MOODY
Independent School District

TECHNOLOGY REVIEW

Conducted by SDSM, Inc. for the
Legislative Budget Board

SEPTEMBER 2008

September 8, 2008

Mr. Allan Law
Superintendent
Moody Independent School District

Dear Mr. Law:

The attached report reviews the management and performance of the Moody Independent School District's (MISD) technology operations.

The report's recommendations will help Moody ISD improve its overall performance as it provides services to students, staff, and community members.

The Legislative Budget Board engaged SDSM, Inc., to conduct and produce this review, with LBB staff working in a contract oversight role.

The report is available on the LBB website at http://www.lbb.state.tx.us.

Respectfully submitted

John O'Brien
Director
Legislative Budget Board

cc: Mr. Eddie Newman
       Ms. Carol Haas
       Mr. Roy Ewing
       Mr. Jeff Dean
       Ms. Staci Stone
       Mr. Scott Wilson

MOODY INDEPENDENT SCHOOL DISTRICT
TECHNOLOGY

In April 2008 the Legislative Budget Board began a review of technology in the Moody Independent School District (MISD). The purpose of the review was to help the Legislative Budget Board gain an understanding of technology planning and usage in school districts across the state. MISD was one of three school districts selected for this review based on the size of the district and their School Technology and Readiness (STaR) Chart self assessment.

Understanding technology and developing computer skills are an important part of today's education and essential in the preparation of our children for a successful future. Almost every job in today's world—from automotive repair to open heart surgery—requires an understanding of computers. To provide this understanding and skill set, school districts must implement a broad curriculum that includes hardware, software, teacher training, and administrative support. State and federal law sets standards for technology education. Each school district decides how they will implement these directives.

GENERAL INFORMATION

MISD is located approximately 26 miles south of Waco, Texas. Moody is primarily a farming community with a population of 1,400 in the 2000 census. The median family income for a household in Moody is $34,271, and about 16.3 percent of families are below the poverty line.

In 2007–08, MISD had 768 students and three campuses: an elementary campus (Early Childhood-grade 4), a middle school campus (grades 5-8), and a high school campus (grades 9-12). Seventy two percent of the students are White, five percent are African American, and 22 percent are Hispanic. Less than one percent of the students are Native American or Asian. The district enrollment includes 57.8 percent economically disadvantaged students, slightly above the state average of 55.2 percent for the same period. MISD has 116 employees, with 65 percent considered professional staff.

The district's 2007 Accountability Rating is Academically Acceptable with Gold Performance Acknowledgements for Texas Success Initiative (TSI) in English and Language Arts and in Mathematics. The district also received a Commended rating in Writing. In 2007–08, the district had 12.1 students per teacher—compared to the state average of 14.5. While MISD's teachers average 11.1 years of experience, the average years of experience with the district is only 5.3 years. The turnover rate for teachers as well as instructional staff as a whole were both slightly above the state average.

MISD has no bonded debt. The district fund balance at the end of the 2005–06 school year was $2,656,981, or 46 percent of its total budgeted expenditures for 2006–07.

Moody ISD does not have a separate information technology department but tasks various instructional and administrative staff with computer and web site maintenance. The planning, purchasing, and maintenance of district technology are performed primarily by a teacher who also functions as the district Technology Director. A Technology Aide is responsible for hardware maintenance and assists the Technology Director. Other district positions may also include

technology-related responsibilities. For example, in 2007–08 MISD created an administrative position, Curriculum Director, which is also responsible for maintaining content on the district web site.

The Technology Director has been with the MISD since 1983, teaches two classes in math and physics along with his network administration duties, is certified in computer repair, and drives a bus. The Technology Aide is trained in computer technology by Texas State Technical College in Waco and holds a certificate in network copper wiring.

There is no dedicated technology budget. Technology purchases are funded from the state technology allotment or from school budgets. The board will also find money for technology purchases when convinced of their merit.

The district network consists of servers which contain the administrative applications for state required functions such as attendance, performance data, and student fitness tracking. With Windows Server 2003 R™ as its network operating system, MISD uses the following software to support its administrative and instructional functions:

- Nutrikids™ food service software by LunchBite Systems supporting cafeteria sales and services;

- Fitnessgram, a physical fitness tracking software required by the Texas Education Agency (TEA); and

- Regional Education Service Center application for student record creation and retention that includes attendance, grades, and discipline for mandatory state reporting.

Learning-based software consists of Accelerated Reader™, a student tutorial for the Writing to

Read™ lab, and SLEEK™ TAKS tutorial for high school students.

RECOMMENDATIONS

- **Recommendation 1: Implement a comprehensive computer acquisition and replacement program that identifies and targets multiple sources for computer equipment acquisition.**

- **Recommendation 2: Increase classroom integration opportunities by establishing a Technology Users Group with administrative rights at the campus level and responsibility for evaluating promising technology, identifying available training programs, and providing curriculum integration support.**

- **Recommendation 3: Develop and implement a time-phased network enhancement plan that includes an assessment of the effectiveness of the current infrastructure, traffic loads, and internet service provider services.**

- **Recommendation 4: Contract with the Technology Director on a one time basis to develop the necessary planning and management documents.**

- **Recommendation 5: Formalize the disaster recovery plan and include redundant backup of key systems for added security.**

The five recommendations in the report have a total five-year fiscal impact of $27,376 in costs.

DETAILED RECOMMENDATIONS

KEEPING TECHNOLOGY CURRENT AND ACCESSIBLE (REC. 1)

Implement a comprehensive computer acquisition and replacement program that identifies and targets multiple sources for computer equipment acquisition.

MISD has embarked on a computer replacement program with a goal of upgrading one school each year for the next three years. Once this goal is accomplished, MISD does not have a comprehensive acquisition plan or identified funding strategies for keeping classroom technology current. Without a clear plan to ensure a sufficient number of reliable computers with continuing capacity for instructional needs, MISD will not reach state and federal technology educational goals.

In June 2007, MISD updated its technology plan. According to the plan, each of MISD's classrooms has a computer and internet connection for teacher use. The elementary school has two computers per class. Some of the middle and high school classrooms have a second computer. The MISD elementary, middle, and high schools each have a computer lab. The middle school and high school labs are wireless. The high school reserves its lab for technology-based classes, limiting students in core subject classes to use of the seven library computers or the mobile lab laptop computers for internet research or other technology-required projects.

The *Moody ISD Technology Plan 2007–2010* states that MISD has a student-to-workstation ratio of three to one. This ratio is lower than the four to one student-to-workstation access ratio in the Texas Education Agency's (TEA) Long Range Plan for Technology. In the plan, the TEA had established a 4:1 ratio as a goal for districts to reach by the year 2004.

According to the MISD computer inventory, MISD has 273 personal computers. Of this number, 16 percent are between eight and ten years old, 43 percent are between five and eight years old, 14 percent are between three and five years old, and 26 percent are less than five years old. MISD committed to updating district computers over a three-year period, beginning with the 2006–07 school year. In 2007–08, 10 percent of the district's total personal computers were a year old.

Although the MISD's Technology Plan suggests that the district is meeting TEA student access standards, staff and students said that access was inadequate due to hardware and maintenance limitations. For example, working student computers replace non-working teacher computers until the teacher's computer repair is complete. Older computers lack capabilities to run much of the interactive educational software. Some computers still have floppy drives, so students working on home computers cannot easily transfer homework between computers. If the student computers that are out of service or have been used to replace broken teacher computers are removed from the count, the actual ratio of students per computer is 4.8 to 1. This ratio includes the computers in the high school lab, although only students taking a computer related class can use the lab computers.

Administrative tasks also fall behind repair and maintenance duties. For example, not all computers receive a district identification tag before put into service. The Superintendent said this procedure resulted from a desire to not let technology sit in a box until the administrative tasks could be completed. The current technology inventory shows inconsistent reporting of information, and

the Technology Director said the administrative inventory listing was not current.

The inefficiency inherent in old and sometimes obsolete technology is made worse by the limitations on the Technology Director's time. In addition to serving as the network administrator, the Technology Director teaches two classes and drives a bus. With available time deployed to keep aging technology resources running, there is little time for planning or other essential business practices.

District staff identified funding as the primary problem with technology upgrades, but the district does not have a clear process for identifying different funding options. In 2006–07 a teacher voluntarily but unsuccessfully applied for a grant. Teachers expressed an interest in applying for additional grants, although no teachers have received training to increase the potential for successful application. The Superintendent has attended grant-writing training, but the district has not tasked any position with responsibility for pursuing grant opportunities. Further, MISD has not pursued other sources for technology funding such as E-Rate, which is the federal Schools and Libraries Universal Support Program that provides discounts for acquiring telecommunication services.

Because MISD does not apply for E-Rate, it does not have use of E-Rate discounts for eligible equipment. The E-Rate program consists of discounts that schools receive for acquiring telecommunication services. Internal connections such as network components that allow technology to be used in the classroom are eligible for this discount. The district's technology plan identifies approximately $34,000 worth of networking equipment needed to upgrade the telecommunications infrastructure between the middle school and the high school.

Although this category of expenditure is eligible for an E-Rate discount, the state technology allotment is the primary source of funding for technology purchases. MISD previously applied for E-Rate funding, last receiving $25,330 in 2004. Since MISD does not currently use E-Rate to maximize its purchasing power, there are fewer technology allotment funds available for student workstation purchases.

The district does stretch its technology dollars by making use of donated equipment. For example, in 2007–08 MISD received some computers from a state agency. The Technology Director said the district can upgrade donated technology for approximately $100 per computer. Donations are not a major source of new computers for the district since the surrounding community does not have many businesses with which to partner. The district does not use other technology acquisition partnerships such as the computer recovery program offered by the Texas Department of Criminal Justice or the federal Computers for Learning donation program.

The district's technology plan identifies three funding sources for 2008 technology purchases: technology allotment funds, general funds, and E-Rate. While MISD did not apply for 2008 E-Rate funding, the Business Manager said they intend on applying next year. The availability of general funds is uncertain, and there is no separate technology department budget. The district appropriates general funds for technology projects on an "as requested" basis. If a campus budget does not have available funds, the Technology Director meets with the Business Manager who determines if funds are available from another part of the budget.

As a result of aging technology and inadequate funding commitments, the Technology Director spends available time in maintenance or repair leaving inadequate time for administrative tasks. Curriculum integration projects are often delayed as teachers wait for Technology staff to load information onto their computer. In addition to productivity costs, older systems are more costly to maintain as replacement parts become more difficult to find and acquire.

Students must have access to technology to meet the proficiency expectations for Texas students. The computers must be new enough and have enough capacity in terms of memory and speed to be able to run the latest educational software programs. Computers must be available for student use rather than functioning as backup for older units.

When asked about the adequacy of district technology, student focus group participants said school software is adequate for class projects because the projects are very simple. Technology projects usually consist of a computer-typed paper or presentation. Students sometimes do not have adequate time in class to complete the project, as the computers are very slow. In order to complete the project, students must ask to miss other classes.

TEA has established targets for student technology access. In its Long Range Plan for Technology, TEA recommends a technology equipment target for a student to workstation ratio of 1:1 by the year 2010. The target assumes on-demand access for every student and/or the best available technologies.

MISD should develop and implement a comprehensive acquisition and replacement program that identifies and targets multiple sources for computer equipment acquisition. The program should be phased and budgeted to ensure adequate student access to technology. One of the program's goals should be to establish a five-year replacement cycle for all computers. Another goal should be to meet the TEA target ratio of 1:1. While this five-year goal will place the district beyond the TEA recommended target date, it will allow MISD to develop a sustainable technology schedule that balances both acquisition and replacement costs across several budget cycles.

Once goals are established, the Technology Director should identify the number of computers needed to meet the target ratio with working computers. Optimal replacement cycles should also be identified. As part of the analysis, the Technology Director should research and define the type of computer, fixed workstation, or wireless laptop that will provide the greatest student accessibility. At the same time, network upgrades necessary to support additional or newer technology should be identified.

The next step is to establish a time-phased acquisition and replacement cycle. A basic rule for establishing the targets is that all computers acquired should meet minimum configuration standards established by the district. **Exhibit 1** uses the district inventory to demonstrate the calculation, but because the inventory is not current, the numbers are approximate.

The Superintendent should work with the Technology Director to develop strategies to meet the targets. One strategy is to maximize available funding from the technology allotment by seeking E-Rate reimbursement for items currently purchased from the allotment that are E-Rate eligible. The Technology Director should identify the items currently funded with allotment funds and apply for E-Rate funds. After

EXHIBIT 1
EXAMPLE ACQUISITION PROGRAM CALCULATIONS

GOAL 1: ACHIEVE TEA WORKSTATION RATIO OF 3:1 BY 2010, 2:1 RATIO BY 2012, AND 1:1 RATIO BY 2014.

GOAL 2: ESTABLISH FIVE-YEAR REPLACEMENT CYCLE FOR ALL DISTRICT COMPUTERS.

Assumptions:
- Student population remains constant.
- The number of new student computers needed takes into consideration the current PC(s) to reach the target number.
- Replacement rate is for all current PC(s) based on age estimates from inventory.
- In 2015, the district will continue the 5-year replacement cycle.

DESCRIPTION	2010	2011	2012	2013	2014
Average number of new computers to meet 1:1 ratio	126	126	125	125	125
Replacements (Assumed 5-year cycle)	81	80	37	48	27
Total computers to be acquired	**207**	**206**	**162**	**173**	**152**
Cost of acquisition at estimate of $1,500	**$310,500**	**$309,000**	**$243,000**	**$259,500**	**$228,000**

Source: MISD inventory data, 2007–08.

E-Rate reimbursement is received, the technology allotment funds that have been freed up should be used to purchase new workstations.

Another strategy to maximize district funds might be to use computer extenders. With this equipment, a single computer connects to multiple screens and keyboards, allowing several students to work simultaneously from a single hard drive. MISD's Technology Plan assumes $1,500 for each new desktop computer configuration purchased. Configuring a single computer to support seven users with an extender costs $2,929. This figure includes the cost of one desktop system, two extender cards, and six additional monitors, keyboards, and mice. The number of software licenses will be dependent on the particular software application's licensing agreement. While this configuration may not be appropriate for all classrooms, it can reduce the number of workstations needing purchasing and replacing each year as the district reaches the target access level. At the current $1,500 amount, the district purchases seven computers for approximately $10,500 when, for the same number of users, the district could spend $2,929 on an extended system.

The district should also seek out and apply for technology-related grants. Interested staff could be identified and sent to grant-writing training to maximize success. As an incentive, teachers successfully applying for the grant could receive the purchased technology for his or her classroom. As another option, the Region 12 Education Service Center (ESC 12) provides technical assistance in developing grant opportunities. ESC 12 has a grant writer/consultant position that can assist in identifying funding opportunities, designing grant programs to meet application requirements, writing or critiquing proposals, and facilitating collaborative applications among districts.

The Technology Director should be included in the grant review process to ensure that the equipment proposed for grant funding will meet district configuration requirements. The Superintendent should also review grant applications to make sure any grant requirements for district matching funds or resources can be met.

The final strategy is to obtain donated or refurbished computers. The TCI computer recovery program details and application are available at

http://www/tci.tdcj.state.tx.us/services/cr/. Other opportunities should be explored such as the federal computer donation to schools, found at http://computersforlearning.gov/.

The development of a computer acquisition program can be accomplished with existing resources. The annual cost of implementing the plan will be determined by the district's decisions on configuration and successful acquisition of additional resources.

IMPROVING CLASSROOM TECHNOLOGY USE (REC. 2)

Increase classroom integration opportunities by establishing a Technology Users Group with administrative rights at the campus level and responsibility for evaluating promising technology, identifying available training programs, and providing curriculum integration support.

While MISD's aging technology is the primary obstacle to technology integration into the classroom curriculum, there are other components of technology proficiency that MISD has not yet implemented. Primarily, MISD does not have a defined process for evaluating, acquiring, training, and supporting the integration of technology into the classroom. Elements of a process exist but are not performed with regularity. Students and staff said district technology is only minimally integrated into classroom curriculum and cited lack of resources as the fundamental reason.

TEA provides a self-reporting tool for determining technology proficiency referred to as the School Technology and Readiness (STaR) Chart. The STaR Chart is a tool developed to assist districts in assessing their ability to integrate technology effectively across the curriculum. The STaR Chart

measures proficiency in the four key areas of TEA's Long Range Plan for Technology: Teaching and Learning; Educator Preparation and Development; Leadership, Administration and Instructional Support; and Infrastructure for Technology. Progress is charted at one of four levels: Early Technology, Developing Technology, Advanced Technology, or Target Technology. The goal for educators is to fully integrate technology in the curriculum.

A review of STaR Chart data for districts under 1,600 students shows MISD to be below average, with only a small number of districts reporting a lower averaged total score. In interviews, staff identified several areas that act as barriers to classroom technology integration:

- Limited staff support for uploading curriculum related materials to district computers;

- Inadequate access to limited technology; and

- Lack of technology evaluation and planning.

Because of its size, district communication of technology needs is primarily informal, based on casual conversation rather than organized committee process. The Technology Director did not sit on the campus or district planning committee for 2007–08, and his past participation was as a teacher rather than as Technology Director. No position is tasked with research and development of classroom technology standards, and MISD has not adopted a standard configuration for its classrooms.

To keep abreast of technology trends, administrators have relied on teachers transferring from technology-savvy districts to identify useful technology. There

is no formal process for researching unfamiliar technologies to determine if a new product or application can better meet district needs. For example, recent purchases of electronic whiteboards were made after teachers who had previously used this type of technology presented their request to the board. As a result, the district purchased 10 electronic whiteboards at a cost of $1,728 each. This technology is particularly suited for younger students as it remains in a fixed location and can be used easily by students. However, placement in every room is costly, and staff expressed concern that some teachers will find the effort required to set up and take down the shared board frustrating. Since the electronic whiteboards were not part of an organized planning process, some teachers have computers that cannot run the electronic whiteboard application, making the technology unavailable in some classrooms.

Other promising technologies have not been considered, and there is no process by which to do so. For instance, a similar technology to the whiteboard is electronic slates. With an electronic slate, a teacher can hand the slate to a student whose work can then be projected for the entire class to see. The student participates from his or her seat. The electronic slate provides mobility for the teacher to help another student while the student with the slate is providing examples for the remainder of the class.

District technology integration is further limited by available staff to upload curriculum-based programs. In order to limit the risk of viruses and inappropriate use of district technology, the Technology Director configures district technology to allow only Technology staff to load programs and applications on computers. For example, not all classroom computers have a media player

application, so educational video cannot run on the computer. If a teacher locates a video resource to use in a class activity, the teacher must wait for Technology staff to find time to load it on the classroom computer. The two Technology positions, the Technology Director and Technology Aide, service four campuses, with priority responsibility for the repair and maintenance of the computer network. Uploading curriculum-based programs fall in priority behind keeping the internet connection working or upgrading and installing the computers.

The classroom computer is not the only barrier to video resources. Access to the district's streaming video service is limited to a single computer located adjacent to district administrative offices. Because of its off-site location, teachers wanting to use the streaming video computer must schedule the use similar to a field trip, causing students to miss the class periods before and after the lesson. Each school is capable of receiving streaming video, but Technology staff has not committed its resources to schedule campus downloads. Since there are no campus-based positions with the administrative rights or authority to perform download and upload functions, teachers are not regularly integrating video resources into their lesson plans.

MISD's two technology positions are also responsible for training teachers on the use of administrative software such as the attendance and grade book programs. MISD's Technology Plan 2007–2010 does not identify a specific training approach for reaching TEA proficiency goals, but states that teachers can attend technology training when requested. Teachers were unaware of the technology plan, or the availability of the training. MISD's Campus Improvement Plans (CIPs) include computers as an essential resource

or strategy for reaching the educational goals of the school. MISD could not locate its District Improvement Plan (DIP), so the status of any formal strategies for technology proficiency training is unknown. However, if instructional staff does not understand how to use the purchased technology, their ability to integrate it into the curriculum is limited.

Without an organized process for ongoing evaluation and selection of technology, the district might not always benefit from the best technologies for their technology dollars. Without the appropriate support of purchased technology, new technology cannot be used. Without a process for identifying and notifying staff of training resources, staff will not reach the desired proficiency. Technology staff will continue to deploy resources to address computer error issues that could be solved with user proficiency and adequate technology resources.

MISD can increase classroom integration opportunities by establishing a Technology Users Group (TUG), with administrative rights at the campus level and responsibility for evaluating promising technology, identifying available development programs, and providing curriculum integration support. The addition of a technology users group can bridge the service gap between technology staff and campus need. The elementary, middle, and high schools should each identify a teacher to participate as a member in the group. The teacher should also participate on the campus advisory committee either as a full member, or as an ad hoc position participating when curriculum or technology issues are discussed. The TUG can provide a link between the campuses and administration on technology integration issues,

reducing the information shortfall inherent in an informal communication process.

The TUG Members should be reasonably proficient in technology and willing to devote the time necessary to addressing campus technology issues. The Technology Director should not be a "user" member, but both the Technology Director and the Curriculum Director should serve as ad hoc members of the group. The TUG does not replace the responsibilities of administrative staff for planning and budgeting of technology, but it should complement and enhance those efforts.

The TUG members should be provided administrator rights to upload curriculum related programs for their campuses. Any training needed to ensure the TUG member has the necessary proficiency to perform these tasks should be identified and provided by the Technology Director. Technology staff should monitor this process to ensure appropriate use of the administrative rights and provide additional training as needed to ensure compliance. Once policy and application proficiency are established, the Curriculum Director should identify video downloads to complement lesson plans and work with Technology staff and the TUG to make the downloads available and timely.

The TUG should research current and emerging technology for education by identifying schools with innovative approaches to integration, by discussions with Regional Education Service Centers, and by attending educational technology conferences. As potential technologies are identified, the TUG members should meet with their campus committees, the Curriculum Director, and the Technology Director to determine if the technology should be considered for a classroom standard or as an available option.

Ability of staff and equipment to fully implement the new technology should be a consideration. The TUG should also contact schools using a particular technology to determine performance considerations. Promising technologies should be presented to the Superintendent and board as appropriate. Approved technologies should be adopted into the technology plan with an identified source of funding.

The TUG should also work with principals and the Director of Curriculum to identify necessary technology training opportunities for teaching staff. The STaR Chart could be used to identify progress towards proficiency standards, and Technology staff can confirm specific gaps in proficiency with district applications. Teachers should be notified of available training through email notices or the district web site.

As the district acquires new technology, the Curriculum Director should prepare and provide training in the use of the new technology in the classroom. However, training should not wait until all technologies have been fully implemented. Proficiency tips and tools for popular word processing and presentation applications are available on the internet and could provide an additional training resource. The Curriculum Director should also work with the TUG to develop training on the use of web resources in the classroom, including innovative use of the district's streaming video application. The training could be part of the summer training program or less formal mini-programs.

The Superintendent should identify an appropriate level of resources for the TUG. Depending on the amount of responsibility assumed, each member should receive a stipend for the additional administrative responsibilities. A small travel budget should allow the TUG to make site visits to schools with advanced technology possibilities, as well as attend a technology seminar. The membership should be periodically reviewed and interested teachers with appropriate proficiency should be able to apply. To maintain continuity, not all positions should be reviewed for rotation in the same year.

The cost of implementing this recommendation is $1,500 for TUG stipends [$500 stipend x 3 TUG members = $1,500], a conference budget of $2,430 [$135 registration x 3 attendees = $405], [($90 hotel x 5 days) x 3 attendees = $1,350], [300 miles x .50 per mile = $150], [($35 per diem x 5 days) x 3 attendees = $525]. The total cost for both time and travel is $3,930 for one year. The five-year cost is $19,650.

TECHNOLOGY INFRASTRUCTURE (REC. 3)
Develop and implement a time-phased network enhancement plan that includes an assessment of the effectiveness of the current infrastructure, traffic loads, and internet service provider services.

MISD provides internet and administrative software access through a network of servers. As the foundation of the district's computer system, the network infrastructure should provide adequate storage, speed, and applications to meet district administrative and classroom needs. The district does not have a comprehensive plan that provides an infrastructure blueprint for the desired level of service, making it difficult to cost effectively meet short and long-term needs.

The district's network consists of servers in a RAID 5 array. A RAID (Redundant Array of Inexpensive Disks) array is a computer industry term for a data storage scheme that divides and duplicates data

across several hard drives. The RAID 5 uses three or more disks to protect against the loss of any one disk. The RAID configuration of servers hosts the internet, attendance, and grade book applications.

The district purchases internet services through the Region 12 Education Service Center (Region 12). The district connects to the service center through a T-1 line. A T-1 line is a fiber optic cable capable of carrying data at 60 times the rate of a home internet connection. While this type of cabling can provide adequate service to a hundred simultaneous users who are performing general research, it cannot adequately serve even a handful of simultaneous users of streaming video.

MISD connects its buildings with three types of cabling: single mode fiber, multi-mode fiber, and CAT 5 twisted pair cabling. A multi-mode cable carries the largest amount of data; the CAT 5 cable carries the least amount of data. Switches and routers are the traffic control devices that move data through the network. Cables, switches, and routers must be designed for a coordinated distribution of varying amounts of traffic throughout the day as users get on and off the network.
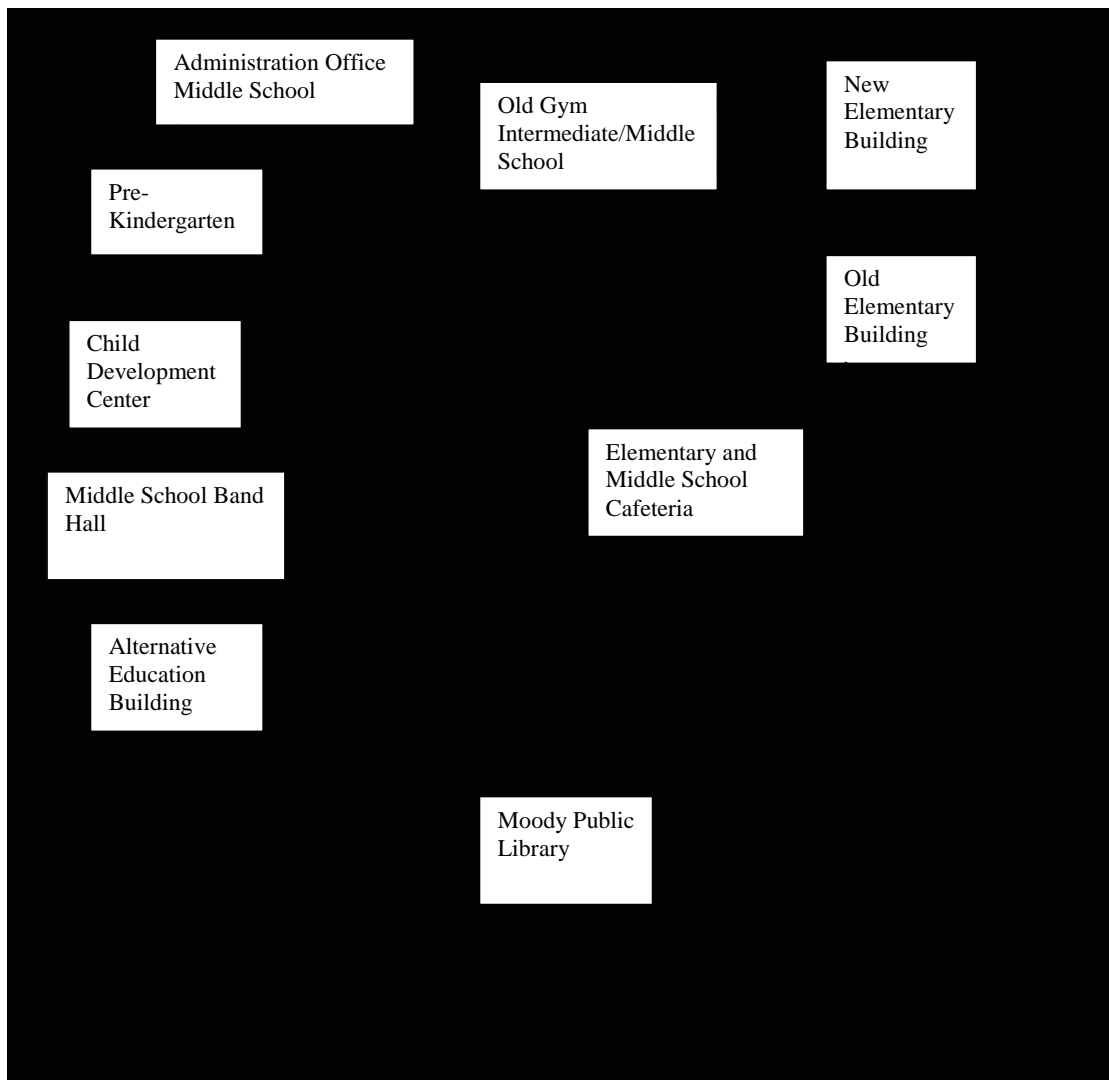
The district T1 line connects to the Alternative Education Program (AEP) building, which serves as the initial internet connection point for all district buildings. As shown in **Exhibit 2**, a multi-mode line runs from the AEP building, underneath the Middle School Band Hall, the Child Development Center and the Pre-Kindergarten building, to service the Administration/Middle School building. The Administration/Middle School building provides service to the Pre-Kindergarten and Child Development Buildings through a CAT 5 cable. The Old Gym/Intermediate School building connects the new and old elementary buildings by an overhead multi-mode fiber cable.

The district also provides internet service to the Moody Community Library by a single mode fiber optic cable from the Old Gym/Intermediate building. The High School is connected through the public library by a single mode fiber optic cable. The cafeteria and middle school band hall receive their network connection from the old elementary building from a Cat 5 cable.

The T1 line shown in **Exhibit 2** was installed in August 2007. The district had continuing problems with its web connection, changing hosts twice before contracting with Region 12 in 2006. While staff said email service has improved since contracting with Region 12, the primary complaint from all staff interviewed was unpredictable and inadequate access to the internet and streaming video resources. The network goes down frequently, and occasionally for extended periods. According to the Technology Director, Region 12 has tested the T1 line, which was at capacity for the volume of traffic it could carry. Other parts of the network have not been tested for traffic volume and capacity, although the staff said that network switches were not adequately performing.

In a document entitled "Infrastructure Proposals/ Needs," the Technology Director has proposed adding a fiber optic cable connection from the AEP building to the public library and high school. According to the proposal, this approach would remove some of the current bottleneck created with having all internet traffic routed through a single fiber optic cable between Administration and AEP buildings by routing the high school traffic in a more direct path to the AEP building. As a second proposal, the Technology Director suggests upgrading to all fiber optic cabling from the Administration building to the Old Gym, elementary buildings, cafeteria, and band hall.

EXHIBIT 2
MISD TECHNOLOGY INFRASTRUCTURE
CABLING DESIGN
2007–08

Administration Office
Middle School

Old Gym
Intermediate/Middle
School

New
Elementary
Building

Pre-
Kindergarten

Old
Elementary
Building

Child
Development
Center

Elementary and
Middle School
Cafeteria

Middle School Band
Hall

Alternative
Education
Building

Moody Public
Library

SOURCE: MISD Computer Network Diagram, 2008.

According to the proposal, replacing the less functional copper wire with fiber would provide additional fiber cable pathways that would alleviate some of the Administration building bottleneck.

The final proposal is to add a second T1 line between Region 12 and the AEP building. A second T1 line would increase traffic capacity, which has not kept pace with the number of new computers and data intensive technology applications. The "Infrastructure Proposal/Needs" document did not provide cost estimates for the three phases of the plan, although the Technology Director has offered to obtain quotes for the outlined work. The proposal described work to be done, but did not contain analysis that determined if district access problems are caused by the AT&T telecommunications connection, the Region 12's hosting capabilities, or the district's network

infrastructure. It did not identify priorities, or rank the proposals in order of most effective in the short or long term.

There are some short term solutions to increase access without increasing infrastructure. For example, each school has the capability to run streaming video, but access has been restricted to the single Administration building computer due to perceived cable limitations. With planning, teachers could schedule streaming video downloads after hours when network traffic is minimal.

Region 12 has recently decided not to accept the E-Rate discount for its services as an Internet Service Provider (ISP). It is also unclear whether the ISP has adequate infrastructure for the number of customers it services. In the long term, the district needs to know if the bottleneck is between Region 12 and MISD, or is somewhere within the MISD network in order to develop an effective solution.

MISD's Technology Plan includes a three year phased technology acquisition plan which includes upgrading and repairing fiber links, adding two new servers, and replacing miscellaneous parts and switches in 2007–08. The second and third years in the technology plan focus on purchasing new computer workstations. The projected technology budget for plan year 2007–08 was $111,000. The projected budget for 2008–09 is $96,000, and the projected budget for 2009–10 is $84,000. The first phase for upgrading the network had not been implemented as of April 2008, although the district has informally committed to implementing the second and third year phases. This detail suggests that the MISD Board understands the need to upgrade current classroom computers but may be unsure if the proposed network upgrades are essential.

While funding decisions have contributed to the patchwork of cabling, the district's lack of a comprehensive plan for a dynamic infrastructure is a significant factor. Acquisition decisions have been based on available funding, rather than an analysis of current and projected need sufficient for the board's understanding and commitment to a corrective plan. Without data supported planning and budget commitment, the district will continue with a network infrastructure that is not adequate to support district administration and educational needs.

The district should obtain outside technical assistance to assess the current network and internet connection status and develop a five-year network enhancement plan. The plan should provide a blueprint for the district to standardize network components and increase the efficiency and reliability of its network and internet services. The plan should focus on upgrading the connectivity and stability of the network, starting with those components creating the greatest barriers to consistent service. Alternative internet service solutions should be explored to determine if the current ISP has the capability to provide an adequate and cost effective level of service. The plan should also identify a minimum committed level of funding for the improvements, which should be provided for by establishing a technology budget consistent with the board approved plan.

The fiscal impact of this recommendation includes a one time cost of $500 for assistance to assess and develop the network enhancement plan, based on an estimate of 5 hours of consulting time at a rate of $100 per hour (5 hours x $100 per hour = $500).

TECHNOLOGY PLANNING AND MANAGEMENT CAPABILITY (REC. 4)

Contract with the Technology Director on a one time basis to develop the necessary planning and management documents.

As is common in small districts, MISD does not have a dedicated technology department but spreads technology assignments among various district positions. The district does not have a Technology budget, or a full-time Technology Director. As a result, the time available for the Technology Director to develop technology planning documents or management programs does not meet basic operational needs.

The district's technology activities are primarily performed by three positions: the Technology Director, a Technology Aide, and the Curriculum Director. The Technology Director is responsible for network administration, hardware and software acquisition, technology planning, maintenance, and repair. The full-time Technology Aide assists the Technology Director and is responsible for maintenance, repair, and installation. The Curriculum Director is responsible for updating and maintaining web content. Both the Technology Director and the Technology Aide are 11 month positions.

Without a focused technology planning and management function, many planning and management activities are not being accomplished. **Exhibit 3** compares technology best practice management activities to MISD efforts and outlines the impacts.

The district should contract with the Technology Director on a one time basis to develop the necessary planning and management documents. This service can be provided without affecting regular routines by extending the Technology Director position

for a 12th month. The documentation developed should be based on best practices, which should be researched as part of the documentation process. Once developed, ongoing maintenance and upkeep of these documents should be managed within the regular responsibilities of the district's two technology positions.

The district should contract with Region 12 to review and advise MISD on the final product. By using a combination of internal knowledge and outside expertise, MISD can produce more effective documents. By implementing this recommendation, the district also enjoys a savings over hiring an independent contractor to develop the documents. Knowledgeable staff creates the initial drafts, saving the more expensive consulting hours for essential edits and suggestions for improvement.

By using MISD staff, the final product will be scaled to the district's ongoing resources, increasing the potential for successful implementation and upkeep. Once the new procedures are available for use, Technology staff should gain additional time in their regular workday to increase time spent on other management activities such as internal training.

The costs of implementing this recommendation are the additional one month salary of the Technology Director for $4,656, and the cost of an outside review. Consulting review services for the planning and procedure documents are estimated at 20 hours at an average rate of $100 per hour, for a total of $2,000. The total one time cost of this recommendation is $6,656.

EXHIBIT 3
ANALYSIS OF TECHNOLOGY PLANNING AND MANAGEMENT ACTIVITIES 2007−08

AREA	BEST PRACTICE	CURRENT MISD SITUATION	IMPACT IF PRACTICE NOT FOLLOWED
Planning	Disaster recovery plan that contains detailed information about the district's systems; location of backups; key vendors; staff involved in disaster recovery, their roles and responsibilities; and recovery tasks and procedures.	Informal plan only partially detailed and documented.	District can recover under many circumstances, but may not be able to recover quickly or completely in the event of an unforeseen disaster.
	Computer acquisition and replacement plan that details timeline for keeping pace with technological advances.	Does not exist.	Out-of-date technology is insufficient for education purposes and becomes a productivity drain on district resources.
Policies and Procedures	Standard Operating Procedures that govern day-to-day operations for Technology staff. Manual is accessible and easy to read.	Written manual does not exist. Some guides to a particular process have been drafted, but no cohesive collection has been developed.	There is no reference guide to ensure that tasks are consistently performed. Training new personnel takes staff time away from daily maintenance support activities. Knowledge base of current staff is lost if staff leaves.
	Procedures for end users that outline procedures for basic hardware troubleshooting and software use.	Does not exist. Some guides to a particular application reside on the server, but many applications reside locally.	Technology staff time is diverted from daily network management and support tasks to respond to issues that could be resolved by users.
Inventory Management	Inventory is kept current with sufficient information on age, location, and cost to support budget and planning activities.	Inventory is not current. Equipment goes into use before it is tagged as a district asset. Staff responsibility for assigned hardware and software is not documented.	Without adequate documentation, the district is at risk of loss when inventory is not adequate to locate the person responsible for the technology or provide proper documentation should an insurance claim be filed.
Evaluation	District technology is periodically evaluated to determine if new tools should be adopted, if configuration standards are still appropriate, and if work orders indicate a change in maintenance or replacement strategy.	Teachers present new technology needs to the board, configuration standards do not exist, and work orders are not documented.	District does not have protocols to analyze and evaluate systems for acquisition or replacement or to develop strategies to address user issues.
Training	Technology staff works with administration to provide regular training on technology acquisitions.	District staff does not receive regular training on technology issues.	Staff might not meet State Board for Educator Certification (SBEC) technology standards. Technology staff responds to calls for service to address issues which could be resolved with training.

SOURCE: MISD staff interviews, 2008.

PLANNING FOR DISASTERS (REC. 5)

Formalize the disaster recovery plan and include redundant backup of key systems for added security.

MISD has an informal plan for recovering district data in the event of a disaster. The informal recovery plan provides some written procedures and removes a CD ROM with data to an off-site location. However, the district could further reduce the risk of loss while increasing data recovery speed with a more comprehensive disaster recovery plan.

The Technology Director has developed a low-cost process for securing district data in the event that a server becomes inoperative. At the close of the business day, district servers are backed-up. At least once a week the backup is copied to CD ROM. Previous backups are deleted from the system to maximize its capacity for running daily routines. The Technology Director takes a district laptop with the district's data home with him each evening.

The Technology Director has also written a series of instruction sheets explaining various procedures needed to restore data and bring up the servers. There are no periodic tests of the procedures, but the protocols are "tested" when a server fails. This process allows either the Technology Aide or the Technology Director to bring up the servers in the event one or the other is unavailable when the system goes down.

The district does not have an emergency generator to maintain network service in the event of a power failure, but the district is the area shelter for local disasters and the city provides the generator during those events. The district has gone through two disasters that tested its procedures—a fire and a tornado. The network has also gone down for other

reasons unrelated to weather, and Technology staff has successfully initiated recovery procedures.

The current process has been adequate to bring district network systems back online. However, should a disaster prevent Technology staff from communicating with the district, the ability for the remaining on-site staff to address the disaster protocol is questionable. Since the off-site backup disks are located with the Technology Director, accessing the necessary disks may also present a problem if the Technology Director is unavailable.

A disaster recovery plan is critical for districts to be able to restore essential business and reporting functions such as payroll, accounts payable, or PEIMS student and financial reporting. The National Center for Education Statistics "Safeguarding Your Technology" states that essential elements in a formal disaster recovery plan include:

- Develop a complete list of critical activities performed within the district;

- Identify which systems and staff are necessary to perform the functions;

- List key personnel for each function, and their responsibilities;

- Create an inventory of all technology assets including hardware, software, data, documentation, and supplies that correctly identify the location and sufficient information to document loss for insurance recovery;

- Define actions to be taken when a pending disaster is projected;

- Identify actions taken to restore critical functions;

- Keep the plan simple but effective; and

- Keep the plan components in an accessible location that can be accessed in the event of an emergency.

MISD should formalize the disaster recovery plan and include redundant backup of key systems for added security. The plan should contain the key elements to protect the district's interest. Once developed, Technology staff should annually review the plan to see that any changes in staff, activities, or systems are incorporated.

The disaster recovery plan should also include the addition of redundant backup. The district's primary server room is in the Alternative Education Program (AEP) building. The high school server room could serve as an additional off-site backup location to the AEP servers. A storage device such as an external hard drive will provide backup capabilities at the high school. Redundant backup is easily managed by adding an external hard drive at both the AEP and high school server rooms.

The district can enhance its server restoration by the addition of software that will image a complete server. By imaging the server application and data, recovery time to reload the data is reduced.

The fiscal impact of this recommendation is a one time cost of $500 for two USB 1TB (terabyte) external hard drives ($250 x 2 = $500) and imaging software at $70 for at total cost of $570 ($500 + $70 = $570).

FISCAL IMPACT

RECOMMENDATION	2009–10	2010–11	2011–12	2012–13	2013–14	5–YEAR (COSTS) OR SAVINGS	ONE TIME (COSTS) OR SAVINGS
1. Implement a comprehensive computer acquisition and replacement program that identifies and targets multiple sources for computer equipment acquisition.	$0	$0	$0	$0	$0	$0	$0
2. Increase classroom integration opportunities by establishing a Technology Users Group with administrative rights at the campus level and responsibility for evaluating promising technology, identifying available training programs, and providing curriculum integration support.	($3,930)	($3,930)	($3,930)	($3,930)	($3,930)	($19,650)	$0
3. Develop and implement a time-phased network enhancement plan that includes an assessment of the effectiveness of the current infrastructure, traffic loads, and internet service provider services.	$0	$0	$0	$0	$0	$0	($500)
4. Contract with the Technology Director on a one-time basis to develop the necessary planning and management documents.	$0	$0	$0	$0	$0	$0	($6,656)
5. Formalize the disaster recovery plan and include redundant backup of key systems for added security.	$0	$0	$0	$0	$0	$0	($570)
TOTAL REPORT	**($3,930)**	**($3,930)**	**($3,930)**	**($3,930)**	**($3,930)**	**($19,650)**	**($7,726)**