project (TMP) is designed to help students successfully progress from high school math to college-level math. TMP identified the math skills and knowledge high school graduates need to meet minimum admission requirements, avoid remediation upon enrolling in college, and complete college-level work.

Southwest Washington-Transitions in Mathematics Education (SW-TIME) is a new program. Washington State University, Vancouver (WSUV), in partnership with Clark College and two regional K-12 school districts, Battleground and Evergreen, is exploring and developing a substantive regional plan that will target high school students who have passed the 10th grade math WASL exam, do not elect to take any more math in junior or senior years, but may, nonetheless, go to college.

The LCC Transition Math Project is designed to help students successfully progress from high school math to college-level math and offers a Math curriculum Summer Institute for teachers that reviews the Transition Math Projects College Readiness Standards, identifies exit points in curriculum that meet those standards, and determines possible course/sequence equivalencies between high schools and LCC.

While progress has been made on aligning academic standards, there appears to be a mixed opinion from interviews as to the degree of actual articulation and seamless transition that as occurred between high school and community colleges and universities. The degree of existing articulation seems to vary by AP or CTE program, as well as field of

study. A continued focus and strong administration leadership and support on this issue appear to be warranted.

Performance: Tracking Progress and Establishing Continuous Improvement Systems

There is little or no systematic tracking of STEM students or program outcomes, especially longitudinal data as they move up in grade level and change schools. Performance is generally measured by participation rates or test scores. National studies call for longitudinal studies for STEM programs as developed in Florida and Arkansas. If the region wishes to track students in more detail, a regional system consistently applied to all participating program would be the most cost-effective and useful means to collect and evaluate this type of data.

Regional Opportunities

When asked about what could be done to enhance the regional capacity and effectiveness of STEM programs, four ideas were repeatedly mentioned in interviews:

- ♦ A network to share information and best practices, and improve communications,
- ♦ A more systematic means to reach and engage employers,
- ♦ Up to date and easier access to career exploration tools for both teachers and counselors, and
- ♦ Enhance coordination of STEM and CTE programs (including health care), and

These areas were further explored, researching how other regions and states are addressing each topic. Results can be found in the accompanying document, ***STEM Best Practice Research: Lessons and ideas for enhancing the STEM capacity in Southwest Washington.***

An overall message from regional STEM programs was not only to increase funding, but to help programs establish funding models that are more predictable or stable for a set period of time. Programs with the majority of funding coming from limited grants or soft contributions have a difficult time calculating their full potential and research to students and teachers since they cannot depend on their budget year to year. It is recommended that the region conducts additional research on funding models (not included in this document) and works to stabilize base STEM funds.

Opportunity A: Develop a Regional Network to Share Information & Best Practices

Key Issue: *Programs within the region do not know what others are doing, and are not effectively sharing resources and ideas.*

Proposal: Establish an Annual STEM Summit. A one day event for STEM coordinators and programs directors that would share information and practices, identify common issues and establish means to leverage limited resources. Issues identified by this summit would be the basis for more in-depth working sessions as described

below. This forum could also be used to explore collaborative grant opportunities, pilot programs and other joint efforts within the region.

Information Clearinghouse: As a follow-up to the summit, a regional STEM website could be developed where information about programs can be posted, career exploration sites can be accessed, employer participation can be organized, and on-line working groups can be supported. Regional programs noted that without the summit or face to face contact a clearinghouse would be less effective.

Proposal: Establish Regular Strategy/Work Sessions. In addition to a summit where program directors share information, an annual in-depth strategy session on key topics and issues was recommended. This type of work session would address selected topics that would differ from year to year. Depending on the issues to be explored, teachers, counselors, employers, funding partners and others would be invited to attend, as well as programs from areas north of Cowlitz County as well as the Portland region. These sessions would be a “roll up your sleeves” event where working groups would identify shared solutions to key issues, and develop a 12 to 24 month work plan for implementing the recommendations. National speakers or best practice models from other states/regions could be invited to share their solutions.

Ongoing work groups/learning communities

Optional work groups of related study/grades by could be established as follow-on to the larger strategy session. These groups would meet on a regular basis between annual meetings to work on specific issues and share resources.

Opportunity B: A More Systematic Means To Reach And Engage Employers

Key Issue: *Outreach to and involvement of employers appears to be fairly informal with multiple programs contacting the same employer for participation.*

Proposal: Establish a regional STEM employer coordinator and information system that would work with regional STEM programs to identify employer needs and then work with economic organizations, industry associations and companies to match employer preferences to STEM efforts. Employer involvement could range from simple speaking engagements to coaching for student projects, mentoring students or teachers, or reviewing curriculum, etc.

The employer coordination program would also work with SMERC or WSU-V to develop a general overview for industry professionals that would provide basic information on teaching concepts and age-based learning strategies for math and science concepts. This overview would be available to industry professionals that would actively involved in mentoring or coaching activities.

This project could easily be a joint Oregon and SW Washington position since many SW Washington employers are members of industry associations located in Oregon.

Opportunity C: Up-to-date and easier access to career exploration tools for both teachers and counselors, and

Issue: *Information about STEM careers, especially newer occupations, is still not well distributed among teaching staff and counselors.*

Proposal: **Develop a shared regional STEM career information system** with easy to access and age appropriate career information targeting grades 6-16, and spanning all levels of careers to support CTE as well as AP students.

- ◆ Develop a package of STEM career exploration tools using off the shelf information and websites aimed at three levels: middle school; high school and adult job seekers. *Other states and regions have developed websites, CDs, and printed materials that can be purchased.*
- ◆ Have STEM programs and One-stop website link to these available resources.
- ◆ Seek funding for a STEM Career Development Coordinator dedicated to gathering and keeping STEM career information current, and going to schools to educate counselors and teachers on the latest trends in STEM careers.
- ◆ Train one-stop counselors in STEM occupations and assessments.

Opportunity D: Enhance coordination of STEM and CTE programs (including health care)

Issue: Interviews with SW Washington STEM directors noted that as more career pathways include increased skills in math, science and technology, there should be an effort to more fully integrate STEM academics in career and technical education (CTE) programs.

Proposal: Further explore STEM/CTE best practices and develop a model appropriate for the region. While this effort could be one of the working groups suggested in Opportunity A, or a stand alone initiative, it was suggested that a more focused effort might be more effective given the state requirements and existing regional coordination among CTE programs. The scope of this proposal would require a grant or additional funding. Suggestions for this issue included:

- ◆ A gathering of CTE and STEM programs to identify key issues.
- ◆ Further research on identified issues exploring other state and regional models.
- ◆ A work session of regional CTE and STEM coordinators to identify possible models, including ones like Heritage High School's Biofuels initiative.
- ◆ A summit with regional and state CTE/STEM programs to explore means to implement preferred models and develop a region-wide action plan. Invite several of these model programs to this event.