A. Project Summary

The *Lane County STEAMOn!* project is a regional consortium that includes 14 districts served by the Lane Education Service District (Lane ESD). The Lane County STEAMOn! Partners (see List of Additional Partners for more details) will include: interdisciplinary district teams from 15 high schools, Lane Workforce Partnership and industry mentors, Buck Institute for Education, Thinkersmith, Lane Arts Council, and Lane Community College (LCC). The 16-month project (see Appendix F for project timeline) will plan and implement a Project-Based Learning (PBL) and interdisciplinary instructional team model to connect students in grades 8th to 12th to contextualized learning across several STEM industries. While the project builds on the Career and Technical Education (CTE) programs in 19 high schools in Lane County coordinated and supported by Lane ESD, those high schools without CTE programs currently will have the opportunity to introduce CTE to their students. The overarching goals of this project aim to bring 21st Century technical and employability skills to more students in high demand and high wage careers and to establish well-rooted interdisciplinary teaching teams.

The specific CTE concentrations for this project include: Engineering in Construction & Manufacturing (ECM), Information & Communication Technology (ICT), and Health Care Services. Science, Mathematics, Arts/Humanities, and CTE teachers at participating schools will form interdisciplinary teams to integrate CCSS-aligned instruction across the content areas and build career/college readiness skills for students. Students will explore their interests in the three distinct CTE concentrations and interact with STEAM industry professionals to enahnce their skill set and produce projects that are relevant and meaningful.

B. Project Rationale

Students must experience real-world problem-solving in schools to become prepared for the high demands of the workforce. This problem-solving should develop skilled communication and use of technology over long-term projects that require knowledge construction and application (Busteed, 2013). Proper guidance, in conjunction with real-world problems, allows students to engage in critical thinking, utilizing prior knowledge to build new connections. PBL has been shown to be "superior when it comes to long-term retention, skill development, and satisfaction of students and teachers" (Strobel and van Barneveld, 58, 2009). Some findings suggest that the single most important factor for underrepresented students to pursue a STEM career pathway is self-efficacy and identity as a scientist. Experiences with research, influences from mentoring adults, and community engagement are critical elements to develop this self-efficacy and identity (Chemers et al, 2011).

The Lane Workforce Partnership 2012 State of the Workforce report forecasts that employment in the three CTE concentrations of this project will increase substantially: 27% growth in the Construction sector, 15% growth in the Information sector, and 31% growth in Health Career Pathways. Detailed in Appendix E (Table 3. & 4.), economically disadvantaged students struggle to enroll in and successfully complete CTE programs throughout Lane County. This program will leverage new and ongoing intitiatives to offer more support to these students. These intiatives include: Lane ESD Title I programs (Migrant, Homeless, ELL and Indian Education), the Oregon Youth Transition Program (YTP), a new ODE-funded partnership with Lane County NAACP (National Association for the Advancement of Colored People), the recently awarded CTE Revitalization grants to Lane ESD (Health Careers) and to Junction City (Construction), and LCC's Career Pathways. By incorporating these established programs Lane

County STEAMOn! will identify and involve underserved students from the inception, using these established supports to ensure successful long-term engagement. As project lead, Lane ESD will guarantee equitable opportunity across the 15 participating schools for equipment sharing, contact with industry professionals, and workshop participation. Project partners will maintain opportunity equity as a top priority throughout the project. The embedded partnerships will support skill development and enrich the PBL experiences through a direct connection to expert professionals. Through Lane Arts Council's skillful teaching artists, every site will infuse creative thinking and articulation of ideas into development of student projects.

C. Project Plan

Lane County STEAMOn! aims to increase the number of underrepresented students in STEM and CTE pathways in Lane County high schools. The project will engage students using evidence-based PBL strategies developed by the Buck Institute for Education (BIE) and delivered by interdisciplinary teacher teams. During the PBL 101 three-day summer workshop, teacher teams will learn by doing, developing their own projects catered to the chosen CTE concentrations. As student projects develop early in the year, teachers and students will choose from a menu of workshop options directly related to their projects and the three CTE pathways. These workshops will include: the award-winning *Traveling Circuits* Middle School curriculum developed by Thinkersmith® (2011), digital arts workshops developed by Lane Arts Council teaching artists, and ICT workshops on App development and Programming from LCC faculty.

In addition to five days of intensive training from BIE, interdisciplinary teams will learn to use the collaborative online platform, ObaWorld, to organize their projects, connect student teams to industry mentors, and provide peer-to-peer feedback between participating high schools. An additional two half-days of collaborative planning will be critical throughout the year. Software and equipment, such as 3-D printers and 3-D design software, will allow realistic

iterative prototyping of ideas. This STEAM inquiry will provide contextual authenticity and a realistic industry setting. Lane ESD will offer the use of the Simulation Man for those who pursue projects in the health sciences. By using ObaWorld, the program creates an accessible professional learning community for both teachers and students, especially rural youth, culminating in a student project and activities demonstration at the end of the year.

Lane County STEAMOn! will include at least one interdiscipinary team of teachers (2-4 teachers each) from the participating 15 schools – with a goal of 45 teachers in total. Research has shown that interdisciplinary and cross-curricular teaching increases motivation and enagagement for students (Resnick, 1989). In contrast to learning skills and content in isolation, interdisciplinary instruction provides multiple contexts in which students can apply their knowledge and skills, placing greater value in their learning (Collins, Brown &Newman, 1989). Emphasizing real-world problems, centered on student interests, the instructional teams will align instruction with the CCSS performance tasks and essential skills in the context of the chosen CTE concentrations. The in-depth collaboration between CTE and core content area teachers will remain relevant and contextualized through insights and guidance from industry professionals. Experimenting with new ways to connect experts to classrooms using online platforms may prove to have long-term impacts for students, teachers, and professionals. These partnerships and embedded professional capacity will sustain past the conclusion of the project.

Table 1. Three tiers of exploration and intensity for student experiences

Tier I	Includes: after school opportunities and in-school demonstrations for 8th grade students, short-term PBL explorations, field trips to industry sites, introductory workshops to industry equipment, software, site visits from professionals, and application of STEAM concepts and skills in the workforce.
Tier II	Includes: pre-apprenticeship classes, career preparation training, opportunities for dual credit through LCC and Regional Technical Early College, and small group mentorship from industry professionals on student project development.
Tier III	Includes: year-long project development and product prototyping, refined student projects for portfolio development, long-term internships, civic engagement and industry experiences, professional certification attainment, and end-of-year project exhibition.

The project will provide exploration of career pathways in ECM, ICT, and Health Care Services and incorporate a 3-tiered structure of student experiences. Based on these three tiers, the program will aim to expose a minimum of 350 students to a wide range of new learning opportunities, bringing 80 Lane County students to the third tier by the end of the 2014-15 school year. Lane County STEAMOn! partners will ensure that at least 50% of these students are from underrepresented and/or underpriveleged backgrounds by matching students to diverse professional mentors, by conducting in-depth interest inventories, and by methodically building student self-efficacy through effective feedback and encouragement.

Table 2. Goals & Objectives

GOALS	OBJECTIVES
Goal 1: To engage Lane County 8th through 12th grade students in relevant long-term STEAM projects that connect student interest to technical skill development and to industry professionals working in the identified three CTE concentrations.	**1.1:** Expose at least 175 new students to CTE programming and 350 students to the Lane County STEAMOn! project **1.2:** Engage at least 30 Industry professionals in mentoring and ongoing project feedback **1.3:** At least 40 underrepresented students commit to the Tier 3 project level and achieve an industry certification. **1.4:** Develop science identity for underrepresented students by providing over 120 hours of workshops between the 15 participating schools through community STEAM partners from diverse backgrounds and expertise
Goal 2: To establish interdicsiplinary instructional teams that include CTE and core content areas teachers and to sustain a shift in instructional practice towards long-term, cross-curricular, and student-centered projects.	**2.1:** Train at least 15 interdisciplinary teams of teachers (>40 in total) using PBL strategies to design, assess, and manage CCSS-aligned projects effectively **2.2:** Provide training to connect virtually with student projects from other schools and with industry professionals from the field **2.3:** Based on response from Post-program survey, teachers will feel that they have developed the PBL pedagogical skill to train other teachers in each school and sustain community partnerships.
Goal 3: To demonstrate student growth in the following areas: STEAM pathway academic acheivement, 21st Century skills, ODE Essential skills in Scientific Inquiry, interest and motivation in STEM domains, and self-efficacy.	**3.1:** Based on pre/post responses, overall program participants will report positive growth in their outlook on both the *Science Motivation Questionairre II* and the *Scientific Attitudes Inventory II*. **3.2:** Based on pre/post responses, participating 8th-10th grade participants will show improvements on the *21st Century Skills Assessment*. **3.3:** Based on school-reported data, previously underperforming students who participate will show improvements in their STEAM-related academic achievement based on state assessment scores.. **3.4:** Based on pre/post responses, participating students will overall show improvement on the *Self-Efficacy Scale* measurement. **3.5:** Using the Official Scientific Inquiry Scoring Guide as formative rubric, teachers will report student growth in these essential skills.

D. Evaluation Plan

Lane ESD staff will be responsible for internal evaluation of all aspects of the project. Data collection for the Goal 3 outcome measures from Table 2. will rely on several straightforward instruments suggested by the National Science Foundation for STEM education purposes. Students will complete all these assessments online once in September/October 2014 and once again in May/June 2015. To monitor ongoing progress, all interdisciplinary teams will use the ODE's Essential Skills Official Scientific Inquiry Scoring Guide as a rubric. CTE and STEAM-related academic achievement data of participants will be included in the evaluation process. Lane ESD staff will conduct an analysis of the results and provide details in the final report. Additionally, the Lane County STEAMOn! project will conclude with a Project Exhibition where student teams can demonstrate their new skills and exhibit their final products. Industry mentors will be able offer their final critique and guidance. Finally, to capture the most important aspects of the experience, both students and teachers will offer their overall impression of the program through an online survey.

E. Sustainability Plan

Designed for sustainability, Lane County STEAMOn! will impact instructional practice at little cost well into the future. Experienced interdisciplinary teams will share their strategies with K-12 colleagues and support expansion locally. Lane ESD expertise will continue to provide training and support. Investment in shared technology and equipment will remain accessible. Partnerships with industry professionals will continue to thrive and online collaboration across sites will evolve using ObaWorld. Through the partnership with LaneWorkforce Partnerships, students and teachers will continue to experience just-in-time feedback from real-world expertise. Lane County STEAMOn! will maintain and support a regional focus by working

closely with the ongoing efforts of Connected Lane Regional Achievement Collaborative (P-20). Furthermore, these efforts will build on and support other regional efforts, such as the collaborative STEM Hub proposal submitted by STEM CORE at the University of Oregon. The anticipated results from this project will provide the means for broader dissemination, acceptance, and implementation to inspire more underrepresented Lane County students towards successful careers in CTE pathways and STEM professions.