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STEM - Data & Metrics Subcommittee

March 10, 2017

1:00 p.m. – 3:00 p.m.

Somerville Conference Room

775 Court St NE, Salem, OR 97301

LOG IN HERE: <https://global.gotomeeting.com/join/362169509>

Call-In Information:

Dial 1 877 309 2073

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MEMBERS: Lisa Graham (Chair), Jim Piro, Celeste Edman

AGENDA

1. Introductions

2. Purpose & Charge of the Committee

Lisa Graham, Chair

3. Overview of the Work to Date

Mark Lewis, Chief Education Office

4. Availability & Quality of Proposed STEM Metrics

Peter Tromba, Chief Education Office

5. Work Plan Development

All

6. Public Comment

Members of the public wanting to give public testimony must sign in. There will only be one speaker from each group. Each individual speaker or group spokesperson will have three (3) minutes.

All meetings of the Chief Education Office are open to the public and will conform to Oregon public meetings laws. The upcoming meeting schedule and materials from past meetings are posted online. A request for an interpreter for the hearing impaired or for accommodations for people with disabilities should be made to Heather Livingston at 503-373-1283 or by email at heather.livingston@state.or.us. Requests for accommodation should be made at least 48 hours in advance.

Priority	Proposed STEM metric	Status Green = data in SLDS Yellow = data collected, not in SLDS Orange = data collected, not in SLDS, data quality questions Red = data not collected	Notes/Next steps
	Elementary time on science		
	4 th grade math achievement scores		
	4 th grade science achievement scores		
	Middle school interest in STEM		
	Historically underserved participating in out of school STEM		
	8 th grade math and science		

	Student declaring a postsecondary STEM interest at HS		
	STEM-CTE participation		
	% of students taking AP stem tests by demographic		
	Success rates on AP STEM exams		
	Seniors and juniors meeting benchmark for math and science		
	College credits earned in STEM subjects during HS		
	High school grad rates		

	Post secondary enrollments in developmental mathematics		
	Community college STEM certificates, degrees, and credentials awarded		
	University STEM certificates and degrees		
	Full-time employment rates of post-secondary STEM completers		
	Oregon completers participating in STEM workforce		
	STEM business start-ups		

APPENDIX B: OREGON'S STEM INDICATORS

The following table contains overall system metrics that will enable the STEM Investment Council and the State to monitor and communicate relevant outcomes for STEM education. These indicators are not fully inclusive of metrics that relate more specifically to individual investments recommended by the Council. While there are numerous possible indicators to track, this list represents an initial set, which will be reviewed on a 2-year cycle (at a minimum) and modified based on changes to available data or additional analysis. These indicators will form the basis for semi-annual reporting to the Legislature, the State Board of Education (SBE), and the Higher Education Coordinating Committee (HECC). *To the extent possible, each indicator will be disaggregated by race, gender, socio-economic status, and region.*

Table 1. Proposed STEM indicators to monitor student access, interest, preparedness, and attainment.

Proposed STEM Metric	Rationale	Definition	Possible Source
Elementary time on science (Access)*	Between 1988 and 2008, the amount of instructional time devoted to science instruction in elementary schools has dropped to an average of 2.3 hours per week in the U.S. The decreased time spent on science instruction is correlated with lower scores on the science portion of the National Assessment of Educational Progress. The most recent data from 2009 shows that is that 25% of Oregon's 4th grade teachers report spending less than one hour on science a week and 60% report less than 3 hours per week. These figures are the lowest in the country.	Average hours/week at each grade level, aggregated.	Teacher self-report on the NAEP. Expanded TELL survey.
4th Grade math and science achievement scores (Preparedness)	Performance on nationally normed assessments in math and science provide a helpful comparison with other States. This is also a legislative requirement for the STEM Council. While the NAEP assesses mathematics every 2 years and science every four years, Oregon's Smarter Balanced assessment for mathematics will provide an annual indicator to monitor progress and comparison to other Smarter Balanced states.	% of students in 4th grade who are proficient or advanced in mathematics and science	National Assessment of Educational Progress (NAEP). Annual state Smarter Balanced assessments in math will also be used.

* 3rd-grade reading and early numeracy are also critical leading indicators of success. The Council will work with agencies in the coming biennium to determine how best to measure and report those metrics.

Proposed STEM Metric	Rationale	Definition	Possible Source
Middle school interest in STEM (Interest)	Research has shown that expressed interest in science in upper elementary and middle school grades is a better predictor of future career trajectories than academic performance or course-taking patterns. It is assumed that this also extrapolates to STEM fields as a whole.	% of students self-reporting interest in STEM futures.	Student interest surveys as part of investment evaluation instruments. Consider including in a statewide survey of student engagement.
Historically underserved and underrepresented students participating in out-of-school STEM experiences and programs (Access)	During the K-12 academic years, students typically spend about 18.5% of their waking hours in a formal school environment. Out-of-school STEM experiences and programs often create more learner-centered and personalized STEM learning experiences that can deepen understanding of STEM phenomena, provide opportunities to think critically, as well as increase interest. Examples include afterschool clubs (e.g., science, Robotics), museums, science centers, aquariums, or field trips to natural areas. A recent study indicates that by 6th grade, students in poverty have experienced 6000 less hours of access to STEM rich learning contexts than their upper and middle class peers. Equitable access to STEM opportunities is included as one of Governor Brown's main priorities for STEM education.	Ratio of historically underserved and underrepresented students participating compared to total students participating.	Program reporting of student self-declaration through Hubs, state grant recipients, OregonASK, and private philanthropic grantees.
8th grade performance on math and science achievement scores (Preparedness)	Performance on nationally normed assessments in math and science provide a helpful comparison with other States. This is also a legislative requirement for the STEM Council. While the NAEP assesses mathematics every 2 years and science every four years, Oregon's Smarter Balanced assessment for mathematics will provide an annual indicator to monitor progress and comparison to other Smarter Balanced states.	% of students in 8th grade who are proficient or advanced in mathematics and science	National Assessment of Educational Progress (NAEP). Annual state Smarter Balanced assessments in math will also be used.

Proposed STEM Metric	Rationale	Definition	Possible Source
Students declaring a postsecondary STEM interest at high school (Interest)	Interest indicated in high school provides a sense of “demand” for post-secondary studies in STEM. This may provide valuable interim data when compared with middle school interest, as well as eventual enrollments and completions in post-secondary STEM studies.	% students selecting interest in a STEM-related field compared to total students taking PSAT	Aggregated self-report on PSAT. Additional data from ACT and SAT will also be gathered, but suffer from more selection bias.
STEM-CTE participation in programs of study (Interest)	Students often have several possible pathways to select in high school. If they choose to take at least one credit (usually two semester courses) in a STEM-related CTE program of study, we anticipate that this indicates an interest in a STEM-related career. Thus, this should provide a sense of talent supply upstream of the post-secondary system.	% of total students earning at least one credit in a STEM-related CTE program of study	ODE course data
Percentage of students taking the AP STEM tests (Access)	While this may provide some indication of interest, it will provide a sense of disparities in access and expectations across demographic groups. Analysis will also include availability of AP courses and enrollments by region using ODE data.	% of students by demographic group taking AP STEM tests	College Board reports. Supplemented by ODE course data.
Success rates on AP STEM exams (Preparedness)	Most students intending to go on to university studies will take at least one AP test if it is offered in their school. Achieving a 3 indicates mastery of the subject area and several universities allow students to earn credit or place out of basic requirements if they score higher than that.	% of students scoring 3 or better on AP STEM tests	College Board reports.
Seniors and juniors meeting benchmark on ACT/SAT for math and science (Preparedness)	While the ACT/SAT have a selection bias toward those intending to pursue university studies, this indicator provides a sense of overall preparedness to be successful in post-secondary STEM disciplines. It may also provide a modest indication of the quality of K-12 education.	% student meeting benchmark compared with total participants	ACT/SAT aggregated state reports.

Proposed STEM Metric	Rationale	Definition	Possible Source
College credits earned in STEM subjects during high school (Interest/Attainment)	Participation in courses that earn college credit during high school has been shown to increase STEM career awareness and college-going rates.	average credit hours earned per student	HECC databases from community colleges and universities.
High school graduation rates (Attainment)	States with a well-educated work force are more likely to have higher levels of productivity and economic prosperity. Oregon's graduation rate is among the worst in the nation; a serious barrier to future talent development. Graduation rates will also be disaggregated by STEM-CTE concentrators (those who earn at least one credit in a state-approved STEM-related CTE program).	5-year graduation rate, plus GED attainment	ODE course data
Postsecondary enrollments in developmental mathematics (Preparedness)	Students who take non-credit bearing math courses in their first year of college are much less likely to continue in a STEM-related field. Students who begin a college career in remedial courses are also less likely to complete a college degree in any field. The need for remedial coursework in the first year of college has additional economic ramifications for students and their families, since remedial courses are typically non-credit bearing. This also provides a quality-related indicator as to the retention of mathematical content learned in K-12.	% of students enrolled in remedial mathematics courses in first year of college	HECC data
Community college STEM certificates, degrees, and industry-recognized credentials awarded (Attainment)	This indicator gives a sense of the supply of STEM-prepared students entering the workforce, or transferring on to further studies. This is a legislative requirement for the STEM Council under HB 2636 (2013).	Number and % of students earning STEM certificates, degrees, and industry-recognized credentials	Institutional reporting? STEM Hubs?

Proposed STEM Metric	Rationale	Definition	Possible Source
University STEM certificates and degrees (Attainment)	In an IES study of longitudinal data from 2003 – 2009, 48% of bachelor's degree students and 69% of associate's degree students between 2003 and 2009 who entered a STEM-related degree field left by the spring of 2009. Women and students of color are more highly represented in biological sciences, but in other STEM fields (especially computer science) there is less diversity and representation, thus providing a less welcoming environment where an individual can see others of his/her background succeeding. Reasons why students leave STEM degrees: uninviting atmosphere, difficult introductory sorting classes (in both math and science), STEM courses do not seem relevant. This is a legislative requirement for the STEM Council under HB 2636 (2013).	Number and % of students earning STEM degrees from public and private Oregon universities	HECC and IPEDs data
Full-time employment rates of post-secondary STEM completers within one year (Attainment)	One of the primary purposes of our STEM efforts is to ensure that supply of high-quality talent meets the demands of our STEM-related businesses and industries. In general, Oregon graduates must compete with out of state transfers for employment in STEM occupations. This indicator should provide some insights into the value of STEM credentials from Oregon post-secondary institutions.	% of Oregon completers (industry credential, 2-year, or 4-year degree) employed full time in Oregon within 12 months, adjusted for unemployment rate.	Employment department data. Cohort data provided by HECC.
Oregon completers participation in STEM workforce (Attainment)	One of the primary purposes of our STEM efforts is to ensure that supply of high-quality talent meets the demands of our STEM-related businesses and industries. In general, Oregon graduates must compete with out of state transfers for employment in STEM occupations. This indicator should provide some insights into the value of STEM credentials from Oregon post-secondary institutions.	% of Oregon completers employed in Oregon STEM occupations	Employment department data. Cohort data provided by HECC.
STEM business start ups (Attainment)	Oregon's STEM initiatives are intended to spur business innovations, not just fill jobs. New business start-ups in STEM fields should provide an indicator of the rate of innovation.	# new STEM-related business registrations annually compared over time	Oregon Corporation Division

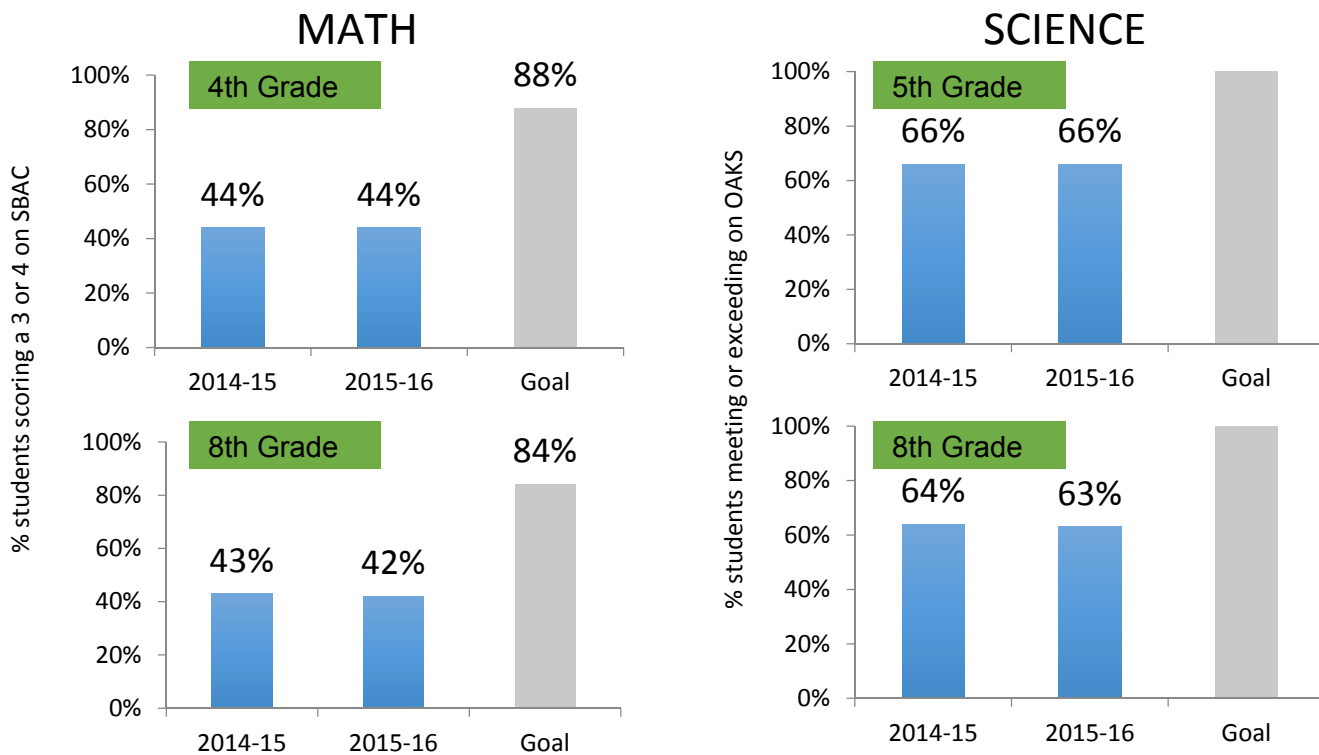
APPENDIX C: BASELINE DATA

Goal 1

Double the percentage of students in 4th and 8th grade who are proficient in Math and Science.

Notes

In Math, the Smarter Balanced Assessment (SBAC) is administered at 4th and 8th grade. This assessment is aligned to Common Core State Standards with a score of 3 or 4 indicating students on-track for college. In Science, the OAKS is administered at 5th and 8th grades. This assessment is aligned to Oregon state standards that are in the process of conversion to the Next Generation Science Standards.



Goal 2

Double the number of students who earn a post-secondary degree requiring proficiency in science, technology, engineering or mathematics.

Notes

Post-secondary STEM degrees were counted using methodology from the Brookings Institute (Rothwell, Jonathan and Kulkarni, Siddharth, Beyond College Rankings A Value-Added Approach to Assessing Two- and Four-Year Schools, pp. 26-28, Brookings, April 2015). Students are defined as those who ever attended an Oregon public K-12 school and then earned a 2- or 4-year certificate or degree in an Oregon public institution of higher education.

