West Linn – Wilsonville School District

Spring 2019

District Technology Plan

This Technology Plan is the collective work of the Staff of West Linn – Wilsonville School District.

Representation provided by:

The District Information Technology Staff

The District Teacher-Librarians

District and School Administration

All District Staff as brought forward formally through the groups above as well as in various and abundant conversations.

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. Ongoing conversations with all staff, and with students by extension inform this plan. And finally, all initiatives of the school district – curriculum adoptions, safety and security plans, data management, operations, business processes, and more – inform this plan.

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INTRODUCTION

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, 2008, and 2014. As the district continues its inventory and needs assessment to inform our ongoing technology-related initiatives and beyond, we find that we have been able to keep the network and hardware robust. Yet, as with all technologies, they become 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, new specialized hardware and software, and the changing nature of supportive facilities.

The results include the creation of an agile and adaptable networked district. The district supports an infusion of new computers, 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 video productions, everywhere-available wireless networking, enhanced and accessible web presence…. The technology network and systems are fully supported through the district Information Technology Department and building technology experts support the network and applications at each school.

Technology integration to support student learning, STEM education, and CTE programs/pathways is ever-evolving and planning must be dynamic in support of curriculum applications to enhance teaching and learning for students and staff. Professional development is provided in an ongoing and "in-time" fashion to enhance appropriate and productive staff and student use of technology. 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 as adapted from CommonSenseMedia.

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, mobile technology, digital curriculum, on-line data bases and resources, blended learning, content specific technologies, research and data retrieval systems, assessment systems, one to one environments, assistive technology for children with special needs, and increasingly specialized applications in teaching, learning, and management. Each of these trends influence and are addressed in the technology initiatives laid out in this document.

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 environments. 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.

District Vision and Vision Themes

The Vision of the West Linn - Wilsonville School District is an inquiry: ***How do we create 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.

TECHNOLOGY LEADERSHIP & VISION

Leaders of technology will inspire and lead development and implementation of a shared vision of 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 magnitude needed; and, be a powerful and exciting enhancement to teaching, learning, and leadership.

Leadership goals for the implementation of the district vision are to:

1. Empower leaders at each level to ensure that curriculum design, instructional strategies and learning environments integrate appropriate technologies to maximize learning and teaching.
2. Provide ongoing professional learning and as-needed support; 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.
3. Integrate the use of technologies to support productive systems for learning, teaching, administration, management, and operations and ensure equitable access.
4. Use technologies to plan and implement comprehensive systems of effective assessment and evaluation.
5. Promote ethical and responsible use, digital citizenship, and model responsible decision-making in the use of technologies.
6. Promote policies and financial plans that support the use of information and communication technologies and other digital resources for learning and in district/school operations.

A Technology Advisory Committee was originally established in 1994 as part of the stewardship of the district vision theme: **Integrating Technology into Daily Learning**.

Over the years, this committee has evolved into several groups that together play the original role of that single committee with broader and more diverse representation that can occur more often, both formally and informally. These include the district administration, each school's leadership team, the district instructional leadership groups, the District Safety Leadership Team, the district IT staff, district operations and maintenance staff, and the Teacher-Librarians.

Each of these groups meets at least once a month, often more. The administration of the schools as well as the teacher-librarians work regularly with classroom teachers and with students and bring those perspectives and desires to every conversation. It is very common to hear "I have a teacher who wants to…" from any of these groups.

These leadership groups have been instrumental in developing, and implementing the technology plan used to guide the technology-related capital improvement efforts ever since and have subsequently provided extensive guidance and leadership in the implementation of the plan.

These groups have collectively 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.

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 progress toward the achievement of the goals in the district technology plan.
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 routine technology plan review.
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 maximize life and minimize maintenance requirements.

LEARNING AND TEACHING FOR STUDENTS

Curriculum and Instruction

The West Linn-Wilsonville School District has 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 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 reading, writing, and mathematics are authentically used and developed in a personally-relevant context. Technology provides a means of discovering and communicating the results of study.

- Classroom work with technology broadens children's experience and knowledge of the subject or area of study.
- Technology tools allow and encourage children to 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 can be attained. 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. Students practice thinking within the disciplines and making connections across disciplines throughout the school experience. 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).

Toward Powerful Learning and a Personalized Education

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	Rules/Inclusive and Restorative Practices

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 using a computer 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 technology to collect data, and for analysis and synthesis. The morphological chart can now be drawn on screen then converted to a database where sorting and analysis take the student to a more complex form of thinking.

Multimedia presentations are already common in our classrooms, and becoming increasingly complex with a progression from bulleted text to video, audio, and graphical representations. 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.

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 tools allow students to explore mathematics they do not yet understand, test ideas, fail, and construct a useful understanding of the concept. Web quests and research link questions to resources and help students juggle the use of multiple sources in a recursive research process. The interactive, collaborative tools of the Google Suite allow students to work with each other to refine their writing and presentation of ideas.

Simulations allow 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. Graphic design tools, including 3D printers, allow 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. Online reading tools and resources allow students access to curriculum without the limitations of their own developing reading skill.

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 and, particularly in a low stakes environment, has the power to provide students with effective feedback on the learning.

Access… to Information, Resources, Devices

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. The prophecy of every student having access to a device when and where they need it has largely been achieved while students are at school.

In order to ensure that all students can continue their educational opportunities even outside of school time, the district wants to identify methods of offering services and tools for students while away from school. Sending computing devices home with students has long been available as an option for students. Take-home, cellular based hotspots hold some potential to help with access to data. There is ongoing conversation about providing Internet access in some broader way perhaps with the inter-agency help of a variety of governmental organizations. Identifying the situations of need is a challenge that we continue to work on.

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 be 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.

Our Strength Lies in Learning Expertise and Teaching Expertise

Some of the very best teachers in the world are right here in West Linn – Wilsonville schools. The wealth of expertise in the complex endeavor of learning is a source of great pride for the students, the faculty, the administration, and the community. In the hands of an expert teacher, our technology-enhanced environment allows learning to achieve unprecedented results.

Teachers and staff have a wide array of support structures and resources available to them. School administration bring leadership and vision to the initiatives and curriculum of the school district. District and school IT staff bring the real-time help with a stuck-point of the moment and also create the technological core environment where these tools can operate to their fullest capacity. Teacher-Librarians merge the complex environment of classrooms with the vast array of information and resources available to students. Instructional leaders provide the curriculum-specific insights essential to the insightful and effective use of technology.

Staff meetings, professional growth opportunities, in-service days, and PLC group gatherings in and across our schools are all characterized by the highly intellectual collaborative classroom environment we are practicing with students. Effective learning for staff parallels the elements of learning and teaching for students, and can be enhanced with insightful use of technology just as it does in the classroom.

And yet, 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. In this pursuit, 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.

TECHNOLOGY-ENHANCED CURRICULUM

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 take advantage of 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 location away from home. Of significance here is that a blended learning environment is not a virtual school, at least not entirely.

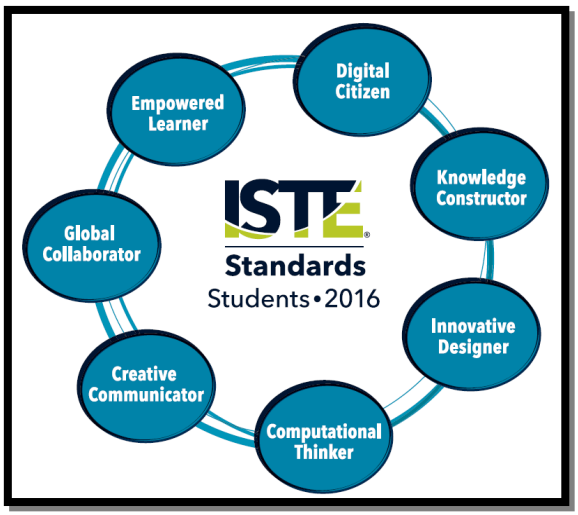
In our schools, we have many variations of blended learning environments. At the younger ages, technology use is purposeful and often teacher-directed. As students get into the upper primary grades, they use technology tools more often and productively. Open-ended projects that incorporate technology 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.

Teachers have increasingly begun to use online management tools for class activities. Such a system provides the ability to automate and enhance many of the traditional classroom processes of assigning activities, soliciting feedback, assessment, and various interactive and collaborative activities. For primary age students with only a single teacher, different teachers using different such systems is not a real big issue from the standpoint of the student or the parent. However, this becomes a problem in middle and high school as students have multiple teachers. A district-adopted learning management system would help to overcome this and is something that will be pursued in the future.

In this new environment, the value of teachers is 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 to 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.

ISTE Standards for Students



In 2016, ISTE (International Society for Technology in Education) released updated standards in relation to technology. The updated "Standards" are not defined in a fashion that provides an easy way to "achieve" them. Instead, they are more thematic in regard to the desirable characteristics of modern learners.

Classrooms in West Linn-Wilsonville schools create classroom environments and structures that model and promote these standards as a normal part of activities.

Similarly, our libraries overflow with structures and activities that promote and inspire these ideals. In fact, the themes of school activities, the inquisitive methods of exploration, the wisdom of expert guidance, the joy of reading, the seamless integration of technology, the self-initiated investigation of a question of the moment, the fun of learning, the collaboration of students and staff – all of which characterize our libraries – all promote the ISTE standards individually and collectively. Indeed, the pursuit of these ideals is unmistakable in the library and resonating from the library.

Ironically, none of the ISTE standards specifically mention technology in their titles; however, each of the standards is best pursued through the employment of technology-rich tools, resources, and opportunities, and most effectively practiced as a whole in all learning activities.

The standards are:

1. **Empowered Learner**
2. **Digital Citizen**
3. **Knowledge Constructor**
4. **Innovative Designer**
5. **Computational Thinker**
6. **Creative Communicator**
7. **Global Collaborator**

Digital Citizenship

Students need to understand the concepts of Digital Citizenship, in its various domains. Students need to learn how to be safe in their digital activities. 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 have used a resource called "Common Sense Media" (www.commonsensemedia.org) to help us develop a scope and sequence that will steer us.

Digital citizenship compels attention to the ethical and safe 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, and State standards in the Arts, Social Studies, World Language, Physical Education and Health.

Career/Technical Education (CTE) programs are being employed at our high schools with significant potential expansion into additional pathways on the horizon, including some high-tech endeavors in programming, robotics, and digital design.

The natural interconnectedness of four disciplines – Science, Technology, Engineering and Mathematics (STEM) – is enhanced through thoughtful implementation of MakerSpaces, where experimentation is encouraged, in all of our schools but especially at the primary level. MakerSpace areas provide specific activities, perhaps with a posted challenge of some sort (eg: make the tallest structure possible that will then have a light on top that turns on from the bottom) and then provide some method for students to document their results and activities.

Today's world calls for an expanded sense of "literacy" that touches into concepts of visual literacy, media literacy, historical literacy, digital literacy, information literacy, civic literacy, global literacy, economic literacy, data literacy, health literacy, and much more. Learning about these literacies happens within the daily and ongoing activities of all classrooms and within the school and is often achieved through appropriate and integrated use of technology.

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	*Safety/Security*	*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.

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 including:

- 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.
- 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

Besides the standard tech tools of computers and modern phones, specialized hardware also characterizes a number of our operational systems including:

- Security system hardware
- Fire alarm system hardware
- Video cameras for safety and security
- Intercom/Paging speakers and components
- Emergency Door-Locking mechanisms
- HVAC integration appliances

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. Most schools take advantage of classrooms clustered around versatile “porches” that facilitate collaborative teaching and learning and promote a constructivist educational approach to education.

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

Data Cabling

Much of the school district’s existing cabling was originally installed in 1998-99. While still mostly functional, it is increasingly in need of updating. The 20+ year life of this core technology has provided an immeasurable value over the years. Recent updates to the main in-building backbones of our facilities has already provided higher capacity between wiring closets where most significant bottlenecks occur.

Recently, the district hired an electrician with specialized expertise in low-voltage applications. Having this capability on staff allows the district to adapt and adjust in more real-time, cost effective ways.

Wireless Networking

Wireless access to the system is in place throughout all district facilities. There are currently nearly 800 WAPs (wireless access points) deployed around the district’s facilities. These are managed through redundant wireless controllers. The wifi network uses a combination of the 802.11a, b, g, n, and ac standards. A regular school day is characterized with around 7,000 devices connected to our wifi system at any specific point in time, with peaks approaching 10,000.

Wide Area Network

The district’s local area networks are interconnected via Clackamas County (CBX) dark fiber. The costs of installation were shared with various agencies including city governments, Tri-Met, PGE, and others. Initial installation costs were also defrayed by use of e-Rate rebates. With associated upgrades to electronics, these circuits provide a virtually unlimited capacity at about 1/3 of the ongoing costs. This cost reduction provides a direct savings to the General Fund.

Electrical Power

Because we use so much technology for the core operations of the district, there is a need to monitor and potentially increase the electrical capacity of the various central wiring closets around the district. And,

because our technology systems would help us respond, redundant always-available electrical power must be introduced so as to remain operational even during a power outage.

Heating/Ventilation/Air-conditioning

The district operations staff continues to manage the ventilation and temperature control needs associated with our core technology systems. At this time, these are adequate and well-maintained.

Intercom Systems

Each of our schools has an intercom system that is used for announcements, daily bell schedules, and emergency notifications. These systems are all of the same vintage and implemented in a district-wide fashion that integrates with our phone system. Speakers are placed in classrooms and most commonly occupied spaces. There are areas – such as restrooms – in which additional speaker locations and zoning would be helpful. With some investment in components, the ability to manage speaker volume and individual zones/speakers would be possible.

District Radio System

With the problematic cell phone coverage in our district which would be intensified during a potential local emergency circumstance, we have recently implemented a district-wide, IP based radio system. The system consists of radios for communicating emergencies across all district facilities, as well as localized radios at each location for the ongoing operations, including during emergency circumstances, of the facility. The expansion of this system along with the need to keep it functional and optimal is now an absolute need.

Capital and Operating Budgets

Fiscal 2001-2002 was the first year the district identified specific General Fund budget line items for technology, including funding for technology support personnel, supplies and materials, and minimal equipment maintenance. 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 and subsequently in 2015 from the 2014 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.

TECHNOLOGY-RICH SYSTEMS & SOLUTIONS

District-Provided Tools

As instructional tools, it is effective for students to be accessing digital classroom resources using the same device (hardware). This provides a 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. As such, classroom technology is typically deployed in charging carts that contain enough devices for all students in the classroom at any time.

As we move ahead, we intend to:

- Pursue one-to-one deployment models of devices to students
- Implement lab-based environments for certain activities
- Update/replace core teaching and office systems
- Update the infrastructure of the district to keep the core system robust and stable

Our intent is to have 3 rollouts of technology tools over next 6 years following a bond passage. If a bond is pursued and passed in November of 2019, the first would occur in summer/fall of 2020 with subsequent purchases in the summers of 2022 and then 2024. 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.

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 provide students and staff with on-site personal and shared storage space that is secure and backed up. 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.

As parents approve, students are provisioned with a Google account that provides Google cloud-based storage as well as email accounts. These accounts, or the WLWV-Cloud account, provide single-sign-on authentication to most systems used by students.

Students can print things in both color and black-and-white. Teachers can distribute and collect notes, worksheets, and other materials to students electronically in a variety of fashions. 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.

Our technology resources are plentiful and robust. They have become ubiquitous – they are virtually transparent to the ongoing activities of learning, teaching, and operations – 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.

Technology tools have evolved to the point where desktop, stationary computing tools are uncommon and mainly in use only in office spaces.

Our phone system includes wired, VoIP-based phones in every occupied room of every district facility with additional in shared office spaces. The phone system is integrated with the intercom and email systems for notifications of various types. Phone system changes, modifications, and additions are managed by our IT staff via a web-based configuration system.

Our video system is used for video storage and retrieval and is the course of most of our digital signage. The system is accessible via a web browser and large displays are strategically placed in schools. We have come to realize that these systems can be a very effective communication tool for events and other announcements as well as student-created video productions.

Access to our resources is 24 by 7 by 365. This is accomplished through redundancy of systems, connections, and power supply. File Servers are centrally located and managed taking advantage of virtualization technologies to reduce power use.

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 core server environment remains vital to our operation for self-hosted systems.

All schools and district facilities are interconnected via Clackamas County fiber services (CBX). These services are "dark" – translated, that means that they provide wires but do not put any data on the wires. Since the service is dark, we put data on the wire and it is into a closed point-to-point connection between our facilities. This also allows us to expand the capacity simply by connecting the wires with higher grade electronics on each end.

Currently all connections between schools and between wiring closets of our schools run at 10 Gbit. And, as this document was being completed, a second connection to all facilities was being installed that takes a different point-to-point path and thus allows for fail-over functionality in the event of damage or sabotage.

We will continue our every other year plan of updating/replacing approximately 1/3 of our inventory of computing devices with expansion during each rollout as much as possible.

Expanded Technology-Based Solutions

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. We now have an integrated intercom system in all of our schools. The system allows for district-wide announcements and emergency notifications. It can be accessed in a variety of ways both at school and away from school.

The district has installed video cameras in all schools and other facilities in order to enhance security and provide the means to investigate activities.

We have also invested in a robust and comprehensive radio system that is a key piece of our emergency operations.

The Need for Ongoing Support

The district currently has approximately 12,500 computing devices in total; roughly 750 of those are primarily used by staff. There are about 8,000 Chromebooks, 2,750 laptops, 1,500 iPads, and 250 desktops. There are about 500 data projectors and 475 document cameras. Our core infrastructure consists of nearly 800 wireless access points and about 80 network switches with about 300 module inserts and nearly 7000 ports. We have over 1000 phones and about 250 printers. We have recently begun an exploration of classroom deployment of flat screen technology.

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 these devices. Our district-level staffing of 5 people supports the electronics, systems, and data management that make everything else work. These staffing levels were basically created via a board level initiative from 2003. Growth in the IT staff has only gradually occurred since then, mostly only as additional facilities have opened.

The efficiency of our system, the stability of the IT staff, the evolution of technology to be more centrally manageable, and the overall technology savvy of all staff have allowed us to move from an environment with 12 schools and about 3000 computers, to an environment with 16 schools and over 12,000 devices without a comparable growth in IT staff and support.

However, as the district continues to grow with more schools and more devices, as users continue to develop their complex and creative use of technologies, as more systems of data collection and analysis are employed, as IT's responsibilities expand into additional realms of operations and safety/security, as cyber-based misbehavior and vulnerabilities continue to explode, and as existing IT staff with their vast cultural and physical knowledge begin to move into retirement or other endeavors, the district's need to adequately address these realities with expanded expert support and management staffs is paramount.

SOME BASIC TENETS OF IT IN THE DISTRICT

Students should have access to technology tools that can enliven and enrich their learning experiences, bringing more relevance and currency, and reinforcing the educational objectives of each student, when they need it, where they need it.

The district's long-standing pedagogical constructivist approach fits well with our use of technology.

Technology allows students to move beyond simple fact retrieval, retention, and knowledge into higher order thinking skills associated with reasoning, drawing analogies, application, synthesis, and analysis.

Technology use and the mastery of technology tools is not a heavy curriculum in our schools. While some degree of introduction to resources and tools is needed, ongoing development of those skills and that knowledge should take place within the ongoing, appropriate, and productive use within the curriculum areas.

For some populations of students, technology-rich pathways are an absolutely appropriate and positive means to pursuing their goals. As programs of study move into CTE and other technology-rich career-related realms, our technology system should expand to include those tools and resources.

We fully embrace the ISTE standards as ideals. However, we see them more as desirable attributes we want to develop in all children. And we believe that they can be achieved best by appropriate use of technology tools and resources.

We believe in educating the whole child and acknowledge the potential impacts of too much screen time. However, we also note that many technology tools are not based in viewing a screen and that the nature and specifics of a screen-experience raise or lower its value.

Curriculum-based initiatives that require technology should be considered in the context of available tools, but not limited in this way. If a particular resource is "valuable enough", then the needed technology tools should be obtained whenever possible.

Students should be gradually eased into increasingly independent technology use over their primary school years and even beyond. A rich and broad Digital Citizenship curriculum is vital.

Being able to project websites and other resources within the classroom should be smooth and easy, and should be a common occurrence in most classrooms. The tools should be as invisible as possible.

Display and amplification technologies should be available within each school in a central location in order to support the greatest portion of the student population at one time in one place as possible.

Improving the operational processes of the classroom (delivering curriculum, giving assignments, collecting assignments, assessments, progress, online dialog) should be enhanced with technology whenever possible.

The ability to improve communication between all stakeholders should be enhanced with modern technology tools whenever possible. This includes traditional means of communication – amplification, email, websites – but also additional types of communication – increased digital signage and video displays. The District must take appropriate action to follow required records retention guidelines.

Technology should only be employed in the direct or general support of the district's initiatives. General network connectivity, access to the Internet, wifi are all things that have no singular or specific agenda, but very much support all other technology initiatives of the district.

Core technologies of network, wifi, and Internet access should be open and accessible, and safe-guarded.

Technology tools can be used to enhance Safety and Security agendas via the district's Safe and Welcoming Schools initiatives.

Student data of all kinds (demographics, personally identifiable information, educational records, student work) AND staff/personnel data – should be kept in highly secure systems and protected steadfastly.

Systems should be always available, especially systems that promote safe operations, communications (both internal and external), and the reasonable disposition of an emergency situation. This needs to cover power needs, data connectivity needs, environmental conditioning of appropriate spaces, and the ability to provide nearly-as-good operational redundancy in case of major damage to core systems.

All other things being equal, technology systems that are self-hosted can be maintained and secured in a more predictable and effective fashion than systems hosted elsewhere.

Reliable, stable, and long-lasting technology tools should be a high priority. When possible, standardization of systems should be maintained so as to gain component interoperability and improved ability to provide ongoing support. Devices should provide the broadest stable range of resource access while providing a reasonably non-disruptive continuity of system support.

Technologies and supporting systems that allow the minimization of ongoing support needs should be used whenever possible within the cost-benefit analysis of the circumstance.

No specific system or technology is set in stone. All systems are subject to change at any time based on the overall "good" of the district.

Data Systems should provide access to actionable data, and present it in near-real-time understandable ways.

Systems that support the operations of the school district – HVAC, lighting, intercoms, alarms, bells, door locks, audio sensors, security cameras, lighting as well database systems for student information maintenance & analysis, food service management, library management, and so on – should be technology-enabled in a centralized management environment as much as possible and appropriate, but stability and functionality of these systems is paramount.

At-home access to resources should be "as similar" as possible to at-school access.

Technology tools sent home should be provided and used through a partnership with the home.

TECHNOLOGY PROJECTS

Planned for Potential Fall 2019 Bond

All aspects of our system are ultimately designed to positively impact the experiences of our students. The items listed below are not listed in any particular order, except that the first item is the most direct impact on the ultimate goal.

Other projects listed directly or indirectly support the first item in a variety of ways.

Student & Staff Device Rollouts: With over 10,000 students and over 1000 staff, and with the advent of a greater than 1-to-1 reality, end-user devices continue to be in high demand. We have to keep these devices current and operational. Through today's eyes, this would include a mix of traditional Mac and PC computers, iPads, and Chromebooks. However, these rollouts could also include sensors, calculators, cameras, audio/video recording devices, drones, and who knows what as we move forward. As we have done for the last 18 years, we would plan to have at least three "rollouts" of new end-user technology that would be spaced two years apart.

Cost Estimate: $6,000,000

Re-wiring Existing Schools: Back in 1998, most of our schools were wired with a grade of cabling called Cat5E. At the time, we actively "joked" that it would be great if the wiring would last 17 years as some estimates suggested. Most of us, at the time, expected to have to be replacing it within 10 years. Well, it has lasted 20 years! But, this cabling has a capacity of performance that we are now routinely experiencing as limiting.

As we move forward, we see an increasing need to have this wiring replaced/upgraded. And, perhaps even re-engineered. There are two basic approaches:

1) MDF/IDF: This is our current approach. MDF stands for Main Distribution Frame. IDF is Intermediate Distribution Frame. This approach would continue to utilize a mix of MDF's and IDF's. These are "rooms" from which wiring goes to jacks in the walls/floors/ceilings. They are located such that they are within approximately 200 feet of any destination jack. The IDF's in each building are connected back to the MDF of each building in a star-configuration via fiber optic cabling.

   In this configuration, in order to keep all services fully functional during power disruptions, we would need to provide emergency generator power to all IDF's and MDF's. Currently, most MDF's have this, but very few IDF's do. This means that a power outage causes an outage to segments of a building. Locally provided battery power has a relatively short finite life.

   The fiber optic cabling that connects the MDF and IDF's has already been upgraded to handle greater bandwidth, but the station-cabling to the jacks in classrooms and other locations is still just Cat5E. Cat6A or Cat7 is the current standard.

2) GPON Implementation: GPON stands for Gigabit Passive Optical Network. Basically, it eliminates the need for IDF's by allowing fiber optic cabling to run to every "space", generally in the ceiling. In the ceiling, a device needs always-on power (generator-provided) – this device accepts the fiber optic cabling and passes the data signal to copper wiring that can be split into multiple connections. Because fiber optic cabling is not subject to the same length constraints as copper wiring, we can run all of the fiber wiring back to the one MDF for the location. This is how most Internet providers are beginning to offer their services to homes. It is a well-known strategy.

Backfitting a GPON model into existing schools would be very expensive as dealing with PoE needs and finding pathways for every location to stretch back to a single MDF could be near-impossible. At least as of this writing, we believe the best approach would be upgrade the Cat5e cabling to Cat6A. There are 10 schools that would need this upgraded wiring. In addition, CREST and DOC would need it as well.

However, we believe it would be wise to potentially use the GPON model in any new construction where adequate pathways and power-needs can be more easily addressed. As with all other technology aspects of new construction, the construction budget (not the technology bond budget) will cover these costs.

Cost Estimate: $2,000,000

Network Electronics: Our current network electronics (layer 3 switches in the MDF/IDFs) were originally acquired in 2009. In this realm, a lot has changed since 2009 in particular in the areas of safety and security around systems and the data that they carry. New electronics are also needed in order to handle the additional high-bandwidth applications used across the district. There are approximately 75 such devices across the district.

While it is true that many of our devices do run via wifi, we will continue to need actual wiring for a variety of tools into the future including phones, printers, intercom paging modules, wireless access points, HVAC controls, and many other devices, most of which are central to the operation of the district.

Cost Estimate: $1,000,000

Wifi Upgrades: Our recent wifi upgrades took our wifi environment into the realm of higher bandwidth and more "MIMO" (multiple in, multiple out) connectivity of the 802.11AC world. As things continue to progress in the wifi world, the need to support an even higher density of devices is coming. A new standard – 802.11ax or Wifi 6 – has been developed. While no client devices have been launched that can use this new standard yet, it is only a matter of time. We expect this to occur during the "life" of the next bond.

Cost Estimate: $1,000,000

Server Environment: We currently house approximately 70 virtual machines in our VMWare environment. These virtual machines host a number of our resources and tools that are vital to our operation and that we prefer to keep close to us for maintenance and for security of data. This environment includes 3 hosts and 100 terabytes of storage across 3 "tiers" of access. It is a highly robust environment.

In addition, our data center houses another 10-15 physical machines that augment the 70 with additional, usually specialized, capabilities. Our data center also houses core components of our phone system as well as our firewalls, ISP uplinks, and other vital services. We don't believe an overhaul of the data center (the room) itself is needed. However, in order to stay current with hardware, we do need to update/replace the server environment (virtual and physical).

Cost Estimate: $1,000,000

Phone System Update: Our phone system was installed in 2009 and has worked very well for us. However, like other components of our environment, it is very old. Since the installation in 2009, the owners/developers of our system have been bought out and are merging product offerings. This could mean having to replace all components of our system. Even if some pieces can survive, there is a logic to updating to a new system, or at least the newer version of the same system. With over 1000 handsets and a potential need to provide VoIP via wifi, some potentially significant work is needed in this realm as well.

Cost Estimate: $1,000,000

New Student Information System: We have enjoyed a very stable student information system for 18 years. It is un-heard of for a software package to stand that test of time. Yet, our system – Schoolmaster – has withstood that. Several years ago, the Schoolmaster system was purchased by TylerTechnologies. Tyler has continued general support and state-reporting support of Schoolmaster and has not announced an end to that. But, a software package of this age cannot have a long life left to it.

Tyler has been developing a new more modern system. And there are other competitors out there as well. We need to move a more contemporary system that provides a more robust interface, support for "cutting-edge" educational objectives (for example, learning target based grading), more graphical display of information, and true analytical capabilities. Acquiring such a system will come with a lot of costs. Of course, there is the hardware cost and the software itself. However, there will also be costs for training. And there will be "costs" in the transition that will be experienced by all aspects of our educational environment. Schoolmaster is touched by 100's of staff and 1000's of students and potentially over 10,000 parents and guardians daily.

A new system is needed soon. But, this will almost certainly be the most impactful and wide-ranging technology transition involved in this or even recent capital bond projects.

Cost Estimate: $500,000

Districtwide Distributed Digital Signage: Standing displays are becoming more and more the norm for a variety of purposes. Visit virtually any college campus and you will see/experience digital displays used for announcements, directions, alerts, and lots of other communication. We currently have such a system, but its use is limited due to cost and definition of roles about updating content. However, we believe that there is great potential in expanding such a system's use.

These visual displays are a very effective tool in increasing communication to many stakeholders. Visitors, staff, and students can all more easily learn of upcoming events and activities using this technology.

Cost Estimate: $1,000,000

MDF/IDF Generator Power (Power Redundancy): So many of our core tools rely on our network and its connectivity. Phones, intercoms, radios, email, websites, HVAC, lighting… Having these tools remain functional at all times is crucial to the ongoing activities of modern classrooms. In the event of many emergency situations, the availability of power from the street cannot be assumed. And these events can strike with literally no notice. If we are to manage these events and communicate about them in reliable ways, we have to do everything we can in order to keep these systems operational even when there is no power from the street. This is accomplished by a combination of UPS devices and emergency/standby power. Simply put, the UPS would detect an outage, provide power for that brief period of time (one minute or less) in which an on-site generator would spin up and begin providing power. The UPS would get the generator-provided power and switch off of its battery at that point. In short, the UPS handles the transition from one power source (the street) to another (the building's generator). Emergency generators have historically focused on emergency lighting and consumed minimal power. However, more and more devices are able to draw their power over the Ethernet cabling using Power-over-Ethernet. While these devices consume relatively small amounts of power individually, they end up consuming a lot of power collectively. As such, we need the added capacity of 220 power as well. Extending and enhancing that power draw to all IDF's will require additional power and engineering.

Cost Estimate: $1,000,000

Intercom System Enhancement: We have now lived with intercom systems in all schools for several years. They have become a vital part of our emergency operations. As we move forward, we would like to add some locations that announcements can be heard that were initially left out (bathrooms, workspaces that are only sometimes occupied, etc). We would also like to add some limited two-way communication via the intercoms. And, over the potential 6-year life of a bond, we anticipate needed upgrades.

Cost Estimate: $500,000

Video Monitoring: We have over 200 camera views that we have implemented now. At West Linn High, we used cameras from their "old" system which were adequate. However, they are not state-of-the-art like the cameras we have installed otherwise. We need to replace all of these cameras and a small number of similar-age cameras at Wilsonville High as well. There were a small number of locations that were deemed desirable but were simply too expensive to install in phase one of this project. And we will surely discover additional locations that are needed (as has already happened). We may also want/need to look into server updates associated with the camera systems.

Cost Estimate: $500,000

Radio Network/System: Our radio system and network is new and quite robust. However, like all technologies, we will need to be ready to respond to innovations and we also expect to expand our deployment to keep it current and robust.

Cost Estimate: $350,000

New Clock Systems in all Schools: Having a synchronized clock system is vital to the smooth operation of a school and district. Not long ago, we replaced all clocks at a few schools that had problems with their old existing systems. We would like to standardize all schools on the same system. This system is wireless in syncing to a master controller via radio waves, and runs on batteries. Deploying such a system is quick and

relatively easy and requires no wiring. Having a standard system will reduce maintenance costs and allow for more cost effective spare-and-repair strategies.

Cost Estimate: $350,000

Updated Classroom Display Technologies: Our current classroom display technology employs data projectors that are generally not mounted as this allows the greatest flexibility of the classroom space whether for short term or long term desires. However, projector-based technology is problematic in that the image is not sharp or bright as newer alternatives. It also requires some room space for the purpose of the projection, even if it is done via "short-throw" projectors.

While we believe that large flat screen technology is taking over, we have watched neighbors struggle with this type of display due to its fixed-size screen. Simply put, a flat screen mounted on the wall is often just not big enough in a lot of cases. Many schools are going to 2 or even 3 large screen displays in a single room. Certainly, this would increase viewability but at what cost?

We are experimenting with mobile flat screen technology and see some promise in this. By being mobile, a teacher could move the display closer to the students (to increase viewability) and could also locate the display wherever desired at a moment's discretion. Another "upside" is that it is does not consume valuable wall space or white board space. A downside is that the "system" would consume some amount of floor space.

So, it is not particularly clear what the best classroom display solution is. However, what we do know is that we will need to be updating our existing systems with something. Exactly what that is will be determined "at the time" of acquisition, most likely as a part of a phased-in rollout process.

Cost Estimate: $1,000,000

Updated Printer Fleet: We last purchased printers across the district in 2009. These printers have worked very well, but are aging and in need of replacement. Printing is not the "need" that it has been in the past. However, there is a high-desire around keeping printing convenient.

Cost Estimate: $300,000

Auditorium/Commons/MPR AV Systems: We have a large and wide disparity of AV systems for school-level activities. We want to bring more consistency to these systems as well as ensuring that they are "adequate" for the needs of the school. Across the range of schools, this could range anywhere from a whole new system to replacing an old one to enhancement of an existing system.

Cost Estimate: $500,000
