Application Narrative

(A) Vision & Mission

Committed to equity and excellence, Eugene School District 4J will convert its most high-poverty middle school, Arts & Technology Academy (ATA), into an exemplary STEM Lab School. ATA is dedicated to preparing its students, many of whom are economically disadvantaged and students of color, for success in high school and postsecondary STEM education, and high-wage, high-demand STEM careers. The school will serve as a model of best practices in STEM education, and will actively train teachers across the district, region and state.

After five years of operation as a STEM Lab School, in a newly designed STEM facility, ATA will be recognized for its high achieving students, highly innovative teaching and learning methods and ongoing adaptability to current practices in STEM industry and education. Students demonstrate high content proficiency and are becoming familiar with STEM career pathways. Teachers are highly skilled in implementing an exemplary integrated, STEM-focused core curriculum, having engaged in deep professional learning with STEM professionals and national instructional experts. In a new building designed for optimal learning, students are immersed in project-based learning based on the Buck Institute's *8 Essentials for Project-Based Learning* model (BIE 2014), that mirrors work of STEM professionals. Diverse students construct understanding by tackling real-world challenges and applying their own preferences and ideas.

Students and staff are united in the core principles: learning is important, everyone can learn with effort, and everyone within the community plays an integral role in its success. Students and teachers are all learning simultaneously to build conceptual understandings that keep pace with innovation in the 21st century. Critical thinking is a major part of the curriculum, with essential questions about real-life problems guiding the process. Students are supported by a STEM-

focused daily Advisory and wraparound services coordinated by staff teams that help them develop and maintain high aspirations for STEM careers. Well-developed Advancement Via Individual Determination (AVID) methodologies are integrated into STEM learning.

Teachers across classrooms use a common approach to formative and summative assessment centered on evaluation of project work using rubrics based on new standards. Students focus on learning targets and have multiple opportunities to acquire and demonstrate mastery. Students share their learning through presentations, and in a digital portfolio on a personal learning device.

Entering the school, visitors notice students and teachers engaged in experimenting with new ideas and learning from each other's mistakes. Visitors see students, teachers and industry partners collaborating in teams. State-of-the-art technology is used for STEM learning and for sharing best practices remotely with other schools. Staff and partners are participating in regional and statewide learning communities, sharing innovative strategies across the network.

(A) Equity

Eugene 4J aims to promote equity by designating ATA as a STEM Lab School. Of ATA's 288 students, 72% are low-income, and 37% are racial/ethnic minorities. They come from a neighborhood of southwest Eugene in which median family income is less than $30,000 in several areas (City-Data.com 2013; City of Eugene 2011). The STEM Lab School enables ATA to strengthen an equity culture it has already created based on the district's core beliefs that <u>all</u> students have the ability to learn and meet high expectations, and that a student's success in school should be independent of factors such as ethnicity, gender, and socioeconomic status. By instilling a climate of high expectations, high-quality instruction, and comprehensive supports, ATA has recently begun to see significant student growth. In 2011-2013, incoming ATA 6th grade students had the lowest rate (54%) of meeting OAKS math benchmarks among 4J's eight

middle schools, yet 8th grade students had the second highest rate (84%). ATA has already seen the value of STEM and created high quality engineering courses, resulting in a high passing rate in OAKS science relative to other middle schools (83%). Despite this success, the goal of putting all students on a trajectory toward college and a STEM career has challenges. ATA data points to an achievement gap, as well as a gender gap in Science, as shown in Table 1:

Table 1. Percentage of Students Meeting State Benchmark

2012-13	White	Hispanic/Latino	African-American	Amer.Indian	Multi-racial	Girls	Boys
Math	72%	66%	46%	50%	61%		
Science	86%	77%	67%	n/a	n/a	74%	88%

The ATA STEM Lab School will implement several culturally-responsive strategies:

(1) Advisory**,** *an intensive focus on building STEM career aspirations and plans, and a system for coordinating wraparound supports for students*. Building on their STEM core learning, a daily Advisory class provides students with a curriculum focused on STEM college- and career-readiness. A student's Advisory class and teacher remain the same in all three years and provide highly personalized attention. Teachers have frequent individual conferences to develop a student's personalized education plan, review the digital STEM portfolio and academic progress, and arrange interventions, tutoring and counseling. Students engage in college and career exploration, interact with STEM professionals including persons of color, and visit STEM studios and labs. Advisory teachers coordinate with AVID Elective teachers to promote STEM college readiness among students who are the first generation to attend college.

(2) Growth mindset development *by students and teachers, who receive training in the Mindset Works model.* Mindset Works is based on the research of Carol S. Dweck and is used in hundreds of schools worldwide. During Advisory, students engage in the high-quality on-line interactive, *Brainology*®, that fosters a mindset that intelligence can be developed and hard work

affects improvement more than "how smart you are." Students who learn this mindset show greater motivation in school and higher achievement (Blackwell, et al. 2007), including groups underserved in STEM (Good, et al. 2003). Teachers engage in a companion *Mindset Works EducatorKit* and participate in an online growth mindset community.

(3) Parent and Partnership Coordinator (PPC), *a bilingual/bicultural staff member dedicated to supporting ELL students and students of color in STEM learning and career-planning activities.* The STEM-trained PPC supports students individually and in small groups to address academic progress, tutor, advise on college and career planning, and coordinate interface with STEM professional mentors. The PPC conducts educational Parent Nights to help parents learn about STEM pathways and support their students' readiness for STEM careers.

(4) Out-of-school time opportunities, *for building STEM self-identity*. A STEM-focused after school program enables students typically not engaged in STEM – girls, economically disadvantaged students, and students of color – to gain high interest through "free choice learning" opportunities (please see Section E, Partnership for more details).

(C) Effective Learning Environments

Content Integration. The core curriculum (math, science, language arts, and social studies) has a central STEM focus. Content learning is integrated across courses to reflect the natural interconnectedness of skills and concepts in real-world STEM practice, avoiding the artificial isolation of subject areas that occurs in traditional schools. Teachers plan in interdisciplinary teams to identify and develop connected lesson plans, and share authentic projects that support targeted learning outcomes at all grade levels. Teachers use flexible grouping to differentiate based on both student area of interest, and learning rate and level. Content integration increases progressively from a student's sixth through eighth grade years to ensure solid foundations and

scaffolding. At the sixth grade level, students have a science/ math block allowing for flexible use of time. At the seventh grade level, language arts is added to the science/math block, allowing students to read non-fiction and write about authentic topics. At the eighth grade, all core subjects are integrated for a longer block period. An example for social studies could be analyzing ethical issues related to STEM technology development.

Project-based Learning (PBL). The central learning activity across core courses is authentic projects that have a real-world context and are connected to the actual work of STEM professionals. By putting learning in a context of applied problem-solving, ATA increases student engagement in STEM and strengthens content understandings. The project-based curriculum incorporates the complex, interrelated concepts, skills and processes embodied in three sets of standards – Common Core (CCSS), Next Generation Science (NGSS) and Oregon Essential Skills (OES). Using Buck Institute for Education's (BIE) PBL model and *Atlas*, Rubicon International's curriculum mapping tool, teachers design high-quality projects that require critical thinking, collaboration, communication and creativity. Students use mathematics procedures in authentic contexts, aligning with expectations in CCSS and OES to do real-world problem solving (BIE, 2013). Common project tasks – conducting research, using technology to publish data and writing, and collaborating with diverse partners – are elements of OES and CCSS. In alignment with newly-adopted NGSS, ATA projects emphasize the practice of science skills, such as planning and carrying out investigations, analyzing and interpreting data, and engaging in argument from evidence. An example of a project that could address standards across content areas is a design challenge to produce a long-term growth plan for Lane County hazelnut farming that accounts for predicted climate change patterns. Students research and summarize background articles about hazelnut agriculture and rainfall trends (ELA), analyze

rainfall data (science) and build an algorithm to calculate future projections (math), design a device maximizing or reducing the effects of rainfall on the crop (engineering), and conduct a consumer survey of seasonal appetites for hazelnuts (social studies).

STEM Professionals Involvement. To foster STEM skills and career aspirations, STEM professionals participate in projects. Scientists, engineers and technicians assist teachers in designing projects that mirror their STEM work in three fields – general engineering, environmental/sustainability science, and information technology – and involve authentic problems, procedures and materials. Students interact with the practitioners to see skills demonstrated, receive guidance and feedback on work, and learn about future jobs and careers.

Student-Driven Learning and 21st Century Skills. In project work, students have choice in challenges to work on; strategies for solving a problem; team roles; and presentation formats. Their understanding of STEM content is constructed out of the problem-solving process rather than from a teacher. Writing to articulate thinking is a core practice used across grades and classes. The focus of the middle school STEM years is on the process and skills of learning, and follows a grade level progression of self-management. In sixth grade, students participate in a two-week immersion into the expectations of a STEM school environment, collaboration strategies and understanding "thinking" vocabulary. They take a Foundations of Inquiry course focused on critical thinking, guided by the NGSS Engineering Design standards. Seventh graders work on increasingly complex problems and seek input from others, including STEM professionals. Students practice communication skills with a variety of authentic audiences. Eighth grade students complete a self-directed capstone project judged by industry professionals on a comprehensive rubric, and students who meet the standards receive a Middle School STEM Certificate worth high school credit.

Technology and Learning Environment. Industry partners loan hardware, software and specific industry tools that enable students to carry out authentic STEM projects. The school will acquire tools for broad use – Vernier probes for scientific investigations, video cameras, and a 3D printer. Using dedicated district funds, all students in the school will be provided with a personal learning device (PLD)– tablet or laptop – for STEM research and project design; interacting and collaborating online with peers, teachers and STEM professionals; writing STEM reflections; and collecting and sharing STEM exemplars in a digital portfolio. The PLD facilitates teacher-student-parent review and discussions of academic progress, and college and career preparation.

As part of the district plan for improved facilities, ATA will have a newly-constructed building by 2016. Conversion to a STEM lab school is timely since major construction allows for optimal STEM designs for which funds have already been designated. (Please see Section G, Sustainability for more details.)

Assessment Methods. Student assessment will be project-based. Teachers develop rubrics for the different tasks of each project, aligned CCSS, NGSS, and OES standards. Rubrics will encompass critical thinking, content (math, science, engineering/design, technology, social studies), reading, writing, presentation, creativity/innovation, collaboration, empathy/service orientation, personal management, and civic engagement. Teachers measure students' knowledge and skill proficiency while projects are in progress (formative) and upon completion (summative), getting input from industry professionals. Student exemplars include: written summaries and reflections, graphic designs, constructed models, computer programs and applications, data charts, oral presentations, slideshows, videos, and electronic courses/tests/quizzes. Proficiency is tracked in terms of meeting clearly-defined learning targets, and grading is based on proficiency.

Wraparound supports. As a STEM school, ATA enhances and augments the effective strategies that enabled it to narrow achievement gaps in recent years – Advisory, academic interventions in reading and math, AVID, and academic progress monitoring. A "Lunch Bunch Academy" staffed by instructional assistants is devoted solely to STEM content support. A new Parent and Partnership Coordinator meets with ELL students regularly during lunch for tutoring and problem-solving, and to bridge communication between home and school. Counseling services are available to all students through a full-time counselor and Looking Glass, a support services organization for struggling youth. AVID-trained teachers (75% of teachers) focus AVID methodologies on STEM project work to support STEM college readiness. Students facing academic or motivational challenges in the daytime curriculum attend the on-site after-school program for a structured "Power Hour" of academic support. An enhanced Advisory curriculum focuses on understanding STEM college and career trajectories. The advisors build students' understanding of STEM-related higher education programs and coordinate an annual hands-on career fair with industry professionals. A wraparound team meets with 8th grade students to develop a four-year high school plan. (Please see Section B, Equity, for details on Advisory.)

(D) Effective STEM Instruction

Intensive professional development with built-in collaboration time for teachers is the cornerstone of the ATA STEM Lab School. Teachers will transform the curriculum to be STEM-focused, integrated and project-based, and will receive training from experts on research-based models to do so. To build a foundation for exemplary curriculum and instructional practice, teachers engage in several activities:

Objective	Professional Development Activity
Ensure high-quality project-based learning	Buck Institute for Education presents three-day summer workshop on *8 Essentials* model and two full-day follow up sessions to refine common framework and methods.
Maximize benefit of technology in STEM learning	Technology Support Specialist leads two days of training on use of PLD, Vernier probe, 3D router, video camera
Instill "growth mindset" in students and focus on effort for achievement	Teachers engage collaboratively during weekly sessions in online interactive *Mindset Works EducatorKit*
Develop effective interdisciplinary STEM curriculum	Regional ESC trains teachers on Rubicon International curriculum mapping tool, *Atlas*, during weekly sessions
Teachers gain understanding of the practices of science required in the new NGSS content; and develop authentic projects that mirror STEM professional practice	Teachers collaborate with STEM researchers at University of Oregon (UO) in an iterative process for designing student projects. In initial discussions with UO STEM faculty, teachers review objectives and essential elements of projects. This is followed by a four-day session at the university in which teachers engage in hands-on activities in STEM research laboratories and interact with research teams to "take in" how STEM is practiced in various STEM fields. Focus is on learning STEM concepts and practices. Additional curricular planning days, and ongoing biweekly collaboration follows, in which research faculty, graduate students and ATA teachers co-generate ideas for project-based learning modules based on the focus of the research and alignment with standards. During projects, graduate students assist teachers on an "on call" basis and lend resources (e.g., scanning electron microscopes, digital resources of the Science Library), and host STEM laboratory visits for teacher teams.

A critical component for success as a "lab" school is ample time for teachers to collaborate on effective practices and refine models. Teachers meet for two hours weekly throughout the year to engage in focused training activities. Grade level teams of teachers, counselors and the PPC meet twice monthly for full-day sessions, operating as professional learning communities (PLCs) to develop and improve curriculum, instruction and assessment. To ensure the success of time spent together, education experts from Education Northwest (EdNW) train teachers on PLC functioning, provide initial facilitation, and train administrators and teachers on facilitation. They instill protocols for both generative and reflective PLC operation, and a rubric for internal

and external evaluation of PLC functioning. To support high-quality integrated core classes, EdNW provides training on the School of Study Design Framework for interdisciplinary instructional design, and facilitates a process of developing units. Teachers also receive training in using projects for instruction and formative and summative assessment. EdNW provides on site coaching for teaching teams in integrating curriculum, instruction and projects; on site classroom observation and feedback; training on peer observation; and individual "spot" coaching for struggling teachers.

To ensure a high-quality Advisory, teachers receive training on advisory principles; developing outcomes, learning targets, curriculum maps and lessons; and developing an evidence-based cycle of reflection for improvement. They refine systems for regular, frequent systematic review of student data and portfolios as the basis for instructional modifications.

While innovative STEM education practices are being refined at ATA, teachers are sharing lessons learned and modeling practices for other schools. Connected Lane County, a Regional Achievement Collaborative, assists in coordinating a STEM best practices observation event, *STEM Forward*, for county- and state-wide teachers, curriculum leaders and administrators. The program includes classroom observations, networking with STEM professionals, sharing STEM projects, and building a strong statewide network of educators for sharing resources and collaboratively developing STEM professional practices. Through Connected, ATA contributes to a statewide vision of STEM and shares it with other educators and their business partners in webinars, published articles in education journals, and the school website.

(E) Partnerships

ATA draws on a significant amount of STEM resources in our community. Services provided by two leading educational institutions, University of Oregon and Education Northwest, support

professional development vital to ATA becoming a model of innovation and best practice.

Several partners contribute staff time, services, equipment, and resources as contractual or in-kind donations, as follows (Please see Section H, Budget Narrative, and Appendix C for details).

Partner	Contribution
Boys & Girls Club/ Emerald Valley	*(Nonprofit youth organization)* Present an enhanced STEM-focused after school program (attended by 65% of ATA students) extending the STEM learning day. Research shows that "free choice learning" helps underserved students develop an affinity for STEM (Dierking 2007). Provide hands-on interactive STEM activities – Claymation, computer programming, apps and model creation, and specific homework support. City of Eugene provides a Robotics program with regional competitions. STEM activities led by community partners Palo Alto Software, Symantec. After school staff attend monthly ATA teacher meetings to ensure a seamless STEM program from 8 – 6:30 pm. *Contractual and In-Kind.*
University of Oregon STEM CORE	*(Regional collaborative for STEM education)* Present 4-day STEM institute for teachers; model projects from Lane County Regional STEM Hub's Math-Science Partnership; oversee six graduate students as assistants to teachers in project implementation; loan equipment. *Contractual and In-Kind.*
Connected Lane County	*(Regional collaborative for PK-20)* Promote the expansion of STEM practices based on the ATA model to schools region wide; support the STEM Forward event; coordinate collaborative grant proposals. *In-Kind.*
Education Northwest	*(Leading educational non-profit)* Lead an in-depth professional development program for teachers, providing training, facilitation and coaching on several research-based processes that guide a PLC approach. *Contractual.*
Private engineering and IT firms	Symantec, Cisco, Eugene Water & Electric Board, netCorps, NetApp, Info@Risk, IRIS Educational Media, InSilico. (See Letters of Commitment in Appendix D.) Mentor teachers and collaborate to design authentic projects; give guidance and feedback to students; mentor students; host workplace visits; present career-awareness activities; provide access to on-line courses and certifications; lend or donate equipment and materials; give financial support; serve on STEM Lab Schools Advisory Committee. *In-Kind.*
Presidio	*(Leading technology consultant)* Facilitate a comprehensive assessment of the school's technology needs for STEM learning and professional sharing, using a stakeholder input process; Develop a road map for acquisition of technology for the new school facility. *Contractual and In-Kind.*

ATA will draw on the resources of the Regional STEM Hub of Lane County and Connected Lane County, two regional partnerships of school districts and higher education institutions, to produce events and publications that share ATA's STEM best practices, and to support collaborative initiatives for expansion of STEM education through fundraising, shared resources, coordinated industry partnerships, and networking among schools.

(F) Outcomes & Evaluation

The ATA STEM Lab School will be known for its effectiveness in producing middle school students who *exceed* in science, math and literacy, and are *motivated* to pursue STEM careers. ATA teachers will model exemplary practice, and the school will be engaged in strong partnerships. (Please see Appendix E for Outcomes and Evaluation details.)

(G) Sustainability Plan

Eugene School District 4J undertakes the implementation of the ATA STEM Lab School with a strong commitment to sustaining and growing the school program into the future. The district's commitment is evident in the investment it will make in technology and a new facility supporting a state-of-the-art STEM learning environment. The architects describe a vision for the school:

> *The design of the ATA building will be planned around the integration of the STEM curriculum. Classrooms and learning spaces will be open and flexible, providing a vibrant, active environment, adaptable to all aspects of the STEM curriculum. The STEM lab, a large workshop space, will be central to the plan of the school, providing a place for classes to build ideas into working models. The building itself will serve as a teaching tool, displaying sustainable design strategies, structure and other building systems. Daylight and views to exterior gardens and fields will create a healthy and inspiring environment for students and teachers to explore, experiment and create.*

In the project year, the district will purchase 300 personal learning devices (tablets or laptops) for students to use. Funds have been set aside to implement innovative technology systems. Exciting possibilities are remote labs, cloud-based data sharing, a well-equipped engineering studio, a spherical display system for projecting global/planetary data, a "fly on the wall" video system, and virtual classrooms. During the grant year, the ATA community will engage in a methodical process of stakeholder input, led by the leading technology management company, Presidio, to assess needs for STEM technology and develop a multi-year "road map."

The district is committed to absorbing new required staff hours – the Parent and Partnership Coordinator and Technology Support Specialist – into operational budgets. The BGCEV has committed to sustaining the new STEM-enhanced after school program through its funding.

The school will sustain professional development critical to instructional excellence through these strategies: (1) ATA will explore ways to provide teachers common planning time and modify the daily schedule to afford additional PD days; (2) Teachers will incorporate STEM instructional goals as part of their regular professional growth and evaluation; (3) training of new ATA teachers will be provided by the district; and (4) University of Oregon STEM CORE, a recipient of federal and state grant awards, will seek funding to support the continued and enhanced mentoring of teachers.

A significant support to sustaining the new STEM school is the robust and rapidly-growing STEM industry sector in Eugene-Springfield. Nearly 200 companies comprise the "Silicon Shire" network of high tech companies and, as noted in a recent news article, there is a shortage of qualified workers (Register-Guard, February 2014). Numerous companies have expressed willingness to support STEM education efforts in the region, and eight have signed on as ATA partners. We anticipate recruiting several more businesses within the grant period and beyond.

The evolution of the school over coming years will be steered by a new ATA STEM Lab School Advisory Committee consisting of education and STEM industry representatives that meets at least twice each quarter to monitor project implementation, oversee fiscal and programmatic accountability, and identify opportunities for partnerships and expansion of STEM learning. The Advisory Committee will work closely with Connected Lane County and the Regional STEM Hub to share the ATA project and help expand STEM in the region.