West Linn – Wilsonville School District

December 2013 ***DRAFT***

District Technology Plan

This Technology Plan is the collective work of the Technology Advisory Committee. The members of this committee include:

William Rhoades, Superintendent
Jane Stickney, Deputy Superintendent
Kathy Ludwig, Asst Superintendent
Tim Woodley, Operations Director
Jennifer Spencer-Iiams, Student Services Director
Curtis Nelson, IT Director
Nell Achtmeyer, STEM Coordinator
Aaron Downs, Principal – Wilsonville High
Barb Soisson, Principal – Wood Middle School
Peter McDougal, Principal – Cedaroak Park Primary
David Pryor, Principal – Willamette Primary
Kathy Gregg, Asst Principal – Athey Creek Middle School
Stacy Erickson, Teacher Librarian – West Linn High
Stuart Levy, Teacher-Librarian – Wood Middle School
Tara Perkins, Teacher-Librarian – Cedaroak Park and Sunset Primary Schools
Patrick Minor, Instructionl Coordinator – Stafford Primary
Emilie Bennett, Instructional Coordinator – Sunset Primary
Dave English, IT Specialist – Wilsonville High
Peggy Pricer, IT Specialist – Rosemont Ridge and Athey Creek Middle Schools
Joe Wade, Former IT Specialist – WLWV Schools
Jennifer Ziolko, Instructional Coordinator – Student Services

In addition to bringing their own voice and perspective to this work, each member was additionally charged with representing all groups that they associate with as well.

DRAFT TABLE OF CONTENTS

EXECUTIVE SUMMARY

The West Linn - Wilsonville School District has a strong history of creating and implementing a dynamic and comprehensive technology plan that supports the district's technology systems and networks, efficient work environments, innovative and effective instructional practices, and trends in Science, Technology, Engineering & Mathematics (STEM) education (including increasingly robust robotics and engineering programs).

The West Linn – Wilsonville community has supported the evolution and updating of our instructional technology and technology systems through passage of capital and facilities improvement bonds in 1997, 2002, and 2008. As the district continues its inventory and needs assessment to inform the Technology Plan for 2013 and beyond, we find that the network and hardware remain relatively robust AND, as with all technologies, they are becoming dated and must be continually renewed and refreshed. As we do this we simultaneously keep abreast of new standards, applications, developments, innovative teaching and learning systems, wireless applications, personal desktop accessories, new specialized hardware and software, and the changing nature of supportive facilities.

This plan considers the current state as well as the next phases of technology of planning for the district. It includes review and revision in the areas of Leadership, Stewardship, Curriculum and Instruction, Management and Operations, and in the Physical Technology Structure and resource needs.

It is the role of **Leadership** to promote and provide the stimulus for creativity and innovation, integration, and utilization of technologies. We believe that Technologies should be integrated through all district areas, levels, and functions; be available and accessible as needed; and be a powerful and exciting enhancement to teaching, learning, and leadership.

The **Stewardship** of the plan is led by the **Technology Advisory Committee** who assists in setting direction and recommending strategies for technology acquisition, staff development, integration of best practices, and evaluation/assessment of technology and applications. Because this is a dynamic plan a major role of the Technology Advisory Committee is to keep abreast of and advise on current research on effective and efficient uses of technology to enhance our systems of teaching, learning, and work.

The **Learning and Teaching for Students** component is focused on creating effective and efficient curriculum models and standards, instructional applications and innovation, and a rich learning environment through collaborative instruction and interactive technologies. It includes achievement of technological and informational literacy as a strong focus on research and inquiry, and the development of digital citizenship. We believe strongly that instruction and high quality teaching and learning systems should lead the work of the district and that technologies should be considered as powerful tools to support that work.

The **Learning and Teaching for Staff** component emphasizes the need and process for effective professional learning. Our goal is to prepare staff for the integration of technologies into the daily learning of the classroom by incorporating the current understandings of research on best practices in using technology to enhance learning and child development. We understand that this is a rapidly evolving field and that our ability and willingness to learn and adapt is critical in our professional growth models.

The purpose of the **Management and Operations** plan is to imagine, fund, create, implement, and deploy technology infrastructure, hardware, and software to streamline decisions and maximize resources in the daily operation of the school district. Special focus will be made on minimizing time demands for external reports and other management tasks.

The **Networks and Systems** plan outlines a system that significantly increases student access to technology and its related resources. The specifications outline a dynamic classroom environment in which use of technology is seamless, transparent, and non-disruptive.

It is important to note a couple of distinguishing characteristics of this plan:

1) This plan is intended to be more than the purchase and infusion of technology – the concepts incorporated in this plan embrace an evolving classroom environment characterized by the district's six vision themes. We believe that instructional strategies and learning environments are undergoing rapid and exciting improvements and that technology is a core piece of these new environments.

2) This plan provides our district with a path for moving forward with these new environs. It creates the path, provides methods, and creates the organizational culture for opportunity and growth in teaching and learning. There will be a renewal process to continue to move ahead even as we implement new technologies.

INTRODUCTION

Beginning In 1997, the West Linn - Wilsonville School District passed a series of bond measures that included significant and far-reaching upgrading of the district's technology systems and networks which supported efficient work environments, innovative and effective instructional practices, and trends in Science, Technology, Engineering & Mathematics (STEM) education (including an increasingly robust robotics program).

The results included the creation of an agile and adaptable networked district. The district supports an infusion of new computers in every classroom, fully supported data, voice, and video systems, upgraded electrical and network wiring at each school, the creation of a telephone system with its own prefix and telephone numbers, video systems that support a growing application for distance learning and video productions, extensive access to wireless networking, enhanced and updated web presence…. The technology network and systems are fully supported through the district Information Services Department and building technology experts support the network and applications at each school. While the network system and technologies are still generally robust and effective, as with all technologies, they become dated and need to be refreshed regularly to keep abreast of current technological applications and developments for all components of the district.

Technology integration to support student learning and STEM education is ever-evolving and planning must be dynamic in support of curriculum applications to enhance teaching and learning for students and staff. Professional development opportunities are provided in an ongoing and often "in-time" fashion to enhance staff and student use of technology and in understanding elements of information literacy, STEM, and digital citizenship. Curriculum for instructional technology has been aligned to the International Society for Technology in Education standards, the Common Core, the Next Generation Science Standards, and Oregon's Standards for Technology.

There are significant new technological application developments and research on effective teaching and learning with technology that are influencing future network, hardware, software, and curricular needs. These trends include wireless applications, rapid evolution of mobile technology, digital curriculum, on-line data bases and resources, distance learning, content specific technologies, research and data retrieval systems, assessment systems, one to one environments, assistive technology for children with special needs, and new specialized applications in teaching, learning, and management. Each of these trends influence and are addressed in the district technology plan.

Demographics of the District

The West Linn - Wilsonville School District serves a 42 square mile area in Clackamas County, Oregon, serving the communities of Wilsonville, West Linn, and a large unincorporated area between the two cities. The 2013-2014 projected enrollment is 9000. The District is made up of 9 primary schools, 3 middle schools, 3 high schools, and one charter school and employs approximately 470 licensed staff, 255 support personnel and 28 administrators.

District Vision and Vision Themes

The Vision of the West Linn - Wilsonville School District is an inquiry: ***How do we create a learning communities for the greatest thinkers and most thoughtful people for the world?***

The West Linn - Wilsonville School District community shapes our children's future by generating knowledge and hope, and with tradition and vision. We envision a school learning community that allows for:

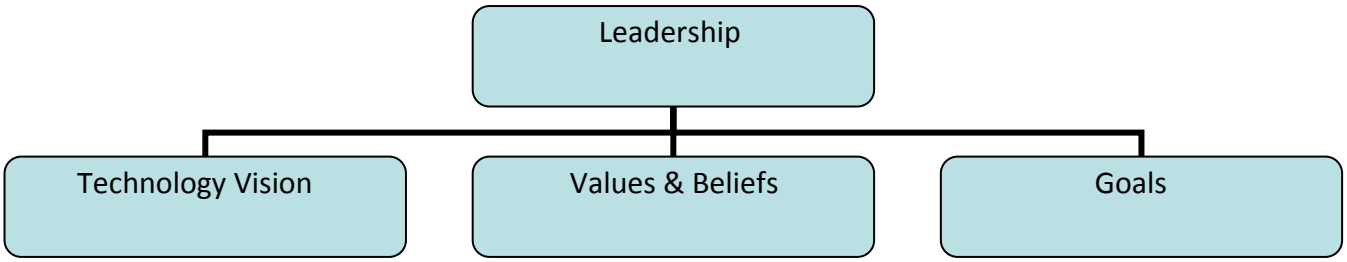
- The demonstration of personal and academic excellence.
- A personalized education to improve each and every child's performance.
- The establishment of community partnerships that expand the classroom beyond the school.
- The creation of a "Circles of Support" for each child.
- The education and development of the whole child.
- The integration of technology into our daily learning and our work.

District Technology Goal Areas

The Technology Advisory Committee includes central office and building administrators, teachers, instructional coordinators, Teacher-Librarians, the Director of Information Services, Director of Operations, Bond Manager, IT Specialists, and Student Services Specialists. Their primary tasks have been to develop and update the district technology plan and curriculum, to monitor progress in implementing strategies, and to make recommendations for revision based on current research and review. The Technology Advisory Committee reviews and informs around six major goal areas. They are:

1) Leadership
2) Stewardship and Advisory
3) Teaching and Learning for Students
4) Teaching and Learning for Staff
5) Management and Operations
6) Network System Specifications

TECHNOLOGY LEADERSHIP SECTION



Technology Vision

Leaders of technology will inspire and lead development and implementation of a shared vision or comprehensive integration of technology to promote excellence and support transformation throughout the organization. We will create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students We will promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources. We will provide digital age leadership and management to continuously improve our organization through the effective use of information and technology resources. We will model and facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture.

Technologies should be integrated through all district areas, levels, and functions; be accessible and available to all at the level and intensity needed; and, be a powerful and exciting enhancement to teaching, learning, and leadership.

Leadership goals for the implementation of the district vision are:

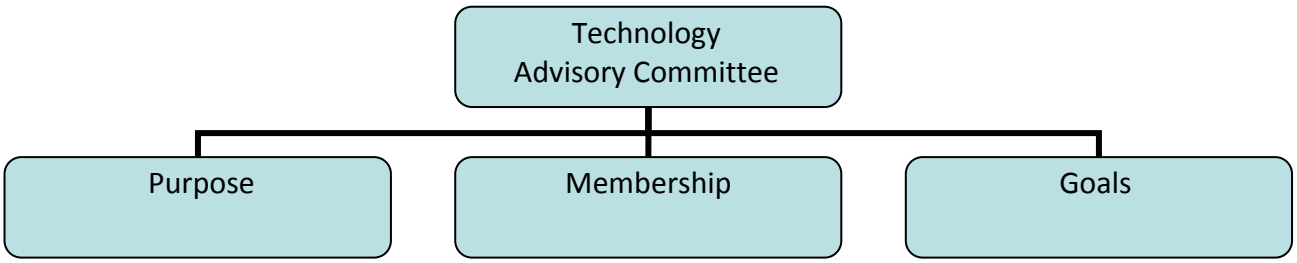
1. Empower leaders at each level to ensure that curriculum design, instructional strategies and learning environments integrate appropriate technologies to maximize learning and teaching with a focus on the National Education Technology Standards.
2. Develop a shared vision and implement a systemic plan aligned with that shared vision for school effectiveness and student learning through the infusion of information and communication technology (ICT) and digital learning resources
3. Maintain ongoing professional learning and gather, communicate and provide venues for the implementation of contemporary research on use of technologies to enhance professional practices, student learning and effective and efficient management systems.
4. Integrate the use of technologies to support productive systems for learning, teaching, administration, management, and operations and ensure equitable access.
5. Use technologies to plan and implement comprehensive systems of effective assessment and evaluation.
6. Promote ethical and responsible use, digital citizenship, and model responsible decision-making in the use of technologies.

7. Promote policies, financial plans, accountability measures, and incentive structures support the use of information and communication technologies and other digital resources for learning and in district school operations

Goals for the Use of National Educational Technology Standards

1. Improving higher-order thinking skills, such as problem solving, critical thinking, and creativity
2. Preparing students for their future in a competitive global job market
3. Designing student-centered, project-based, and online learning environments
4. Guiding systemic change in our schools to create digital places of learning
5. Inspiring digital age professional models for working, collaborating, and decision making

TECHNOLOGY STEWARDSHIP



The Technology Advisory Committee originated in 1994 as part of the stewardship of the district vision theme: **Integrating Technology into Daily Learning**. The work of this committee has been instrumental in developing, and implementing the long-range technology plan used to guide the 1997, 2002, and 2008 capital improvement efforts and have subsequently provided extensive guidance and leadership in the implementation of the plan. Activities have focused primarily on maintaining the technology vision through regular researching, progress monitoring and eventual advising and coaching district leaders to support their decision making in regards to the use of technology.

The Technology Advisory Committee has also engaged in development of the district's web pages, created software purchase guidelines, prepared hardware purchase guidelines and procedures, studied aspects of distance learning, conducted surveys of current and needed skills, and studied issues of technology support, technology standards, instructional strategies, and safety and security issues related to technology.

Statement of Purpose

The purpose of the Technology Advisory Committee has been to assist the district in setting vision and direction and in developing and implementing action plans for technology acquisition, staff development, and evaluation/assessment of technology and technology applications in the district.

Integrating Technology into Daily Learning is one of the district's guiding vision themes. As the district moves into the next generation of technology and technology standards, the Technology Advisory Committee will meet monthly to give guidance to leadership for implementing goals in teaching, learning, and professional development. The Technology Advisory Committee will actively study best practices supporting the achievement of technology standards. The advisory committee will support the development of all aspects of the technology plan with a particular emphasis on teaching, learning, and professional development.

Members

The Technology Advisory Committee includes central office and building administrators, teachers, instructional coordinators, Teacher-Librarians, the Director of Information Services, Director of Operations, Bond Manager, IT Specialists, and Student Services Specialists.

Goals

1) Meet regularly to monitor and update the implementation of the technology plan through the systematic review of current research on technological applications that enhance teaching, learning, and operations.

2) Create and support professional development programs that support the ongoing integration of the standards within the technology plan.

3) Provide guidance and support in the development and use of specialized applications as well as universal applications.

4) Develop systems to monitor progress and provide support for all students and teachers in continually improving technology and information literacy skills.

5) Evaluate annual progress toward the achievement of the standards and goals in the district technology plan with a focus on maximizing and optimizing usage.

6) Create partnerships with technology and business corporations (such as our South-Metro STEM partnership) in ways that enhance integration of technology into daily instruction and work flow.

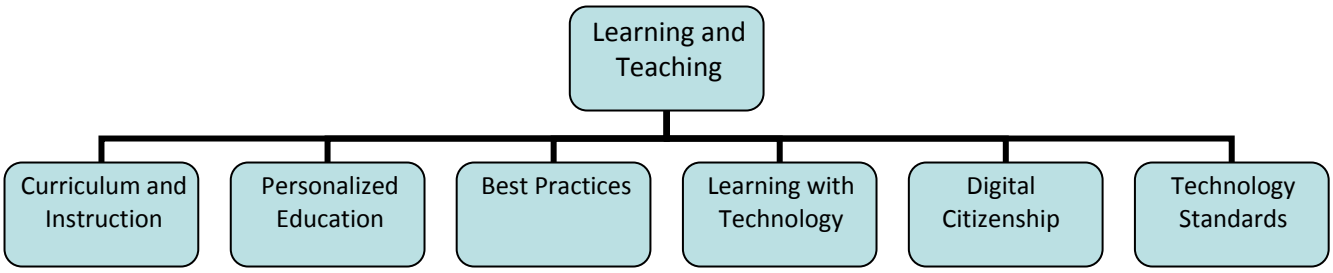
7) Develop and implement a system-wide, collaborative process to provide recommendations for annual technology plan review and budget planning.

8) Make recommendations for the planning and implementation of technologies in both the instructional and operations of the district.

9) Support the development of leadership, technical expertise, knowledge, and systems that successfully support and integrate technology into school organizations.

10) Develop guidelines for cycles of equipment purchasing and consider specifications that insure maximum life and minimal maintenance requirements.

LEARNING AND TEACHING FOR STUDENTS



Curriculum and Instruction:

The West Linn-Wilsonville Schools have a well-developed curriculum framework defined by:

- major conceptual themes
- specific content knowledge
- academic research skills
- intellectual skills for inquiry, analysis, and innovative thought

The curriculum is linked to Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS) in each discipline. In each area of the curriculum the complex processes of learning is recognized with the habits and mind, mathematical, scientific and engineering practices and the literacy practices defined in the CCSS. Each discipline is mapped from Kindergarten through grade 12 for coherence. The curriculum is embedded in instruction that is both integrative and inquiry-based. In our classrooms, curriculum arising from children's questions is a way of learning and a way of teaching. It is open, flexible, and responsive to children's interests and developing capabilities. Assessment is authentic and formative, giving children the keys to their own improvement in learning.

Such an approach to learning draws upon children's concerns and questions, actively involving them in planning, executing, presenting, and evaluating a negotiated learning experience. These investigations provide meaningful and purposeful contexts in which the basics like reading, writing, mathematics, and technology are essential tools for discovering and communicating the results of a study.

Broadly, the work of learning advances children's understanding in several ways.

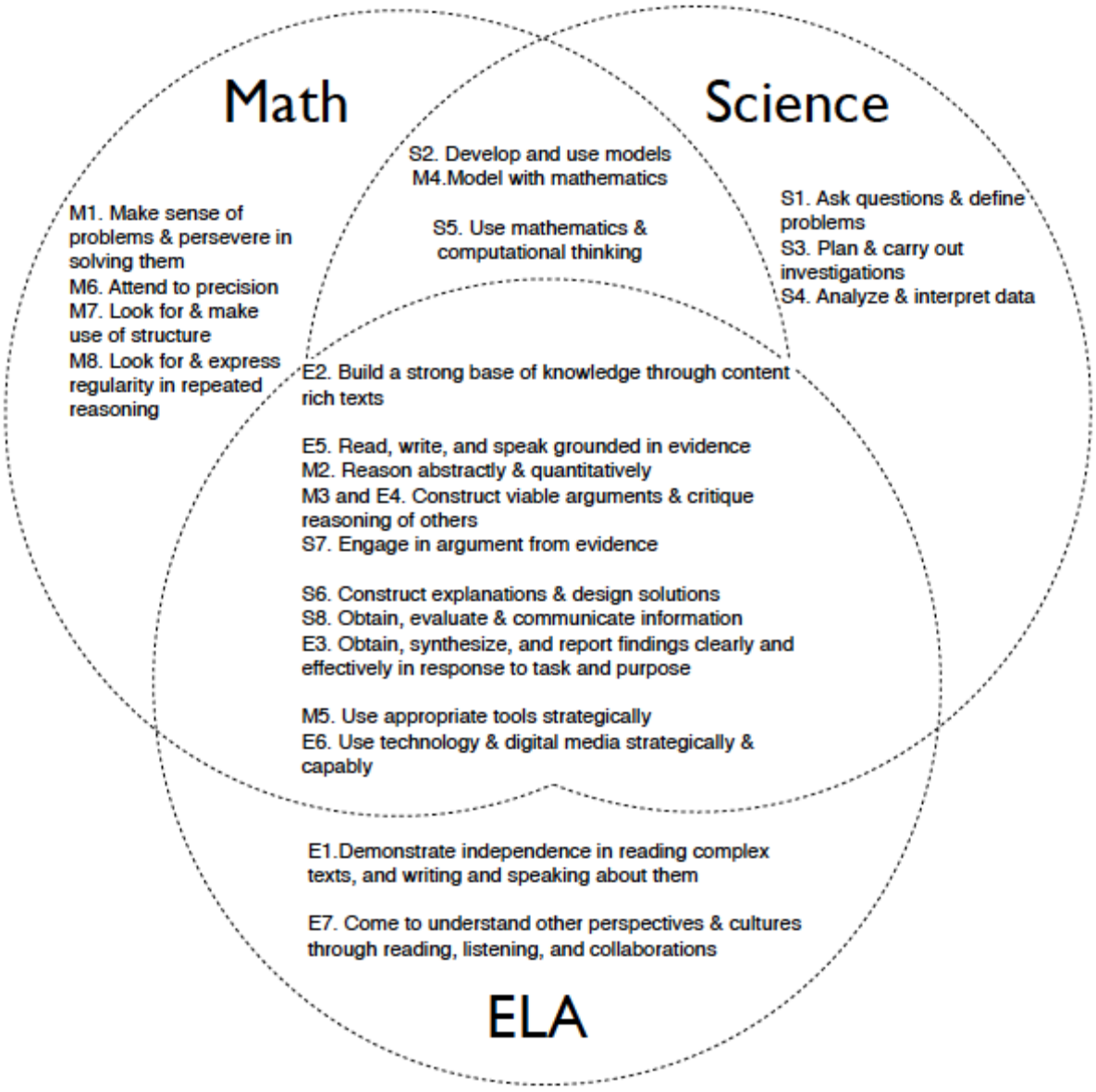
- Classroom work with technology broadens children’s experience and knowledge of the subject or area of study.
- Technology Skills are developed through which the children can control and direct their own learning, including their linguistic, numeric, and manipulative skills.
- Children build concepts that enable them to generalize, organize and relate ideas, and make informed judgments.
- Attitudes, or dispositions, which foster a growth mindset are developed, including the willingness to question, listen and observe, concentrate on a task in hand, and deal with ambiguity and complexity.
- Children learn to work individually and cooperatively, engage in multiple revisions, celebrate successes, and use their experience as springboards to further inquiry.

Instruction occurs in complex ways. After posing questions, children embark on an information search. They learn, within the context of the study, to locate, extract, record, interpret, interrogate, and integrate information leading to the construction of knowledge. With a purpose in mind, children explore organizational patterns and select formats that most closely and powerfully match their identified audience and message. They work through draft, revision, and editing phases, completing their efforts with reflection, evaluation, and presentation of their thinking.

These ideals incorporate more than simple technology skills or knowledge. Children are invited to engage in higher-order *expert thinking*. *Expert thinking* requires sustained reasoning, managing complexity, testing solutions, evaluating information, and collaborative thinking in team learning environments. Students are increasing their ability to *use computers as tools that facilitate expert thinking and complex communication.* (Levy and Murnane, 2004). Technology enables the development of learning environments in which these ideals are modeled and practiced. In these learning environments each student's personal access to technology facilitates communication, analysis, creativity, thinking, and decision-making. Educational technologies and relevant curriculum content are interwoven to create the conditions for deep understanding and powerful learning. An educational experience crafted with these ideals provides students with the key cognitive strategies, key content knowledge, key learning skills and techniques and key transition knowledge and skills that define a student who is prepared for success in college and future careers (Conley, 2012).

The convergence of the standards and practices in a well crafted interdependent curriculum are represented in the graphic in chart 1. Students practice thinking within the disciplines and making connections between the disciplines throughout the school experience.

The secret joy in work is excellence. -Pearl Buck



Toward Powerful Learning and a Personalized Education

The development of an Ethic of Excellence has a significant history in the West Linn-Wilsonville School District. Since the 1990s, the school district has been moving toward more democratic, student-centered schools. Constructivist learning engages children in a process for making meaning. Children develop personal schema and the ability to reflect on their experiences through shared inquiry. Unique outcomes are expected and encouraged as children find their passions, and develop their own voices. Assessment is integral to the learning process and most effective when children are supported in taking control of their journey toward high standards of performance, valuing craftsmanship in thinking and the production of *beautiful work* in every setting. Children increasingly learn to place a personal signature on their own learning.

This approach to learning and the redefinition of roles and responsibilities emerges from and contributes to the district vision for ***Personalized Education.*** In this environment, student achievement is soaring.

The following chart shows the movement that now exemplifies most classrooms in West Linn-Wilsonville schools.

From Traditional Classroom	To West Linn-Wilsonville Classrooms
Teacher centered instruction	Student-centered instruction
Serious, regimented drill	Challenging, purposeful, complex, joyful investigation
One perspective	Culturally responsive curriculum
Fixed Mindset	Growth Mindset
A single story	Culturally rich perspectives
Rule based tasks	Sustained reasoning, managing complexity, testing solutions
Compartmentalized instruction	Integrative instruction
Part to whole	Whole to parts to whole
Assigning work	Workshop strategies
Single sources/textbooks	Multiple resources/books/digital content
Single entry points	Multiple points of access
Isolated work	Individual and collaborative work
Passive learning	Active, inquiry-based learning
Factual knowledge based	Knowledge creation, research, critical thinking
Single way of learning	Multiple intelligences
Individual classroom focus	School/community focus
Separated environments	Inclusive environments
Autocratic classrooms	Democratic classrooms
Private work completion	Public demonstrations of learning/portfolios
Rules/punishment	Guidelines/group agreements and logical consequences

Work of Excellence is transformational.
Once a student sees that he or she is capable of excellence,
that student is never quite the same. -Ron Berger

Best Practices **for Instruction**

In West Linn-Wilsonville schools, the learning culture mirrors the new world of interactive technologies and character-based collaborative organizations. Many elements of successful corporate and public sector cultures are being transformed from the broadcast, talk-down, authoritarian model to a culture that is open, interactive, collaborative, principle-centered, and thoughtful.

Best Practices in teaching have often been debated and politicized in the United States. The West Linn-Wilsonville School District seeks to maintain coherence with *the strong consensus* among *the major professional organizations, research centers, and subject-matter groups in American education. The term "Best Practices"* is *a shorthand emblem of serious, thoughtful, informed, responsible, state-of-the-art teaching* (Zemelman et al, 2005). *Best Practices* in instruction are characterized as student-

centered, active, experiential, authentic, culturally responsive, democratic, collaborative, rigorous, and challenging. Best Practices in instruction are clearly purposeful, managing the tools, tasks and talk that bring lessons alive. Best Practices are characterized by high leverage instructional strategies, those strategies that give access to all students, are most powerful for engaging all learners, and most likely to lead to deep connected understanding.

The Common Core mathematical practices, the scientific and engineering practices, and the literacy practices defined in the Common Core State Standards describe those high leverage strategies and practices that research tells us are most likely to raise rigor while simultaneously closing achievement and opportunity gaps.

Some instructional technologies from the past worked only in one direction, to disseminate information. The lecture, broadcast TV, and commercial film are examples. The instructional technologies of the present and future are more open and interactive. Each student is an actor on the stage, a player in the game, synthesizing knowledge, creating content and interacting in powerful ways with diverse ideas and diverse people.

Learning with Technology

Technology has the potential to change the learning and the learner. In the earliest days with computers in schools, the workbook style activity was transferred to the computer format. Very little changed in the learning, in fact, research showed that basic facts practice, as it was presented in its simple form, did nothing to increase the quick recall of facts.

Technology is now widely used by our students for research, close reading and production. Students use the technological tools available to calculate, to read and write, to tap into streams of live information, to communicate with others, and to do so from school and from home.

Teachers and students in West Linn-Wilsonville schools are harnessing the power of graphic organizers for analysis and synthesis. The morphological chart formerly drawn on paper can now be transferred to a database where sorting and analysis take the student to a more complex form of thinking.

Digital video, digital music, graphic multimedia presentations are becoming common in our classrooms. When children are invited to make public presentations of complex learning, the products become exemplars for the next student, the next class. In this way, a rising standard of student performance is emerging in the learning community. These multimedia presentations have become more polished and are used more extensively with new production technologies.

Learning with technologies allows children to do what they could not otherwise do. Well designed software coaches children in mathematics. Video sources provide a window to worlds the student cannot visit, a seat in the great lecture halls of the world, and quick reference for review or expansion of concepts. Computer adaptive software allows students to explore mathematics they do not yet understand, test ideas, fail, and construct a useful understanding of the concept. Well designed writing software coaches children through the complexity of written composition. Web quests and research software link questions to resources and help students juggle the use of multiple sources in a recursive research process.

Simulation software allows children to manipulate and tweak the parameters of the variables in complex situations gaining an understanding of the principles of mathematics, science and the social

sciences. Design software allows children to take on design challenges in robotics, geometry, graphic arts, art, and architecture. Quick access to references on line allows students to read dense text with more understanding.

Assessment with technology escapes the boundaries of time, becoming timely, personalized, and adaptive. Computer adaptive assessment has greater power to yield useful assessment information for teachers to use as feedback and actionable data to aid in planning. Computer adaptive assessment, particularly in a low stakes environment, has the power to provide students effective feedback on the learning.

Digital Citizenship

Information search broadens the view from the classroom to global sources. Children have wide access to print, video, and live contact with people and places around the world. They learn to communicate with people who hold differing perspectives and prepare content to share with others around the world. Children now embrace the challenge to understand people from varied cultures and to communicate with wider audiences. They take on the challenge to evaluate sources and develop a thoughtful and discerning use of information that broadens the view capturing richness and complexity. A basis for deeper understanding comes with this wider view.

Digital citizenship compels attention to the ethical use of technologies and a strong family and school dialogue about what one ought to do with technology. Students' digital life reaches beyond classroom time into their home and beyond the school year. We attend to a process for creating the conditions for students to develop as safe and productive digital citizens. This learning advances and is nurtured by a strong partnership between the children, their parents and school. The conversation about digital safety and productive use of technologies is guided by the same values that guide other school and family behavior. Lessons at school and communication with families assist students as they consider the implications of decisions they will make with technology. In the classroom they practice citing sources, selecting appropriate language, following protocols of civility and demonstrating good judgment, respect, responsibility and courage. A coherent curriculum is defined to articulate the development from early years to more sophisticated uses of technology.

Learning Into The Future

> *We live in a time of vast changes that include the accelerating globalization, mounting quantities of information, the growing hegemony of science and technology, and the clash of civilizations. These changes call for new ways of learning and thinking in school, business, and the professions.* -Howard Gardner

Gardner suggests five capacities, five minds, needed by professionals in the future:

- *The disciplinary mind* – mastery of major schools of thought (including science, mathematics, history) and of at least one professional craft.

- *The synthesizing mind* – ability to integrate ideas from different disciplines or spheres into a coherent whole and to communicate that integration to others
- *The creating mind* – capacity to uncover and clarify new problems, questions, and phenomena
- *The respectful mind* – awareness of and appreciation for differences among human beings
- *The ethical mind* – fulfillment of one's responsibilities as a worker and a citizen

To prepare children for the world they will inherit, the learning experiences we design for them should cultivate facility with the major disciplines. Students should be invited into integrative and creative thinking within and between disciplines. Students' experiences at school and in their wider life should develop the skills and dispositions to use ideas and information for worthy purposes to accomplish *beautiful work*.

A Convergence of Standards

Our schools are educating learners to be technology-capable and information-literate digital citizens. We are educating children to be literate readers, writers, researchers, and creative and critical thinkers. We are educating children to be capable mathematicians and scientists. Schools live, learn, and work in an increasingly complex and information-rich society where Standards for students are defined by the Common Core State Standards, The Next Generation Science Standards, the National Educational Technology Standards, and State standards in the Arts, Social Studies, World Language, Physical Education and Health.

The STEM/STEM construct emphasizes the natural interconnectedness of four disciplines, Science, Technology, Engineering and Mathematics. The connections are made explicit through real and appropriate contexts integrated into instructional practices, curriculum and assessment. Addressing challenges and solving complex problems with critical and creative solutions is the heart of the STEM/STEAM movement.

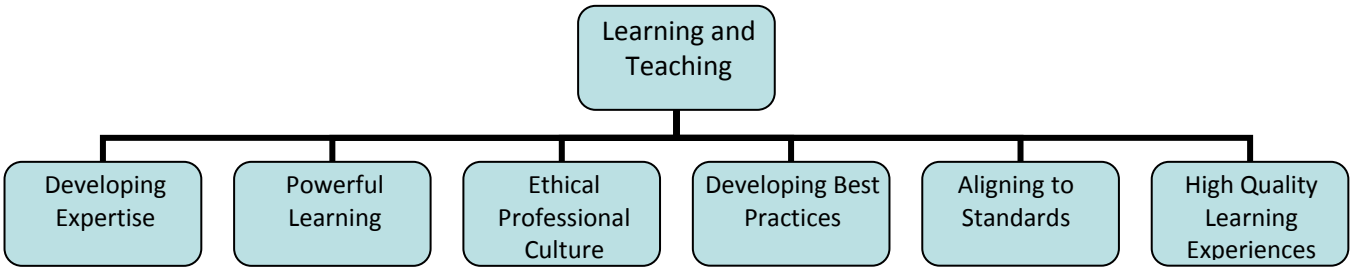
Attached in Appendix E is the district STEM/STEAM Education Overview and Framework.

LEARNING AND TEACHING FOR STAFF

PROFESSIONAL DEVELOPMENT

Too many organizations have spent too much time obsessing on the information they want their networks to carry and far too little time on the effective relationships those networks should create and support.

- Michael Schrage, MIT



Our Strength Lies in Learning Expertise and Teaching Expertise

Professional development in The West Linn-Wilsonville School District is both generous and engaging. It is based on the strength of each staff member to demonstrate Learning Expertise and Teaching Expertise. Staff members demonstrate *Learning Expertise* by continually refining skills and attitudes, practicing self-monitoring, and finding ways to avoid plateaus in his or her own learning. *Teaching Expertise* cultivates the ability to create conditions for learning for all students (Fink & Markholt, p.9-11, 2011).

Staff members are invited to participate in rigorous collaborative learning experiences that take on many forms and formats. Graduate level studies, studio and lesson study, essential readings discussion groups, cohort studies, new teacher study groups, action research projects, district-wide sponsored speakers and symposiums are some of the most powerful formats. These staff development opportunities engage teachers in wide and ongoing conversation about high leverage instruction, powerful assessment, effective feedback, school and classroom culture, equity of access, deep content, and culturally responsive instruction. These studies link members of the learning community to the mission of the school district and the important goals that define the district theory of action.

Professional development is designed with each teacher setting out professional goals. Each year, the teacher and principal agree upon professional development goals to advance teacher learning. The professional goals coordinate with the school goals and contribute to the goals of the school district and the state of Oregon. The goals are written in terms of impact on student performance.

Professional development offerings are designed to create a strong professional culture, characterized by value for growing teacher expertise. In the professional culture of the district, teachers are invited to go where their questions lead. Teachers operating on the edge of their own learning provide

leadership for the entire professional community. In this culture of inquiry, teachers ask questions about and grapple with the significant issues of technology in student learning. Far more than simple courses about how technology works, the emphasis for professional development in technology is on the changing role of the teacher, the active role of the learner, and the interface between technology and daily learning. Annual goals for certified staff address how the teacher will adapt to the new teaching and learning environment that is fostered by technology with information literacy and digital citizenship as a core concept.

The *Professional Teaching Standards*, defined by New Teacher Center, and *The Five Dimensions* from Center for Educational Leadership provide useful structures for thinking about teacher development. The *Professional Teaching Standards* define the teacher's responsibilities in six areas: engaging and supporting all students in learning, creating and maintaining effective environments for student learning, understanding and organizing subject matter for student learning, planning instruction and designing learning experiences for all students assessing student learning, and developing as a professional educator. The *Continuum of Teacher Development* is a tool for teacher reflection, for coaching conversations, and for formative assessment of a teacher's level of practice. Teachers and principals are using this framework to understand the dimensions of practice that contribute to strong learning and teaching. The new Professional Growth and Evaluation system is founded in these standards. *The Five Dimensions* framework provides a tool that allows teachers and principals to dive more deeply into purpose, engagement, curriculum, pedagogy, assessment, and classroom culture. This framework provides questions to lead the professional inquiry toward greater levels of instructional effectiveness.

The Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS) define practices for disciplinary thinking that teachers use to ground every course and lesson. These practices and habits of mind deepen meta-cognitive processes and strengthen the opportunities students have to think deeply about the themes, trends, and crosscutting disciplinary concepts bringing meaning to their studies.

Toward Powerful Learning

Effective learning for the staff parallels the elements of learning and teaching for students.
The learning environments described in the section on **Learning and Teaching for Children** are both capital-intensive and people-intensive. The widespread infusion of technologies calls for a significant capital outlay. But, boxes and wires do not educate. Integration of technologies creates a compelling need for more highly educated teachers – teachers who know how to personalize student learning. Peter Drucker suggests that we are in an *Age of Learning*. In this *Age of Learning*, he asserts, technology can do some of the simpler tasks so that teachers are free to do what teachers do best – to attend to the intellectual, emotional, and ethical development of the child. Teachers choose technologies to do the more simplistic tasks once required of teachers. More importantly, teachers select technologies that provide integrative learning opportunities that were not previously available.

Teaching in this way is complex, sophisticated, challenging, and intensely intellectual work. The role of each individual teacher has become extraordinarily significant. Successful teachers are those who

prepare for their students, not just for their lessons. Successful teachers are more skillful in knowing and understanding individual learners. Successful teachers respond to diverse learners with varied culturally responsive approaches to instruction. Each teacher has a range of strategies and is able to choose the strategy to fit both the content and the learner. Teachers prepare student-centered, divergent learning experiences that draw each and every student to high standards of performance. Teachers in this *Age of Learning* work from student strengths rather than focusing on the weaknesses. Effective teachers carry the belief that every child can be successful. This mindset leads to a reorientation of teachers' role and disposition toward teaching.

Highlight my strengths, and my weaknesses will disappear. Maori saying.

An Ethical Professional Culture

A vibrant collegial culture takes advantage of formal learning teams, natural collaboration, and differing expertise.

Learning teams for adults, as for children, mean that people have formal connections defined by assignments, roles, and responsibilities. The development of the skills of team learning is a deliberate focus. Teams are developing collective responsibility for the success of each member and of the whole team. Teams reflect on their work and in the planning process ask themselves, "How could we make this better, stronger?" The *Culture of Critique* and the skills of teaming are being taught and practiced through dialogic processes, studio and lesson study, action research, critical friendship techniques, dialogue, and varied protocols for group inquiry.

Natural collaboration for adults, as for children, means that people work together in varied and flexible groups. Everyone comes to the table, the task, or the discussion with a unique interest and piece of the truth. Natural collaboration requires openness, respect, a relentless drive to improve, and an unlimited capacity for inquiry.

Differing expertise is a concept that recognizes the unique contributions of each learner. Different questions, different experiences, different lenses through which one makes meaning all contribute to differing expertise. When adults working together recognize each other for their differing expertise, a rich culture of collaboration develops.

The West Linn-Wilsonville School District is uniquely prepared to support the requests of a single teacher or a group of teachers who identify an interest or staff development need. The tuition reimbursement format, the PDC grant format, staff development days, summer curriculum time, and grant money from several federal grants, all are designed to be responsive to teacher staff development needs.

Developing Best Practices

Professional Development is designed with the following components of effective professional development in mind.

- Development and practice close to the classroom
- Connection to student learning
- Developing disciplinary expertise and content knowledge
- Hands-on technology use
- Curriculum-specific applications
- New roles for teachers
- Collegial learning
- Active participation of teachers
- Ongoing process
- Sufficient time
- Technical assistance and support
- Adequate resources
- Continuous funding

Teachers in the West Linn-Wilsonville School District are engaged in the study of many critical issues. Some of the current topics are referenced in the list below. Each of these study areas has an implication for and connection to integrated use of technologies.

1. Mathematics
    a. Algebra Structures
    b. Math Best Practices
    c. Productive Mathematical Collaboration
    d. Growth Mindset
    e. Common Core Standards and Practices

2. Science
    a. STEM and STEAM
    b. Engineering
    c. Contextualized Field Study
    d. Student research
    e. Sustainability
    f. Growth Mindset
    g. Next Generation Science and Engineering Standards and Practice

3. English, Language, Literacy, Social Sciences
    a. Culturally Responsive teaching and materials
    b. Writing
    c. Close reading

d. Common Core Standards and Practices
e. Growth Mindset
f. World Language and culture for all students
g. Educating Emerging Bilingual Children
h. Best practices instructional strategies in the regular classroom
i. ELD Through Content
j. English Language Development
k. Dual Language

4. Educating children with Special Needs
   a. Best practices instructional strategies in the regular classroom
   b. Growth Mindset
   c. Circles of Support for all children
   d. Intensive Expert Instruction in Reading
   e. Intensive Expert Instruction in Writing
   f. Intensive Expert Instruction in Mathematics
   g. Intensive Expert Instruction in Social-Behavior
   h. Special Education

Aligning to Standards

The emphasis at the district level is to increase attention to the role of technologies in integrative student research, mathematics and science inquiry, and deep literacy learning. Staff development is designed to address the national technology standards for students, teachers, administrators, and libraries in technology and information literacy. These standards documents are included in Appendix A.

1) ***Technology Educational Standards for Students***
2) ***Technology Educational Standards for Teachers***
3) ***Technology Educational Standards for Administrators***

Through coursework and professional development experiences, the district is supporting the implementation of High leverage Instructional strategies. In this culture, teachers are expanding their expertise, tapping into the research base, adopting a scholarly approach to professional improvement, practicing with colleagues, and developing the natural collaborations that take advantage of brilliance within the learning community.

Diverse Training and Learning Opportunities

The district hosts a "Teaching and Working Summit" in the summer just before school begins. The summit is a full-day event of 45-60 minute sessions covering technology tools and resources as well as their integration into the Teaching, Learning, Administration, Curriculum, and Assessment of the district.

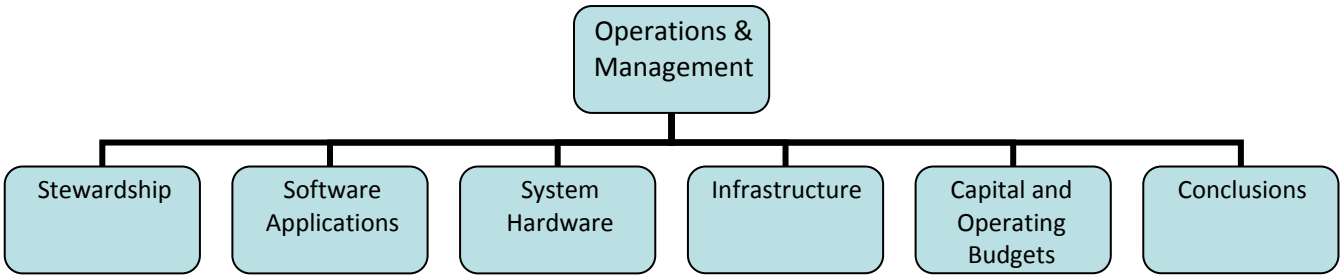
The structure and content of the event is determined based upon feedback received from teachers and administrators via electronic survey as well as from anecdotal conversation and the leadership of the district. Teachers are asked what topics they would like to attend and are also asked what sessions that they may be able to teach. The T&W Summit schedule of sessions is developed by the IT Director.

Additionally, each school – through the school leadership team – provides regular on-going training opportunities for all staff throughout the year. Although the specifics are slightly different, each school offers these workshops and trainings approximately every few weeks.

References

- National Educational Technology Standards (NETS) for Students (2007). ISTE. www.iste.org
- National Educational Technology Standards (NETS) for Teachers (2000). ISTE. www.iste.org
- National Educational Technology Standards (NETS) for Administrators (2002). ISTE. www.iste.org
- "e-Learning: Putting A World-Class Education at the Fingertips of All Children." U.S. Department of Education. 2000. http://www.ed.gov/about/offices/list/os/technology/reports/e-learning.html
- School Technology and Readiness (STaR) Chart. CEO Forum. http://www.ceoforum.org/starchart.html
- Common Sense Media
- Critical Issues: Providing Professional Development for Effective Technology Use. www.ncrel.org
- Information Power. American Association of School Librarians. www.ala.org
- Planning Good Change with Technology and Literacy. Jamie McKenzie. 2001. www.fnopress.com
- Smart and Good High Schools. Thomas Lickona, Matthew Davidson. 2005. www.cortland.edu/character
- Five Minds for the Future. Howard Gardner. 2006. www.HBSPress.org
- F. Levy & R. Murnane, "Preparing students for work in a computer-filled economy," *Education Week* (September 1, 2004)

OPERATIONS & MANAGEMENT



The "business" of operating and managing a modern high-performance public school system requires the professional application of technological tools at a level equal to or higher than that associated with any successful business enterprise.

To support necessary and expected educational and curriculum goals, school districts must create and implement basic business strategies including but not limited to the areas of:

Finance	*Personnel*	*Inventory*
Printing & Publishing	*Technology Infrastructure Management*	*Food Service*
Transportation	*Geographic Distribution*	*Data Management*
Facility Management	*Energy Conservation*	*Environmental Safety*
Capital Construction	*Public Law*	*Public Relations*
Communications		*Student Records*

These fundamental imperatives must be carried out in the most efficient and effective way possible. Advanced technology, as a tool, provides the best, and possibly the only, means by which the public's business can be routinely assured.

This section of the Technology Plan, therefore, responds to these elementary needs by laying the framework, aside from, but not totally independent of, the educational goals associated with public education.

Stewardship Goals

The term "stewardship" best describes the role the district plays in operating and managing the district's technological assets. The following goals support that notion:

1. Construct and maintain technology systems that support and enhance learning.
2. Create technology-based solutions to efficiently manage daily operations.
3. Identify and resolve network system inefficiencies.
4. Develop effective funding strategies and budgets to support operational and long-term Technology Plan goals.

Software Applications

Each of the various operational functions of the school district relies on technology to carry out individual department goals in coordination with the district wide vision. Many software components are readily interchangeable between departments and between operations and instruction.

In some cases however, software is not compatible, or applications are specialized for the intended purpose only. Examples include:

- Boundary software that enables forecasting and planning for school attendance boundaries.
- Direct Digital Control software that monitors, manages, and troubleshoots all HVAC equipment district wide.
- Inventory software that manages and records district moveable assets.
- Food Service software that keeps track of lunch tickets and accounts receivable.
- Scheduling Software for extra-curricular and Community Ed building use.
- Student Information Databases for Attendance and Grading, Special Education Tracking, and Standardized Test Score Tracking.
- Project Management software for maintenance and capital construction.
- Work Order software to manage and record daily maintenance activity.
- Variety of financial, personnel, and business programs tailored to specific functions.

Each of these applications requires a process for purchasing, training, daily usage, licensing and upgrading over time. Budgets to support current applications as well as future opportunities must be accommodated.

System Hardware

Similar to software applications, in some cases specialized hardware is necessary to carry out non-instructional functions. Examples include:

- Computers with exceptional speed and/or memory (PC and/or laptop)
- Application software specific computers
- Mobile devices to manage personal time and resources
- Digital photo and video equipment
- Projection devices
- Telephone system hardware components and handsets
- Cellular telephones
- Paging devices
- Security system hardware
- Fire alarm system hardware
- Public address system components
- Sound amplification and distribution systems
- Copiers, fax's, printers, routers, servers, monitors, etc.

Each of these hardware devices serves a specific purpose, increases safety and greatly enhances the educational experience of students, as well as the productivity and effectiveness of district staff.

Infrastructure

Related to all technology is the built environment in which it is installed and operated.

Furnishings, floor space, voice/data/video connections, electrical power and cooling/ventilation are necessitated by each hardware purchase.

Architectural Design and Construction

Since 1989, the district has been in an almost constant state of construction due to increased enrollment. For this reason, the district has become fairly sophisticated in regard to contemporary design for K-12 educational facilities and has led the Pacific Northwest in cutting-edge design. A significant amount of energy and time has been devoted to integrating technology into the architectural design of all buildings, whether new or remodeled.

Classrooms, Libraries, Offices and general building spaces have been designed such that technology is a central theme. Examples of successful building design that supports technology based curriculum includes all district libraries. Lowrie, Trillium Creek, Inza Wood, Athey Creek, Boeckman Creek, Cedaroak Park, West Linn High, Wilsonville High, Rosemont Ridge and Boones Ferry all take advantage of classroom pods clustered around versatile technology-friendly "porches" that facilitate collaborative teaching and learning.

As the district expands and is renovated, unique and innovative architectural design solutions that respond to technology use should continue.

Data Cabling

Generally, the district has an adequate data and telephone-cabling network. The demands of current applications into the future will continue to put a strain on the existing capacity though. The need to update the main in-building backbones of the buildings with higher capacity and throughput is upon us.

Although the district is currently wired for most applications and is reasonably flexible in terms of location availability, installation and/or relocation of data/voice port connections is fairly routine. In many cases, the district currently uses private contractors to make these changes.

Wireless Networking

Wireless access to the system is in place throughout all district facilities. The Wifi system currently consists of local wireless network controllers in each building and a distributed network of Wireless Access Points (WAPs). There are currently well over 300 WAPs deployed around the district's facilities. The wifi network uses a combination of the 802.11a, b, g, and n standards. While adequate at this time, the reliance on wifi networking is exploding at a very high rate. We will need to deploy additional WAPs – perhaps doubling or even tripling the quantity – and we should take advantage of the newly adopted 802.11ac standard that brings increased throughput and stability.

Wide Area Network

The district's local area networks are interconnected via Gigabit wide area circuits provided by Comcast. These circuits support all data and voice traffic in the district. With some intergovernmental

agency coordination, we hope to be able to tap into the county dark fiber project to replace our current service. This will include some costs to make the last legs of connections. It will also mean the need to update some electronics in our schools to connect into these new connections. The monthly costs of this ongoing WAN service should be dramatically reduced as a part of this, even as we take advantage of the dark nature of the fiber to increase the bandwidth with minimal costs into the future.

Electrical Power

All locations have new adequate line-power electrical entrances. Internal distribution in the older schools remains problematic; however, the addition of circuits and receptacles is achievable. The district does not have an electrician on staff and therefore must contract for all electric technical installation.

Heating/Ventilation/Air-conditioning

As of 2013 all of the fifteen schools and three support facilities in the district are new enough, or have been upgraded such that heating, ventilation and air-conditioning (HVAC) systems are adequate to sustain the heat loads produced by the technology equipment.

Intercom Systems

With recent current events, the need to be able to address the entire school, or portions thereof, has become heightened. While our phone systems provide some ability to perform this function, they are simply not adequate in many cases, sometimes simply due to volume. Also, where no phone exists or a space is large, a single phone cannot get the attention of everyone in the vicinity. Our middle and high schools (except for Arts & Technology High) have these building-wide, overhead intercoms, but we recognize the need for these systems in the primary schools as well. Integration of these systems with the phone systems, so as to be able to make announcements from anywhere inside or outside of the school is also important.

Cell Phone Coverage

The district, like many agencies, has become increasingly reliant on cellular phone communication in order to handle a wide-variety of activities. Currently, there are pockets of cell coverage issues throughout our schools. This particular technology also assists in communications for emergency service providers (police, fire, etc). We are working with providers to increase this coverage via strategically located towers, but may need to install DAS (Distributed Antenna Systems) within some locations in order to provide adequate coverage.

Capital and Operating Budgets

Fiscal 2001-2002 was the first year the district identified specific budget line items for technology. The operating budget includes funding for technology support personnel, supplies and materials, and minimal equipment replacement due to failure. In Fiscal 2004-05, additional funds were budgeted for expansion of the tech support staff. In Fiscal 2005-06, additional budgetary items were added for software license renewal.

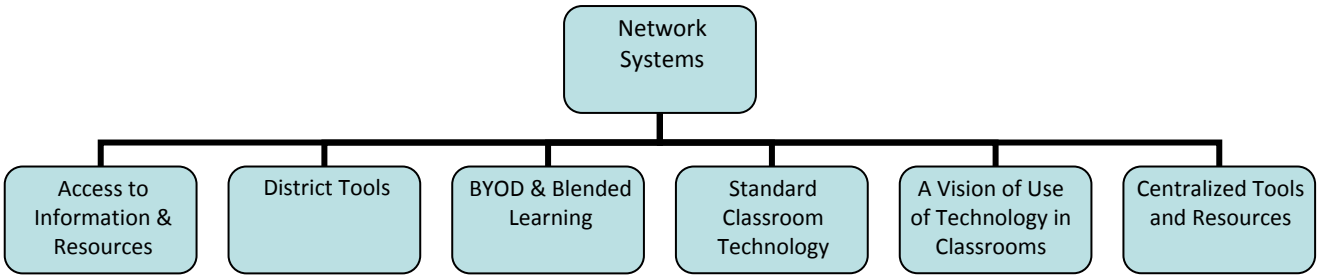
Capital funds come to the district primarily through local bond elections. The 1997 bond provided the infrastructure and some of the hardware/software components in use today. Major upgrades to those components began in 2003 via funds from the 2002 bond with district-wide refreshment between 2009-2012 from the 2008 bond. As is typical of all technology, obsolescence is inherent in the industry. As the district expands in both enrollment and capacity to use technology, capital funds for upgrades, enhancement, expansion and system component replacement will be necessary on a regular basis.

Conclusion

A "systems approach" requires stewardship of the district technology plan in all areas that support education; from academics to support services. Creating, funding, and implementing flexible strategies to maintain and expand these services is imperative; and will assure success for generations to come.

Recognizing that the School District is a multi-million dollar business that is held to the highest level of accountability for both public assets and quality of children's education, "technology" and its successful application is primary to honor and maintain the public trust.

TECHNOLOGY NETWORK SYSTEMS



Access to Information and Resources

It has been argued that access to information and resources levels the playing field of educational opportunity. Students who are deprived of this access suffer from limited exposure to information, especially that of differing viewpoints. In a very real sense, we all have the ability to carry the enormity of access to virtually any piece of information in our pocket. Think about that – the resources of the Library of Congress at your fingertips. And yet, it is actually even way more than that. In our society, anyone with the right tool can access just about any piece of information desired and often within seconds.

Where the labor of that information retrieval consumes valuable time and energy, there is an inability to raise education beyond algorithm processing and information recollection. However, where the barriers to that information are removed, deeper analysis and synthesis of information can be achieved, additional points of view can be accessed and scrutinized, and collaborative opportunities can widen perspective and connections.

In order to reach these realities, students and staff must have access to the tools needed and also must have access to connect. The infrastructure as outlined in the previous section of this plan provides stable, high-speed access within our buildings.

While the district has some limitations in terms of our ability to provide online access in the home, we will attempt to influence and coax those who can help bridge this divide to do so, especially for those in need. That may include service providers themselves but also municipal and county governmental agencies and perhaps even providers of low-income housing locations.

The prophecy of every student having access to a device when and where they need it is not new. This has been the vision for years. However, it is only recently – perhaps accelerated by the power of personal, mobile technology – that this as a potential reality has been achievable. At the same time, Internet access is also spreading. Technology tools and the resources that are made available by them are increasingly ubiquitous and transparent.

When technology is deployed in a 1-to-1 fashion, the power of serendipity and immediacy can take effect. The power of having a question now, and being able to pursue that question now cannot be overstated.

With a technology tool in-hand, students can also become more active in their education. Consider the task of reading a chapter in a book. With hard copy, the student is constricted by the media. We have

developed lots of strategies to become a more active reader. For example, students learn to use context to build vocabulary.

However, with a multi-purpose tool in hand, a student can actively access multiple definitions of a word and beyond. Imagine reading a passage that refers to the Leaning Tower of Pisa. Within a few clicks, students can access a picture of it along with some quick facts. These insights bring deeper meaning and relevance to the original text.

In the science classroom, experiments can be simulated by simply adjusting variables. More simulations create better insight.

In the social sciences, students can access varying viewpoints. They can research the history of a situation and gain deeper understanding.

In the math classroom, technology can bring greater synthesis to the application of the theories being learned. For example, we can be told that linear algebra is actually the basis to most computer animation, but with a technology tool in hand, they can be given tasks that cause them to manipulate the mathematical model to create specific results in an animation.

In Wellness, students can track their diet and exercise habits in order to influence their physical well-being.

Technology allows the engineering in STEM to come alive. When posed with a real-world problem – for example, program this robot to navigate through a maze of unknowns – the significance of doing something real causes the learning to come alive.

The research and inquiry aspects provided by access to technology are clear as well and so too are the communication and collaboration opportunities provided by these resources.

Near real-time assessment tools, like NWEA MAP, provide the opportunity for quick results to be obtained and discerning teaching adjustments to take place.

The debrief of our Studio Classroom projects often bring forward some aspect of the classroom experience that was either enriched by the insightful deployment of a technology resource or that could have been.

The possibilities are endless. Teachers need to come to understand these types of activities and others like them, and then allow/encourage them to be appropriately and masterfully used in their classrooms. As a district, we will continue to provide opportunities for our staff to learn of these types of activities from experts, but also from ourselves. As a leadership group extending to include the IT staff and Teacher-Librarians, we will foster this environment of exploration and innovation. While there may certainly be value to doing some things the “old way”, access to technology opens new opportunities.

The focus is on the experiences and outcomes that lead to better teaching and learning through inquiry and synthesis.

It is important to note that this plan is not about the technology itself. While much thought needs to put into the selection of devices, it is not the device that should drive this. The improvement and

enhancement of the pedagogical practices in the classroom that enhance the educational experiences of students toward the achievement and surpassing of initiatives like the Common Core Standards or the Next Generation Science Standards is the ultimate goal.

District-Provided Tools

While an environment of self-selected tools has some power, it is clearly preferable in the educational arena to have conformity and consistency of device and the abilities they provide. For example, if you have various devices and form-factors in play, a simple instruction such as "Turn to page 37" can mean vastly different things depending on the pagination methodologies of the particular tool.

In order to achieve this consistency and conformity of device, we plan to provide these devices to our students.

As things stand, our current student to computer ratio is nearly one-to-one in terms of sheer inventory and tallies. By comparison to most of our neighboring districts, this ratio is quite good. However, the age of our devices is an issue that limits this potential.

This is also wanting in that specific devices for specific purposes are not available when needed. For example, a school with 280 students, 250 PC computers, and 60 Macintosh computers would seem to have enough to accommodate everyone with a device. However, when movie editing is the desired task, there may simply not be enough of the preferred device (Macintosh computers) available. And, despite occasional thoughts to the contrary, there is a difference in some devices' abilities to perform certain tasks.

Even as students have access to a device dedicated to them, there will be times when other devices are needed for specific tasks and learning activities. So, while numbers would seem to indicate that a computer/device per student should be "enough", even that is simply not true.

As we move ahead, we intend to pursue:

- One-to-one deployment models of devices to students
- Lab-based solutions for certain activities
- Update/replace core teaching and office systems
- Updates to the infrastructure of the district to keep the core system robust and stable

Our intent is to have 3 rollouts of technology tools over the next 6 years. The first would occur in school year 2015-16 with subsequent purchases in summers of 2017-18 and then 2019-20. The specifics of each will be determined just before the actual purchases. In this way, we are most able to capitalize on the latest technological developments. However, in an effort to provide some insights as to the possibilities, a purchase in 2015-16 ***might*** include:

- Enough tablets to cover an entire grade level of students (or multiple grade levels)
- Sets of full-size traditional laptops (for standardized testing or other needs that would be best performed by specific abilities) for each school
- Replacement/updating of approximately 1/3 of core teaching systems
- Upgrades to the wifi system in our district

BYOD – A piece of the plan, but…

Our plan, as laid out in this document, will not rely on BYOD to achieve our goals. However, we will continue to allow personal devices into our environment within the guidelines of the individual school and classroom so long as they do to not cause issues to the educational or technological environment.

We must be clear in our expectations about personal devices at school. In particular, students and families must understand that use of the tool should be safe and appropriate to their education. Students who bring their devices to school must understand that the devices may be confiscated and reviewed at any time by school staff. Students are responsible for the security of their device. Students must also understand that they should always follow the instructions of teachers and staff regarding the use of personal technology.

As we partner with parents, we ask that they take an active role in making sure that technology brought to school does not contain information or data that could be disruptive to the learning environment.

Blended Learning

Our buildings are constructed with learning porches, living rooms, and spaces that allow for various types of groupings and projects. This works well in a technology-rich environment in which varying and evolving tools necessitate different settings. It has also further opened the door to various forms of blending learning environments.

A blended learning environment is a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and pace, AND at least partly at a supervised brick-and-mortar location away from home. Of significance here is that a blended learning environment is not a virtual school, at least not entirely.

In our schools, we have many variations of blended learning environments. At the younger ages, the educational environment is largely teacher driven and organized. Technology use is purposeful and periodic. As students get into the upper primary grades, they use technology tools more often and productively. Open-ended projects that incorporate technology begin. Students use technology to produce products of their learning.

As students enter middle school, technology begins to be used for more personal organization, a skill that is difficult to learn. They continue to use technology to perform research and produce products. However, they also begin to use technology tools to organize their contacts, maintain to-do lists, keep track of class assignments, and maintain a personal schedule. Students engage in peer review and collaborative activities using a variety of tools.

As we evolve into this more personalized technology world, our systems will adjust. We will take advantage of various online tools to help us deliver materials and communicate, and capitalize on the learning moments to discuss confidentiality and security of information. These tools might very well include RosettaStone, GoogleApps for Education, Edmodo, Moodle, and various others as well.

As mentioned in previous sections of this plan, students need to understand the concepts of Digital Citizenship, in its various domains. Students need to learn how to be safe. They also need to learn how to perform intricate web searches and be able to critically scrutinize sources. They need to be aware of copyright. They need to understand the etiquette of online collaboration. Students should realize that they can leave a digital footprint. We are using a resource called "Common Sense Media" (www.commonsensemedia.org) to help us develop a scope and sequence that will steer us further down the road as outlined by the ISTE Standards.

In this new environment, the value of teachers will be heightened. While students will have more access to data and information, they'll still need direction in creating meaning from and interpreting the value of this information. Teachers will need to stay with students as they explore topics and materials that are sometimes new to the teachers themselves. They will need to help students at the learning moments that occur. They will need creatively frame inquiry and help students establish pathways for learning. The effective, innovative teacher will be willing and able to adjust and adapt as new opportunities become available and understood. The teacher's ability to continually assess the effectiveness and availability of these tools will be paramount.

Standard Technology for all Classrooms

The typical classroom will have access to the following technologies:

- Data Projector
- Document Camera
- Phone
- Digital Camera
- Computer (at least one)

While we have occasional desires to mount equipment (projectors, sound systems) in rooms, we have come to discover that the need for the classroom to remain a flexible space, including the use and placement of the various technologies, makes permanent mounting solutions not as desirable as might be expected. Permanent mounts somewhat limit the ability to upgrade equipment in place as mounting locations may or may not be correct for the next generation device.

Many of our schools have wide-scale deployment of end-user devices in the classrooms themselves. This has proven to allow for serendipitous learning opportunities and also to further understand the usefulness of the device itself.

We also have schools that use carts of laptops or tablets to accomplish classroom tasks. This model allows resources to be pooled to provide access to full classes and, like the classroom deployment model, has also been effective but for slightly different uses.

A Vision of Use of Technology in Classrooms

In every classroom in the district, the teacher has a multimedia capable setup that includes projection of computer images as well as still and motion video on a display at least 60 inches in diagonal size. The room has adequate speakers for ease of listening and appropriate volume. Wherever possible, wireless technology is employed so as to reduce clutter and potential hazards.

Our core technology system is robust and strong. We are the only district in the area that provides students with network personal and shared storage space. Students, like many adults, are at least occasional creatures of “re-creation”. This means that students often pick up something that was worked on in the past and modify it. In this sense, they are being “re-creative”. The ability to access documents and projects from prior school years can be very valuable. And, as anyone who has changed devices over the years or suffered from accidental loss of information, storage on mobile devices themselves is sometimes unstable and occasionally problematic.

So, we will continue to provide personalized, centralized storage to our students and staff and will encourage its use for permanent storage. We acknowledge that having access to your data right on your device is often more convenient especially since Internet access, while increasingly pervasive, is not yet ubiquitous or necessarily fast. Being able to store documents and data on our system provides the security of it being backed up and also provides a method of sharing between users and potentially between an individual user’s many devices.

Our unique WLWV Cloud along with its related tools allows Macintosh and PC computers access to these locations. Third party tools allow similar access to these systems from iOS and Android devices as well.

Every student has a district provided email account. Students can print things in both color and black-and-white. Teachers can distribute notes, worksheets, and other materials to students in their home directory and then collect it back. Teachers can email their entire class with a single address. Teachers can email all parents of the students in their class with a single address. Schools send periodic newsletters and announcements to the students and to the homes via email.

As we go further down the road of one-to-one computing, students and staff will focus less on the technology itself and more on the educational benefits it allows – collaboration opportunities, access to information, the ability to collect data in real-time, the reality of real-time documentation of processes and steps, and much more.

Some shared spaces will continue to have desktop computers available. These spaces may be used in a variety of ways, much like they are now. However, they will not be dominated by entire class usage as is often the case as things currently stand.

Our phone system includes wired, VoIP-based phones in every occupied room of the building with some additional in shared office spaces. The phones integrate with the computer network so that a computer with microphone/headphones could become anyone’s phone as needed or desired. Phone system changes, modifications, and additions are managed by our IT staff via a web-based configuration system.

Our video system will continue in its latest incarnation as an IP-based solution as well. Old style TVs, VCRs, and other similar equipment will naturally become less-used, but some will remain so as to allow the use of older sources.

Access to our resources will be 24 by 7 by 365. This is accomplished through redundancy of systems, connections, and power supply. Access to our licensed services is available via VPN access into the network thus allowing an outside computer to be accessible as if it were inside the network. File Servers are centrally located and managed taking advantage of virtualization technologies to reduce power use.

Centralized Technology Tools and Resources

As we expand and enhance our use of technology, our reliance on stable networking will continue to explode, especially in the wireless technologies. Our heavy reliance on our core server environment will be lessened as devices become more personal and the servers are increasingly focused on storage.

Our main links within our buildings need to be expanded as may be the case with the links between buildings and out to the Internet as well. We will continue to monitor this usage and already have begun plans to expand this access.

We will also be looking to retire some older equipment that has reached the end of its useful life. In a few cases, we will be replacing the equipment and system with newer hardware and software that is both more feature-rich and less expensive. In other cases, the systems will be discontinued.

Safety is always a paramount focus of our schools, and technology's role in that focus is even bigger than it ever has been before. Our need to communicate within our schools has never been higher. Many of our schools have only the phones to serve as their intercom system and many have no reliable cellular phone coverage.

We are looking at both short and long term solutions to both of these issues. We are exploring alternative intercom systems as well as attempting to quantify and fully comprehend the extent of our cell coverage issues.

As is always the case, we continue to pursue the most complete use of the systems that we already have as well. From our projectors and document cameras to our websites and email systems and everything in between and beyond, we are always seeking to exploit the full capabilities of all of our systems.

We continue to reap the benefits of core system upgrades invested in as part of the 2009 bond:

- Our virtual file server environment and SAN has kept us nimble and able to deploy new systems very quickly and at minimal expense
- Our core network electronics continue to run well and at necessary speeds

While our current technology has allowed us to explore the one-to-one environments and will continue to do so for another year or so, we will need to engage all stakeholders in helping us to achieve the one-to-one environments that we believe are the future, even as those end-user devices begin to reach obsolescence. Key partners in this are local parent-teacher organizations. As these organizations fund-raise for the various initiatives at a school, we ask them to help us pursue this one-to-one environment, especially in an ongoing sustainable way.

The Need for Ongoing Support

The district currently has approximately 5,000 computers in total; roughly 750 of those are primarily used by staff which leaves about 4,250 that are used primarily by students. There are about 1,250 desktops and 3,750 laptops. There are also an ever expanding number of iPads as well. At the time of this document, that number was approximately 750. There are about 475 data projectors and 450 document cameras. We also have nearly 800 digital cameras.

There are several important things that we have done that make such an inventory of equipment continue to thrive:

1. We have an outstanding staff of well-versed IT support people,
2. We have held strong to hardware and software standardization whenever possible,
3. We maintain a hard drive imaging system which dramatically reduces implementation timelines and support demands, and
4. We have had stability and consistency in our system.

Our frontline IT support staff of 8 full-time employees supports our 5,000 computers. In the industry, the preferred computer-to-tech support ratio is approximately 60-to-1. According to Justine Nguyen of CNET, in extremely efficient environments, this ratio can approach 125-to-1. In WLWV, this ratio is over 600-to-1. As a package, the strategies outlined above have allowed us to expand our system without increasing our IT staff even while keeping it functional and thriving. The size of our support staff, however, may need to expand as we make these leaps forward, especially in needing to help with a wider variety of devices and resources.

APPENDIX A

ISTE-NETS-S

International Society for Technology in Education
National Educational Technology Standards – Students

- Creativity and Innovation

  Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

  a. Apply existing knowledge to generate new ideas, products, or processes
  b. Create original works as a means of personal or group expression
  c. Use models and simulations to explore complex systems and issues
  d. Identify trends and forecast possibilities

2. Communication and Collaboration

   Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

   a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
   b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
   c. Develop cultural understanding and global awareness by engaging with learners of other cultures
   d. Contribute to project teams to produce original works or solve problems

3. Research and Information Fluency

   Students apply digital tools to gather, evaluate, and use information.

   a. Plan strategies to guide inquiry
   b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
   c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
   d. Process data and report results

4. Critical Thinking, Problem Solving, and Decision Making

   Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

   a. Identify and define authentic problems and significant questions for investigation
   b. Plan and manage activities to develop a solution or complete a project
   c. Collect and analyze data to identify solutions and/or make informed decisions
   d. Use multiple processes and diverse perspectives to explore alternative solutions

5. Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

a. Advocate and practice safe, legal, and responsible use of information and technology
b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
c. Demonstrate personal responsibility for lifelong learning
d. Exhibit leadership for digital citizenship

6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations.

a. Understand and use technology systems
b. Select and use applications effectively and productively
c. Troubleshoot systems and applications
d. Transfer current knowledge to learning of new technologies

ISTE-NETS-T

International Society for Technology in Education
National Educational Technology Standards – Teachers

Effective teachers model and apply the NETS·S as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community. All teachers should meet the following standards and performance indicators.

1. Facilitate and Inspire Student Learning and Creativity
   Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
   a. Promote, support, and model creative and innovative thinking and inventiveness
   b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources
   c. Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
   d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

2. Design and Develop Digital Age Learning Experiences and Assessments
   Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS·S.
   a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
   b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
   c. Customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
   d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching

3. Model Digital Age Work and Learning
   Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.
   a. Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
   b. Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation

c. Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital age media and formats
d. Model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

4. Promote and Model Digital Citizenship and Responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.

a. Advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources
b. Address the diverse needs of all learners by using learner-centered strategies providing equitable access to appropriate digital tools and resources
c. Promote and model digital etiquette and responsible social interactions related to the use of technology and information
d. Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital age communication and collaboration tools

5. Engage in Professional Growth and Leadership

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.

a. Participate in local and global learning communities to explore creative applications of technology to improve student learning
b. Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others
c. Evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
d. Contribute to the effectiveness, vitality, and self renewal of the teaching profession and of their school and community

ISTE-NETS-A

International Society for Technology in Education
National Educational Technology Standards – Administrators

1. Visionary Leadership

   Educational Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.

   a. Inspire and facilitate among all stakeholders a shared vision of purposeful change that maximizes use of digital-age resources to meet and exceed learning goals, support effective instructional practice, and maximize performance of district and school leaders
   b. Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans aligned with a shared vision
   c. Advocate on local, state and national levels for policies, programs, and funding to support implementation of a technology-infused vision and strategic plan

2. Digital Age Learning Culture

   Educational Administrators create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students.

   a. Ensure instructional innovation focused on continuous improvement of digital-age learning
   b. Model and promote the frequent and effective use of technology for learning
   c. Provide learner-centered environments equipped with technology and learning resources to meet the individual, diverse needs of all learners
   d. Ensure effective practice in the study of technology and its infusion across the curriculum
   e. Promote and participate in local, national, and global learning communities that stimulate innovation, creativity, and digital age collaboration

3. Excellence in Professional Practice

   Educational Administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.

   a. Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration
   b. Facilitate and participate in learning communities that stimulate, nurture and support administrators, faculty, and staff in the study and use of technology
   c. Promote and model effective communication and collaboration among stakeholders using digital age tools
   d. Stay abreast of educational research and emerging trends regarding effective use of technology and encourage evaluation of new technologies for their potential to improve student learning

4. Systemic Improvement

   Educational Administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.

   a. Lead purposeful change to maximize the achievement of learning goals through the appropriate use of technology and media-rich resources
   b. Collaborate to establish metrics, collect and analyze data, interpret results, and share findings to improve staff performance and student learning
   c. Recruit and retain highly competent personnel who use technology creatively and proficiently to advance academic and operational goals
   d. Establish and leverage strategic partnerships to support systemic improvement
   e. Establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching, and learning

5. Digital Citizenship

   Educational Administrators model and facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture.

   a. Ensure equitable access to appropriate digital tools and resources to meet the needs of all learners
   b. Promote, model and establish policies for safe, legal, and ethical use of digital information and technology
   c. Promote and model responsible social interactions related to the use of technology and information
   d. Model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools

APPENDIX B

Oregon Educational Technology Standards Adopted December 2008

1. **Creativity and Innovation**
   Students demonstrate creative thinking and problem solving skills to develop innovative products and processes using (digital) technology. Students:
   A. Apply existing knowledge to forecast possibilities and generate new ideas, products or processes.
   B. Create original works as a means of personal or group expression.
   C. Develop or apply models and simulations to explore complex systems, issues and trends.

2. **Communication and Collaboration**
   Students use digital media and environments to communicate and work collaboratively, across the global community, to support individual learning and contribute to the learning of others. Students:
   A. Interact and collaborate with peers, experts, or others employing a variety of digital environments and media.
   B. Effectively communicate and publish to multiple audiences using a variety of media and formats.
   C. Engage with learners from other cultures to develop cultural understanding and global awareness.
   D. Contribute to project teams. Produce original works or solve problems in a team setting.

3. **Research and Information Fluency**
   Students select and apply digital tools to gather, evaluate, validate, and use information. Students:
   A. Plan strategies to guide inquiry.
   B. Locate, organize and use information ethically from a variety of sources and media.
   C. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
   D. Analyze, evaluate, and summarize information or data and report results.

4. **Critical Thinking, Problem Solving, and Decision Making**
   Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:
   A. Identify and define authentic problems and significant questions for investigation.
   B. Plan and manage activities to develop a solution or complete a project.
   C. Collect and analyze data to identify solutions and or make informed decisions.
   D. Use multiple processes and diverse perspectives to explore alternative solutions.

5. **Digital Citizenship**
   Students understand human, cultural, and societal issues related to digital technology and practice legal, ethical, and responsible behavior. Students:
   A. Advocate and practice safe, legal, and responsible use of information and digital technology.
   B. Model and practice a positive attitude toward using digital technology that supports collaboration, learning, and productivity.
   C. Demonstrate personal responsibility for lifelong learning.

6. **Technology Operations and Concepts**
   Students utilize technology concepts and tools to learn. Students:
   A. Select, use, and troubleshoot tools efficiently.
   B. Transfer current knowledge to learning of new technologies.

APPENDIX C

Technology Estimations for Remaining 2008 Bond Money

Wifi Upgrade	$50,000.00
Mini Maintenance	$30,000.00
Teacher Stations	$400,000.00
Cell Boosting	$250,000.00
Intercom	$25,000.00
iPad Project	$330,000.00
Total	$1,085,000.00

Explanation of Items:

Wifi Upgrade: Mainly additional Wireless Access Points to support the more dense and increasing use of wifi devices

Mini Maintenance: Batteries and other repair components to keep as minis functional for as long as possible (we currently have about 3100 mini computers)

Teacher Stations: Computer, Projector, Doc Camera setups for teachers – some to be acquired in summer 13 for added teaching spaces, but mostly updating teaching systems in summer of 2014

Cell Boosting: Estimate of the cost to install cell phone boosting technology in schools where coverage is inadequate

Intercom: An intercom system at Athey Creek where there is no such system and internal communication needs are high

iPad Project: iPads and associated components to have at least a class set at each school

APPENDIX D

Estimating for Future Technology Needs

Wifi Upgrades	$400,000.00		
10 GB Circuits	$200,000.00		
Dark Fiber in WV	$200,000.00		
User Devices - Rnd 1	$1,625,000.00	30% of enrollment (~2500) @$650 each	
User Devices - Rnd 2	$1,625,000.00	30% of enrollment (~2500) @$650 each	
User Devices - Rnd 3	$1,625,000.00	30% of enrollment (~2500) @$650 each	
Teacher Presentation Systems	$2,350,000.00	Computer/Tablet	$900.00
470 Stations		Projector	$1,000.00
		Document Camera	$500.00
		Classroom Interactivity System	$2,000.00
		Amplification System	$600.00
		Total per Teacher Presentation System	$5,000.00
Server Updates/Upgrades	$250,000.00		
Office Computer Systems	$225,000.00	150 @ $1500	
Salaries	$1,650,000.00	$275,000 for 6 years	
Network Upgrades	$250,000.00		
Intercoms	$300,000.00		
Total	$10,700,000.00		

Explanation of Items:

Wifi Upgrades: Additional Wireless Access Points and replacement of some existing along with controllers to bring wifi technology to the AC standard (faster and more redundancy)

10 GB Circuits: Upgrade of existing 1 GB WAN circuits, includes cost of installation and equipment

Dark Fiber in WV: Cost to be able to join the Clackamas County fiber project in Wilsonville

User Devices: Specific items to be determined leading up to actual purchase *Round 1, 2, and 3* are intended to be 3 large purchases of these items spaced 2 years apart

Teacher Presentation Systems: These are teaching stations like what we have now, but with a couple added components – audio amplification and potential classroom interactivity systems. Each setup would be approximately $5000 and there are 470 such teaching locations in

	the district. The plan will be to update these systems in 3 stages synchronized with the User Devices.
Server Updates/Upgrades:	Cost to keep current VM environment functional and augmented with some servers for specific applications
Office Computer Systems:	Computers for staff who primarily work at their computers during the day (secretaries, counselors, etc)
Salaries:	Costs associated with the staff needed to implement the items outlined above
Network Upgrades:	Network components to support upgrading internal networking environments
Intercoms:	Enhanced intercom systems within schools (10 schools @ $30,000 each)

APPENDIX E

WLWV STEM White Paper
follows over the next pages

STEM Education and West Linn-Wilsonville K-12 Programs: An overview and framework for development

Prepared by:
Nell Achtmeyer
STEM Program Coordinator
CREST
February 26, 2014

Definition of STEM

The Oregon STEM Education Initiative proposes the following as a new description of STEM Education:

> An approach to teaching and lifelong learning that emphasizes the natural interconnectedness of the four separate STEM (science, technology, engineering and mathematics) disciplines. The connections are made explicit through collaboration between educators resulting in real and appropriate context built into instruction, curriculum, and assessment. The common element of problem solving is emphasized across all STEM disciplines allowing students to discover, explore, and apply critical thinking skills as they learn.

District Mission, Vision Themes and STEM Education

The core elements of STEM Education are inherent in the District's vision themes and mission question: *How do we create learning communities for the greatest thinkers and most thoughtful people…for the world?* The West Linn-Wilsonville School District envisions a school learning community which:

1. Demonstrates personal and academic excellence;
2. Provides a personalized education to improve student performance;
3. Establishes community partnerships and expands the classroom beyond the school;
4. Creates a circle of support for each student;
5. Educates the whole person—intellectually, emotionally, physically, and ethically;
6. Integrates technology in daily learning.

A personalized education for all students that is inquiry-based, collaborative, and integrated in teaching and learning is important in providing real world connections to STEM disciplines. This approach allows for opportunities to extend learning from the classroom into field and community based experiences. Similarly, integrating technology into daily instruction and learning is important in providing students with tools to connect disciplines of science, math, and engineering. It provides a framework for a K-12 continuum that integrates and identifies milestones within our learning communities for students to advance in STEM education. STEM education, as described in the diagram below, integrates many existing programs, while also planning for expansion and establishment of new learning opportunities and experiences for students.


Robotics
ISEF and Science Inquiry
Community Partnerships
District Tech Plan
NETS (Technology Standards)
NGSS (Science)
CCSS (Math and ELA)
CREST Farm and Field Experience
CTE Programs of Study
Professional Development
STEM Education

Primary Elements for STEM Education Program

STEM education in the District, and the expansion of the program, considers the following elements. These six elements are described in great length in the following pages.

- **Best Practices and Instructional Leadership.** The District is exploring the studio and lesson study models of professional development to support effective instructional improvement in mathematics and the sciences across the levels. In this model, teachers work collaboratively to understand best practices, work with state and national standards in content areas, and practice and receive feedback about their instructional practices.

- **State and National Standards in STEM Disciplines.** The Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), and National Education Technology Standards (NETS) provide important frameworks for best practices and scope and sequence for content across the grade levels. Using these frameworks and curricular resources is important to develop truly integrated STEM Education experiences for kids.

- **Environmental Context and Sustainability.** We believe that our greatest challenges in environmental sustainability will be solved through innovative technological solutions. Building a strong understanding in mathematics and the sciences in essential to having the skills to engineer and design these technologies of the future. Grounding students' STEM Education experiences in the environment and sustainable development context reinforces our District's mission of graduating global citizens.

- **Community Partners.** Fostering new and enhancing existing partnerships to support STEM Education is important in creating community collaboration around STEM Education development, finding funders for student service-learning projects, and partnering local professional in STEM related fields as mentors for students. The District currently works with educational providers, the University of Oregon, Oregon Tech (OIT), Oregon State University (OSU) Extension, and municipalities, METRO and the Cities of West Linn and Wilsonville in these efforts. Additionally, the District is part of the South METRO STEM Partnership and the planning and efforts around supporting a regional "STEM Hub".

- **Scope and Sequence of K-12 Experiences.** The scope and sequence of K-12 experiences considers the diverse ways that students engage in STEM education. This includes in classroom and school experiences, after school clubs, independent research projects, and summer and non school day experiences. In addition, this scope and sequence considers the practices related to the individual STEM disciplines, where there are commonalities, and how those practices build on each other throughout the levels to develop a deep understanding, critical thinking and problem solving skills when integrating the disciplines.

- **Career and College Readiness.** STEM experiences work to deepen student understanding while also providing opportunities to develop skills for both career and college readiness. This includes, but is not limited to, mentoring by industry professionals, internships with experts in STEM fields of study, and work experience in real world settings.

Professional Development for Instructional Improvement

The District sees the value and effectiveness of engaging teachers and administrators in a studio based, lesson study professional development experience. The District is exploring a similar approach for professional development around STEM education, similar to what has been historically used for instructional improvement in mathematics. Defining and documenting best practices in a discipline and then engaging in a year-long study of instructional strategies employed in the classroom, connections to curriculum, and assessment of student learning is critical in making professional development meaningful and relevant. Additionally, making connections to the Common Core Standards and STEM Education have been important pieces of that work, providing an opportunity to expand those studios and professional learning communities to consider science instruction and education and its interconnectedness with math.

Professional Learning Communities and Lesson Study in Primary Schools

CREST staff will work with teacher teams at the Primary Schools to form professional learning communities (PLC) around STEM education and instructional practices within STEM disciplines. PLCs will engage in a lesson study model where teachers review best practices in instruction for science and math, work to develop integrated lessons and provide feedback to those lessons by either reviewing tapes or making first hand observations during class times. The organization and support of this model is described below:

Year	School Year	Participants	Focus	Funding Requirements
1	2013-2014	STEM Coordinator, school principals, school ICs	Understanding the lesson study model	Subs for a District wide leadership STEM workshop in winter 2014
2	2014-2015	School ICs, grade level teams K-2	Lesson study for science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
3	2015-2016	School ICs, grade level teams 3-5	Lesson study for science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
		Grade level teams K-2	PLC during planning times and staff meetings and professional growth Wednesdays to continue lesson study work in less formal setting	None.
4	2016-2017	School ICs, grade level teams K-5	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
		Grade level teams 3-5	PLC during planning times and staff meetings and professional growth Wednesdays to continue lesson study work in less formal setting	None.
5	2017-2018	School ICs, grade level teams K-5	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year

Lesson Study with District Middle Schools

The District will support an intensive lesson study model with all middle schools in the District. Based on the success from recent studies and programs in middle schools in Northern California, the District will support a lesson study model for instructional improvement with both math and science teachers. The organization and support of this model is described below:

Year	School Year	Participants	Focus	Funding Requirements
1	2013-2014	STEM Coordinator, MS principals and assistant principals, MS science and math teachers	Understanding what is a lesson study model	Subs for a District wide leadership STEM workshop in winter 2014
2	2014-2015	Separate PLC of school/ grade level team of math and science teachers	Year long workshop on NGSS and CCSS and understanding math and science practices	Extra pay for workshops or additional PLC times??
3	2015-2016	Grade level teams for science teachers	Lesson study for science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
		Grade level teams for math teachers	Lesson study for math	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
4	2016-2017	Grade level teams for both science and math teachers	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
		STEM Coordinator, MS principals and assistant principals, MS science and math teachers	District wide PLC for MS science and math teachers	Subs for a District wide STEM workshops and planning and observation times between Middle Schools
5	2017-2018	School teams with both science and math teachers to work across school departments	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year

Integrated High School STEM Experiences

Year	School Year	Participants	Focus	Funding Requirements
1	2013-2014	STEM Coordinator, HS principals and assistant principals, math and science department heads	Understanding what is a lesson study model	Subs for a District wide leadership STEM workshop in winter/spring 2014
2	2014-2015	Separate PLC of school/ department of math and science teachers	Year long workshop on NGSS and CCSS and understanding math and science practices	Extra pay for workshops or additional PLC times??
3	2015-2016	Grade level teams for science teachers	Lesson study for science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
4	2016-2017	Grade level teams for both science and math teachers	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year
5	2017-2018	School teams with both science and math teachers to work across school departments	Lesson study for integrated math and science	Subs for teachers to watch each other teach and meet during planning times at least 3-4x per year

CREST Summer Camp STEM Experiences

In addition to supporting professional development and instructional improvement in STEM education during the school year, CREST will adopt a studio model during summer programs to provide connections to the underlying themes of environment and sustainability in STEM education. Groups of teachers will work with CREST staff, HS and post-HS counselors and students for a 5 day camp session. One day per session will occur at the CREST farm site. Teachers will observe instructional practices implemented by CREST staff and work in teams to review STEM practices and create integrated place-based and EfS themed STEM lessons and activities based on grade level for the week. Teachers will observe each other teaching and provide feedback in a condensed lesson study experience. The organization and support of this model is described below:

Participants: 10-15 teachers per week, HS and post-HS counselors, CREST staff
Funding Requirements: Stipend per teachers during week long session-- $500/teacher/session

Session	Month/Week	Grade Level
1	June 23-27	preK-K
2	June 30-July 3	K-2
3	July 7-11	3-5
4	July 14-18	6-8
5	July 21-25	1-4
6	July 28-August 1	3-5
7	August 4-8	6-7
8	August 11-15	7-8

Books and Supplemental Resources

See the recommended websites and books listed below to integrate into presentations, workshop or additional reading during professional development.

Websites

- Videos about teaching science from UK
- TedTalk on Teaching Science
- STEM Video games
- Robotics
- Real World Internships and Career Readiness
- Technology integration
- STEM overview/ facts

Books

- *Lesson Study: A Japanese Approach To Improving Mathematics Teaching and Learning (Studies in Mathematical Thinking and Learning Series)* by Clea Fernandez and Makoto Yoshida
- *Leading Lesson Study: A Practical Guide for Teachers and Facilitators* by Jennifer Stepanek, Gary Appel, Melinda Leong, Michelle Turner Mangan, Mark Mitchell
- *Lesson Study Step by Step: How Teacher Learning Communities Improve Instruction* by Jacqueline Hurd and Catherine Lewis
- *Supporting Grade 5-8 Students in Constructing Explanations in Science: The Claim, Evidence, and Reasoning Framework for Talk and Writing* by Katherine L. McNeill and Joseph S. Krajcik
- *The NSTA Reader's Guide to A Framework for K 12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* by Harold Pratt
- *STEM Lesson Essentials, Grades 3-8: Integrating Science, Technology, Engineering and Mathematics* by Jo Anne Vasquez, Michael Comer, and Cary Sneider

State and National Standards

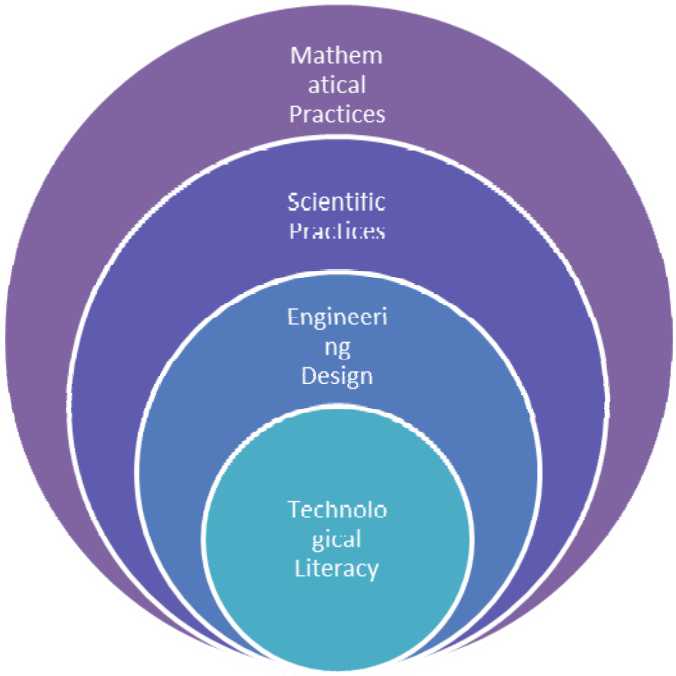
State and national standards in science, mathematics, engineering, and technology provide an important framework for learning practices in STEM disciplines and the scope and sequence of content across the grade levels. District administrators, school principals, CREST Staff and teachers work in varied collaborative groups to unpack and integrate the Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS) into the District's work. As seen in the table below, used in the book *STEM Lesson Essentials*, mathematical, scientific and engineering practices listed in these two frameworks are strongly related. Working to identify these commonalities helps to integrate lessons, curriculum and enhance STEM Education across the grades.

Commonalities between STEM Practices

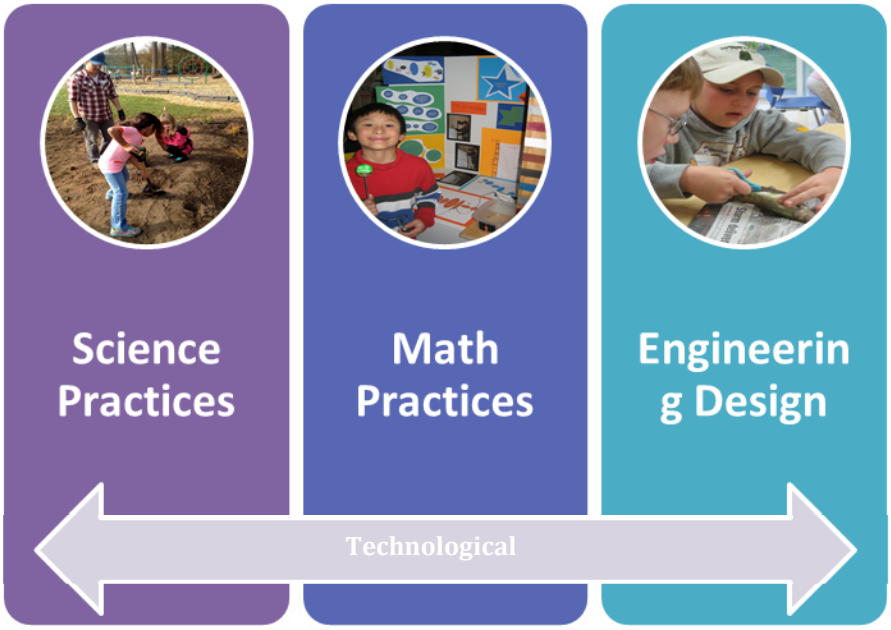
<table>
<tr><th>Scientific Practices (NGSS)</th><th>Engineering Practices (NGSS)</th><th>Technology (NETS)</th><th>Mathematical Practices (CCSS)</th></tr>
<tr><td>Ask questions</td><td>Defining problems</td><td rowspan="2">Become aware of the web of technological systems on which society depends</td><td>Make sense of problems and persevere in solving them</td></tr>
<tr><td>Develop and use models</td><td>Develop and use models</td><td>Model with mathematics</td></tr>
<tr><td>Plan and carry out investigations</td><td>Plan and carry out investigations</td><td rowspan="2">Learn how to use new technologies as they become available</td><td>Use appropriate tools strategically</td></tr>
<tr><td>Analyze and interpret data</td><td>Analyze and interpret data</td><td>Attend to precision</td></tr>
<tr><td>Use mathematics and computational thinking</td><td>Use mathematics and computational thinking</td><td rowspan="2">Recognize the role that technology plays in the advancement of science and engineering</td><td>Reason abstractly and quantitatively</td></tr>
<tr><td>Construct explanations</td><td>Design solutions</td><td>Look for and make use of structure</td></tr>
<tr><td>Engage in argument from evidence</td><td>Engage in argument from evidence</td><td rowspan="2">Make informed decisions about technology, given its relationship to society and the environment</td><td>Construct viable arguments and critique the reasoning of others</td></tr>
<tr><td>Obtain, evaluate, and communicate information</td><td>Obtain, evaluate, and communicate information</td><td>Look for and express regularity in repeated reasoning</td></tr>
</table>

The Interaction of STEM Disciplines

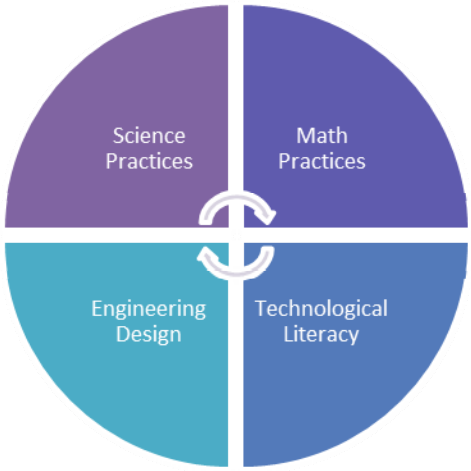
Effective STEM education is grounded in best practices and teaching for deep and enduring understanding in all disciplines. We see the Common Core State Standards (CCSS) in Mathematics and English Language Arts (ELA), as well as Next Generation Science Standards (NGSS), as important resources in establishing the foundation for developing a strong understanding, knowledge and skills in the STEM disciplines. Mathematical thinking and practices, which is at the center of our model, provide a strong foundation for understanding in science, technology and engineering. Scientific practices, understanding, and skills, expand on and interact with mathematical practices, giving students a context for exploring engineering design. Understanding, using and developing technology through engineering also supports student learning in all disciplines, making an important link back to science, mathematics and engineering. The diagram below reflects that thinking.



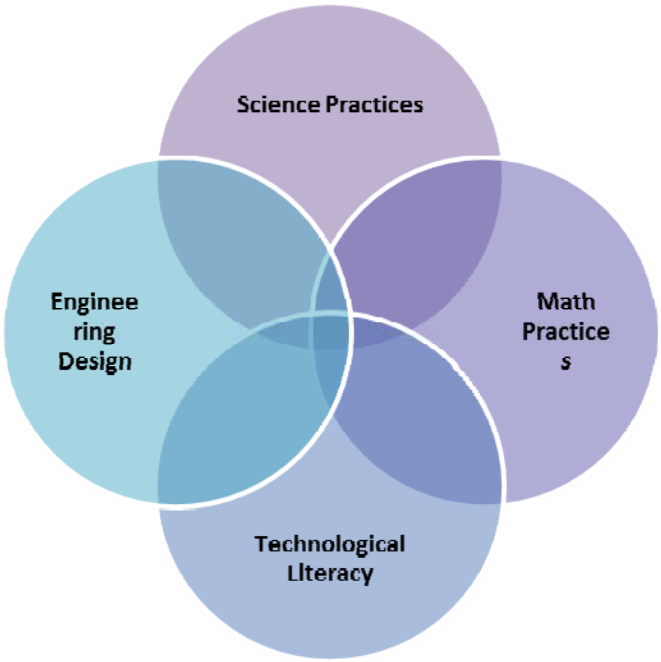
The following diagrams expand on those notions to more specifically consider the interaction of STEM disciplines within a K-12 continuum. Beginning at the primary level, science and math practices share strong connections, eventually providing opportunities for K-5 to explore the engineering design process. The use and understanding of technology is consistent throughout experiences in math, science and engineering.



Continuing to the middle school level, stronger connections between all four disciplines begin to take form. Math and science practices are more explicitly integrated, as are engineering and design practices and technological literacy. There is some overlap between those pairs of integrated disciplines, but not as much as the two have with each other.

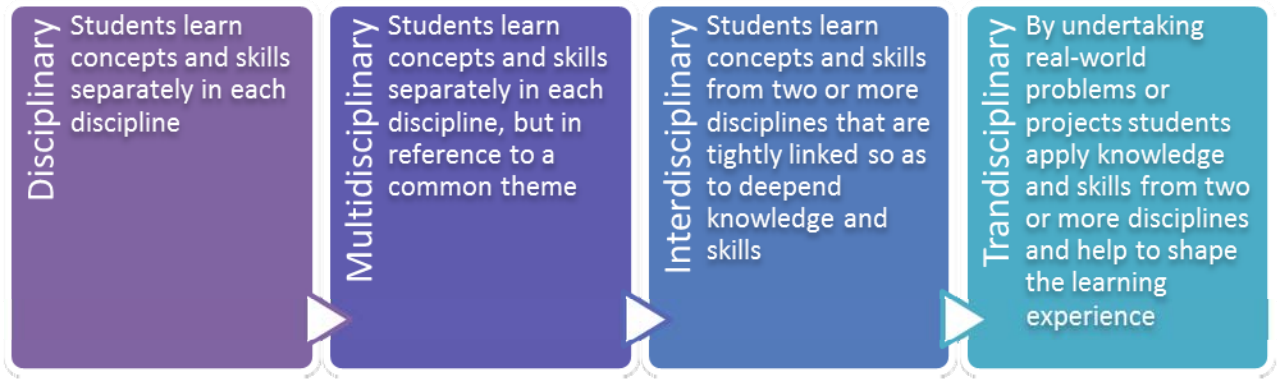


By high school, students experience transdisciplinary studies, where all four STEM disciplines are integrated into learning opportunities. Science and math practices are highly integrated with engineering experiences that make the learning relevant and connect to the real world. Students utilize technology to support their learning, as well as have opportunities to design and develop new technology as components of engineering, math and science studies.



Integrating STEM Disciplines

In the book, *STEM Lesson Essentials*, authors Snider, Comer and Vasquez explore the relationship between STEM disciplines in teaching and learning. Considering the increasing levels of integration of STEM disciplines, *STEM Lesson Essentials* provides a continuum of STEM approaches to curriculum integration. This continuum can be applied to K-12 learning experiences and provide goals for the development of STEM curriculum integration across the levels. While the format is different, the figure below using the language and concepts from *Figure 8.6* in *STEM Lesson Essentials.*



District Technology Plan

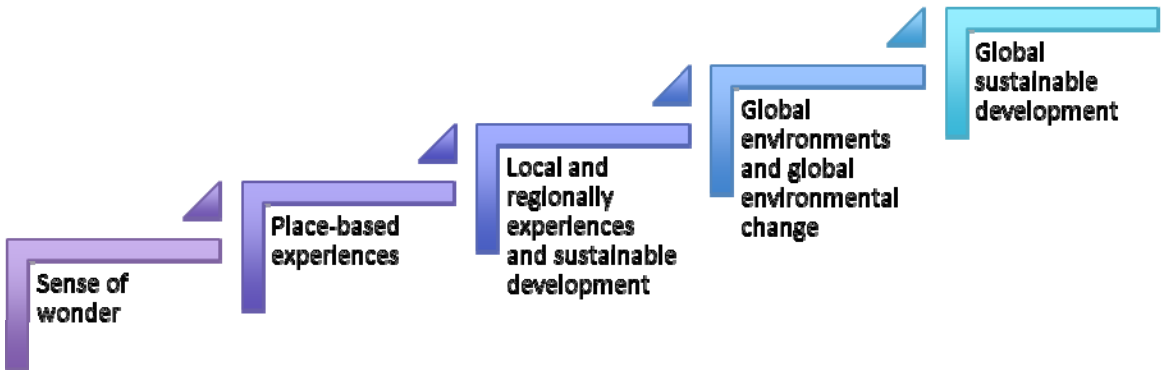
The District has a long-standing approach to technology that includes the use of technology as a learning tool, as a management tool, and as a means to operate the district. The Plan also acknowledges that technology is a means to an end. It also notes that technology is occasionally an end unto itself, especially in the STEM domain where learning often leads to technology innovation. The plan also calls out that the district is using the NETS standards as developed by ISTE as a framework for technology's variety of roles.

Environmental Context and Sustainability

With support from The Center for Research in Environmental Sciences and Technologies (CREST), the District's science center, students in the District are engaged in science inquiry and field based experiences in the early primary grades to extend learning from the classroom. Place-based field experiences, garden-based and farm to school related education, and education for sustainability programs support the early develop of scientific inquiry and wondering about the world at the early elementary grades. These programs occur both during the school day, as well as throughout the summer and non-school calendar to provide learning opportunities in science and engineering throughout the year. Highlighting the environmental threads and context within STEM education reinforces the interconnectedness of these disciplines. Transdisciplinary STEM education is necessary to achieve a deep understanding of sustainable agriculture, science inquiry and research, field based experiences involving long term data collection, hands-on science, and the "3 E's" of education for sustainability focused projects and units.

CREST Program Coordinators and the CREST Director work to find community partners and grant opportunities to expand and develop programs. CREST Program Coordinators are also actively involved with professional development in schools, working with teachers to better understand best practices in teaching science and the practices and core ideas of the Next Generation Science Standards (NGSS). CREST staff model effective instructional strategies for science inquiry and field based experiences for students, working with teachers to build capacity and instructional improvement. Moving forward, CREST staff plan to integrate resources and additional trainings about STEM education as an important expansion of this work.

Based on current research in the fields of place-based education, environmental education and education for sustainability, CREST sees an important continuum for student experiences in the environment. Beginning first with developing a strong sense of wonder and appreciation for the natural world, student experiences build to integrate long term studies and experiences in the schoolyard and community. Applying that understanding and learning to the larger region and local natural phenomena and resources continues to build an understanding about principles of the natural world that can be applied to global environments. Following focused service-learning experiences at the middle school, concepts and notions of environmental degradation, the change in the global climate and sustainable development become more attainable and aligned with the development of high school students. The diagram below captures and outlines this continuum.



Community Partnerships

As a School District, fostering meaningful experiences for students to engage with their community as an "academic neighborhood" aligns with this notion that STEM Education is a joint responsibility with the larger community. The District has existing partnerships in STEM related programs that we are actively expanding and reconsidering as our understanding and development of STEM Education in the District grows. In addition to these educational providers and universities and existing industry partners, the District looks to foster new partnerships with local organizations and companies working in STEM fields.

Oregon Tech (OIT)

The connections and partnership between the West Linn-Wilsonville School District (WLWV) and Oregon Tech (OIT) has possibilities around shared resources, mentorship by OIT professors for high school teachers in the District, and enrollment opportunities for eligible high school students. In thinking about supporting STEM Education in the District and expanding learning opportunities for students, we will initially focus our partnership in three main ways: *STEM HST courses, dual credit offerings, CTE course development*. We hope to "kickoff" this partnership is to offer an Open House in early Winter 2014. This will be an important event to tour interested District community members, the School Board, administrators, and teachers around the campus, talk more specifically about enrollment opportunities in the *Introduction to Engineering STEM HST Course* bundle, and talk specifically to high school counselors about scheduling and forecasting and helping students take advantage of these enrollment opportunities.

STEM HST Courses

We will focus on the connection between OIT and high school students on the "Introduction to Engineering Program" STEM HST Course bundle. This decision was made based on the void of classes currently offered at the WLWV high schools in engineering disciplines. This program is comprised of 6 courses designed to provide a solid background in engineering at the university level and an overview of the different engineering disciplines (software & embedded engineering, electrical & electronics engineering, renewable energy engineering, and mechanical engineering). The District and OIT will work to streamline enrollment into three of the six courses in this bundle, including: CST116, EE131, and REE201. These three were selected because they all identify Math 111 (College Algebra) as a prerequisite. By working with high school math teachers to ensure students are prepared for these courses will be an important piece of this work. We hope to start with a couple of students who have been identified by math teachers, high school counselors or advisors in the spring 2014 term. A consideration that needs to be explored is funding for these courses. While the course tuition is $25 per high school student, in addition to course book and material costs, the District might consider their role in payment considering these courses aren't currently available, in any capacity, within the high schools' course offerings.

Dual Credit Offerings

By identifying the prerequisites students need to have prior to enrolling in the Introduction to Engineering Program STEM HST course bundle, OIT staff and professors will be able to work explicitly with high school teachers to align curriculum for future dual credit opportunities. This will be important to ensure that course curriculum is preparing those students who elect to enroll in classes at OIT, as well as creating the opportunity for all students taking these certain high school math classes to receive dual credit, or accelerated credit. Determining the needed teaching credentials for these high school teachers will be an important piece of this work.

CTE Course Development

Within the context of revitalizing the District's CTE program, OIT staff and professors will work with District administrators and teachers to develop relevant courses at the high school level related to the proposed Sustainable Agriculture program of study. This program of study is designed to culminate in modified course offerings in the second year of the scope and sequence. These two courses are based off of current OIT courses, ENV 112 (Environmental Social Sciences) and BIO 111 (Introduction to Environmental Sciences). These courses will be 2 of the 6 courses offered in this program of study. An ultimate goal around this work would be to provide dual credit for these courses, once the CTE program is further developed.

OSU Extension

CREST has been working with OSU Extension throughout the development of the CREST Farm to School program. Weston Miller, an Urban Horticulturist with the OSU Extension Horticulture Department, has supported the program, master planning efforts and professional development of the resident farm manager. This partnership will continue as the District considers the expansion of the Farm to School program to integrate a Career and Technical Education (CTE) sustainable agriculture.

University of Oregon and Technology

Through a partnership with the University of Oregon and their Global Education program, the District has explored a variety of platforms to use technology to demonstrate student learning. One of these innovative approaches to supporting 21st Century thinking and kills is ObaWorld. This educational platform is cloud based and fosters collaboration between teachers, students and classrooms and experts around the world. Building e-portfolios in ObaWorld related to STEM Education will document student learning across the grade levels and provide a medium for on-going lesson study opportunities for instructional improvement.

Intel and Science Inquiry and Research

CREST has supported science inquiry and independent student research since it opened in 2001. A component of the science inquiry and research program has been the Intel International Science and Engineering Fair (ISEF) and the District's CREST-Jane Goodall Science Symposium. The ISEF affiliated symposium is a regional high school exposition for student projects with the following goals:

1. To provide opportunities for our talented students to compete internationally & be recognized for their achievements in science, math & related fields.
2. To create opportunities for scholarships.
3. To engage students in dialogue with practicing scientists.
4. To encourage our students to embrace math and science as career goals.
5. To enrich our business community with high achieving students focused on math & science.

South METRO STEM Partnership

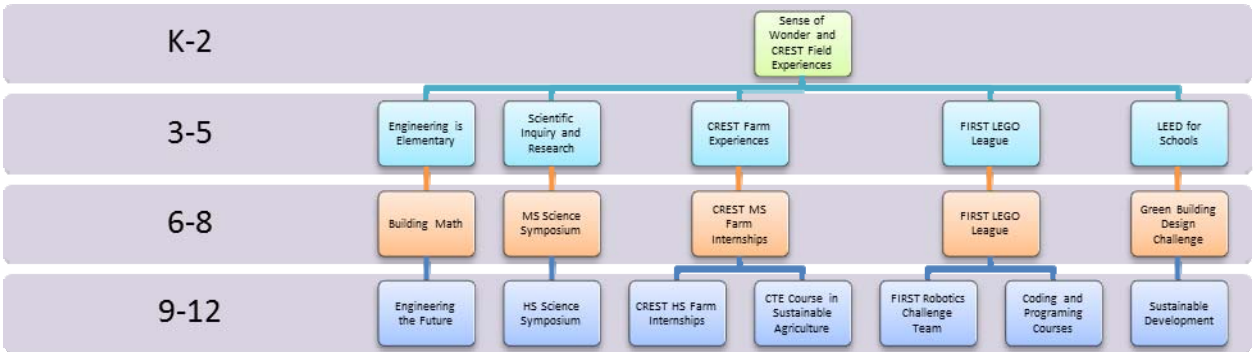
The South METRO STEM Partnership is comprised of industry partners, educational providers, and eleven school districts dedicated to advancing the STEM initiative in the region. In addition to participating in the larger partnership network, District staff and administrators have participated in the planning and on-going work of the Professional Learning Communities sub committee. This group of teacher, principals and educators is working towards developing a plan for professional development for teachers within the participating Districts. This partnership provides important resources and a forum to further learn about STEM education, how to support its development and integration in schools, and ways to expand partnerships to enhance learning opportunities for students.

Regional STEM Hub and District STEM Center

Plans to support STEM education across the state are still in development, however, the value of partnerships between industry partners, secondary educational providers and K-12 school districts is essential. The notion of a STEM Hub contemplates how District can collaborate with partners to provide unique learning opportunities for students in STEM learning. Related to that, the District sees value in establishing a STEM center to strengthen existing programs and provide the space and flexibility for future endeavors. A STEM center would facilitate learning through robotics, sustainable agriculture, computer software courses, engineering design and other programs currently happening throughout the District. Cohesiveness and support around these programs will also provide important professional development opportunities for teachers looking to also expand their practice and integrate STEM education into their curriculum.

K-12 STEM Experiences

Considering the scope and sequence for K-12 STEM Experiences is important as we think about students building on their understanding in STEM disciplines and having real world and relevant opportunities to reinforce that learning. Working through that environmental context and lens, as well as providing varied experiences for our diverse student population, the District has thought about how early elementary experiences prepare students for upper elementary and ultimately middle and high school skills and understandings.



CREST Field Experiences

The District's philosophy about STEM Education across the grade levels is that it needs to begin with fostering a sense of wonder and giving students place-based field experiences. Students integrate science and literacy across the grade levels by using the claim, evidence, reasoning and rebuttal framework for talking and writing in science and mathematics. Exposing kids at the early grades universally to support curiosity and inquiry about the interaction between STEM disciplines is essential. Expanding those experiences to be more diverse between the upper elementary and middle provides opportunities for students to expand on those interests. By high school, students have had diverse experiences and can pursue specific opportunities related to their interests, whether through participation in ISEF, AP or elective classes, or internship experience with the CREST Farm site related to sustainable agriculture. In this model, all experiences are informed and grounded in the CCSS Mathematical, NGSS Scientific and Engineering Practices, and the Big Ideas in Education for Sustainability (EfS).

Engineering Curriculum

Engineering is Elementary (EiE) is a curricular resource that the District adopted with its most recent science adoption. This curriculum, developed at the Museum of Science (Boston), provides units that integrate literacy and anchor texts with relevant and real world engineering problems. As stated on the EiE website, the mission of EiE "is to foster engineering and technological literacy among ALL elementary-aged children." These units and experiences provide primary school students with experience in engineering design, as an extension of science units and concepts outlined in the NGSS. The Museum of Science (Boston) also develops curricular resources for engineering to be integrated into middle and high school mathematics courses. As primary school teachers explore EiE, the District will also continue its exploration into these additional resources, *Building Math* and *Engineering the Future*, as another integration of STEM into the curriculum and K-12 student experiences.

Science Inquiry, Research and Intel International Science and Engineering Fair (ISEF)

The interest and curiosity from the younger grades is further supported in the upper elementary and middle school grades with more formalized inquiry projects and opportunities to participate in local science fairs. Students entering high school have a strong foundation in scientific and engineering design and have the opportunity to participate in the District's Science Symposium, which then prepares students for the state-level Northwest Science Expo and Intel International Science and Engineering Fair (ISEF). Inquiry fairs and ISEF provide an opportunity for students to apply their understanding and interest in the STEM disciplines through meaningful inquiry and research projects that are grounded in real world applications.

Farm to School and Sustainable Agriculture

The CREST Farm to School site provides a unique opportunity for STEM in action. K-12 students work with a resident farm manager and a farm educator on this 10 acre District owned property to understand components of sustainable agriculture, design and construct solutions related to the cultivation, harvest and distribution of produce from the farm site, and have opportunities for year round internships to extend their learning. A deep understanding in STEM disciplines is required to learn about all components of vegetable production and distribution from the farm. "STEM Education in the West Linn-Wilsonville School District has a strong history in the environmental sciences. We ground students' experiences in the natural world around our schools and in the community to provide meaningful and relevant design problems for engineering, connections to science inquiry and use of local technologies. CREST supports field experiences for students at the K-5 level to encourage students' natural sense of wonder and provide connections to the environment for classroom units and learning in science and math. Similarly, the CREST Farm to School program engages students in meaningful, hands-on learning at the District Farm site. They are mentored by a resident Farm Manager as they experience the planning, planting, caring for and harvesting of vegetables for distribution to the community. 5th grade classroom experiences then encourage middle school and eventually high school students to gain relevant and important work and career skills through summer and year round internships." – Bob Carlson, Director of CREST.

US FIRST LEGO Robotics Programs

Technology, engineering and mathematics interact naturally in the District's Robotics program. Beginning at the primary level, fourth and fifth grade students participate in the FIRST LEGO League (FLL) teams, working to solve problems commonly faced by scientists, as well as building small LEGO robots. Continuing at the middle level, sixth through eighth grade students build on these foundational experiences and continue work and participation with FLL. At the high school level, students at Wilsonville and West Linn combine forces on the District's FIRST Robotics Challenge (FRC) team. Over the past___ years, high school students, teachers and mentors have seen great success on the regional and national stage during these competitive competitions. The team's mission is "Building Robots. Building People," reinforcing how students and teachers see this experience as a unique way to give students real world, leadership experiences, while also grounding their work in deep understanding of STEM disciplines. Through mentorship and integrated learning in engineering, math and technology, students design and build robots for local and national competitions. Students are charged to work collaboratively to build and compete with a robot that is designed to solve a problem proposed to all Robotics teams from US FIRST.

Green Building Design and School Buildings

Green building design is an important piece of understanding sustainable development, both at the local and global scale. Students around the District have an opportunity to explore the sustainable design features that are demonstrated in buildings in the community. Following the opening of Trillium Creek and Lowrie Primary Schools for the 2012-2013 school year, the District now has two LEED Gold certificated buildings that were built with student learning in mind and ways to continue to tell the story of sustainability to its occupants and visitors. Through partnership with DOWA-IBI Group, the architectural firm that has designed many of schools in the District, middle school students also have a unique opportunity to enter into a design competition as they design a new middle school to meet given green building criteria. Green building and design is also an important focus and component of high school environmental science courses as students explore the relationship between the built environment and strains on natural resources, urban planning, and energy efficiencies.

Career and College Readiness

Career and Technical Education (CTE) Programs

The District is looking to revitalize its CTE programs, especially as they connect to STEM education and innovative opportunities to support students' career and college readiness. Expanding the CREST Farm to School program to include a vibrant CTE program in sustainable agriculture will enhance existing learning and internship opportunities to include experiences with career and technical education in agriculture. In addition, CTE programs foster new and enhance existing partnerships with professionals and educational providers. A CTE program in sustainable agriculture would also provide opportunities to eligible students interested in enrolling in Oregon Tech (OIT) and exploring their "Introduction to Engineering" course bundle. Sustainable agriculture has strong connections to engineering and having a foundational understanding of the engineering field will be essential for any student wanting to pursue studies or a career in the various components of sustainable agriculture. Finally, through this partnership with OIT, a CTE program in sustainable agriculture also support professional development and provide opportunities for teachers to connect with experts and professors around content and curriculum for a larger population of students enrolled in high school science and engineering courses. As Deputy Superintendent Jane Stickney has said, "While every graduating senior might not choose a STEM related field of study or career after high school, we want to ensure that every student will have the transferable skills and deep understanding in the STEM disciplines to succeed should they choose to go in that direction. Being scientifically literate and graduating with meaningful experiences with engineering design and technological understandings are important components of college and career readiness and global citizenship." These connections can also be seen in the diagram below.