Thomas Jefferson High School for Science and Technology

Task Force for the Future

A Report to the Fairfax County School Board

Jane Strauss, Task Force Chair
Richard Moniuszko and Evan Glazer, Co-facilitators

February 12, 2007

Executive Summary

During the past few years, concerns regarding the aging facilities at Thomas Jefferson High School for Science and Technology's (TJHSST) have been brought to the attention of the Fairfax County Public Schools (FCPS) School Board. Regarded as one of the highest performing high schools in the country, the school operates in a facility constructed in 1964. The school's timeline for capital improvements is the same as all other schools in Fairfax County. The parents and school community believe the current facility precludes providing the students the unique and innovative learning experiences they need to meet the goals of the school. Many of the research labs are now antiquated with equipment over 20 years old and in constant in need of repair.

Fairfax County School Board and the school community have made an effort to improve TJHSST's facilities and resources since its inception. Several research labs were renovated in 1989 to create appropriate space for scientific experimentation, and the school also developed an external mentorship program so students can work with scientific professional's offsite where they can access more state-of-the-art equipment. In addition, the Thomas Jefferson Partnership Fund, created in 1999 by a group of parents, has been obtaining charitable contributions and developing partnerships with scientific, corporate, and higher education institutions. None of these efforts, however, have been sufficient to address large scale renovation or reconstruction of the entire school.

To examine these issues, the Fairfax County School Board and Superintendent Dr. Jack Dale appointed a Task Force in summer 2006 to address the future programs and facility needs of TJHSST. This TJ Task Force consists of representatives from various stakeholder groups, including FCPS school district administration, TJHSST school administration and faculty, curriculum specialists, parents, school board members, science and technology corporate representatives, and a member from higher education.

The TJ Task Force, led by school board member Ms. Jane Strauss, divided into programs and facilities subcommittees. The programs subcommittee, co-facilitated by TJHSST principal Dr. Evan Glazer and FCPS deputy superintendent Dr. Richard Moniuszko, led a team to review innovative secondary programs in mathematics, science and technology, administer a series of public surveys, perform data analyses, and engage in brainstorming and strategic planning sessions. The subcommittee examined the student values and skills needed for future success, potential programs, and facility needs to facilitate these potential programs. The facilities subcommittee, led by Superintendent Dale, reviewed available options for construction in Fairfax County and TJHSST's position on the FCPS Capital Improvement Program (CIP). The two subcommittees worked together to recommend a solution that could reflect both the school's present and future needs, as well as the school district's resources.

Through extensive data collection, the TJ Task Force identified critical skills important for TJHSST graduates, such as problem solving, critical inquiry, and research, and important values for TJHSST graduates, such as intellectual curiosity and social responsibility. The existing school programs incorporate many of these values and skills, but student outcomes would be enhanced through the development of new

program opportunities identified in the report. The programs subcommittee created recommendations with respect to the following components of the school: student population, research focus, curriculum and instruction, student activities, equipment and resources, human resources, innovation, professional development, community partnerships, scheduling and grading, global citizenship, and outreach. In addition, the subcommittee gave program examples and facility and resource needs for each recommendation. For example, a professional development seminar room is needed for teaching institutes and opportunities to demonstrate innovative and best curricular practices with teachers across the school district. Small lecture halls are needed for research seminars, guest lecturers, and student presentations across interdisciplinary courses. Additional laboratories are needed to support the growing student population, pursue new areas of scientific research, maintain space for ongoing projects, and provide outreach science opportunities for students who do not attend TJHSST full time.

The programs subcommittee concluded that many of the new programs described in the report could not be orchestrated within the current facility, calendar, or resources available at the school. The facilities subcommittee concluded that property for a high school is not available in a desirable location in the county. Hence, in order to fulfill its mission and provide innovative, challenging, and well-rounded curricular and extension programs to students and teachers across FCPS and the greater Northern Virginia region, the TJ Task Force recommends the FCPS School Board accelerate the renovation timeline for TJHSST in the Capital Improvement Program to begin redesign of a building on its existing site to incorporate the facility and resource needs described in this report.

Background

Thomas Jefferson High School for Science and Technology (TJHSST) was established in 1985 as a result of a partnership of businesses and schools created to improve education in science, mathematics, and technology. The school was part of the state of Virginia's response to the US Department of Education's report, *A Nation at Risk*, Ernest Boyer's Carnegie Foundation report*, High School: A Report on Secondary Education in America,* and recommendations from the Fairfax County Public Schools (FCPS) Superintendent's Business and Industry Council. Housed in a FCPS High School constructed in 1964, the school has had only minor renovations since that time, most recently in 1989 to its science labs. In addition to serving students from Fairfax County, TJHSST also serves students from six other school districts (Arlington, Fauquier, Loudoun, Prince William, Fairfax City and Falls Church City). As a Governor's School for Science and Technology for Northern Virginia, the school receives approximately 7% more funding than a standard high school from the Virginia Department of Education.

The facility is maintained by FCPS, and thus is considered for renovation according to the same Capital Improvement Program (CIP) guidelines as all other FCPS high schools. As of October 2006, the FCPS time line calls for TJHSST renovation to be funded in a 2009 Bond Referendum, with construction estimated to begin in FY 2011 or 2012. The projected budget is calculated in the same manner as all FCPS high schools, and does not reflect facility needs that support the unique characteristics of TJHSST's learning environment, nor for the increased enrollment mandated by the FCPS School Board following recommendations from the Blue Ribbon Commission on Admission in 2004. The FCPS School Board is scheduled to review the CIP again in January 2007.

Capacity of the school is 1600 students, while it currently maintains over 1800 students and is projected to rise to 1920 students over the next four years. Currently, there are between 432 and 470 students at each grade level (9-12), with nearly 3000 students applying in spring 2006 for the slots in the class of 2011. Twenty-five "learning cottages" have been added outside of the facility to provide extra classroom space, although they are unable to serve science and technology needs due to safety regulations for science classrooms.

TJHSST graduates are high achieving when compared to the rest of the nation, with an average verbal and math SAT score of 1454 and 158 National Merit Semifinalists in 2006. In addition, the College Board has recognized TJHSST with exemplary Advanced Placement (AP) programs in numerous subject areas where students earn greater scores on the AP exam than any other school in the country. In January 2007, the Intel Science Talent Search recognized 14 TJHSST students[1] for their excellence in scientific research, the most among high schools across the nation. More than 99% of its graduates attend institutions of higher education, including some of the most prestigious universities in the nation. Among the 411 graduates in the class of 2006, more than 20 students attended Duke University and Princeton University, and more than 10 students attended the Massachusetts Institute of Technology

Distinguishing features of the school include the ninth grade Integrated Biology, English and Technology (IBET) classes, twelve specialized science and technology research laboratories, and a Mentorship Program to provide students with research opportunities or other projects in science and technology. The school also provides a number of courses beyond the levels of the College Board's Advanced Placement program that do not generally exist at the high school level. In addition to these special program features, TJHSST offers a full complement of high school courses and programs, including humanities, fine arts, and athletics. An 8th period

[1] Almost all of these student projects were completed off-site with a scientific mentor since the resources were not available at the school.

activities period provides each student the opportunity to engage in social and academic endeavors at the school. A brief description of the special programs, along with the current vision and mission statements, is included in the Appendices of this report.

The Task Force

The current Task Force was appointed in July 2006 by the FCPS School Board to examine instructional and facilities issues related to TJHSST. The charge of the Task Force was to review future program and facilities options, and make recommendations to the Superintendent and FCPS School Board. Options to be considered were to include:

- Current renovation timeline
- Accelerated addition plus renovation timeline
- Partnership to allow FCPS students to spend senior year at George Mason University
- New TJHSST facility with acreage for comprehensive high school programs
- New TJHSST academic facility without acreage
- Other partnership options
- Additional options identified by the Task Force

Two subcommittees of the Task Force were formed. The *program subcommittee* was charged with making recommendations for the instructional program, including possible partnerships with higher education and the science and technology community. Their goal was to ensure that TJHSST students graduate with the 21st century skills needed for future success. The *facilities subcommittee* was charged with examining issues related to the building design and funding issues. The members of the Task Force are as follows:

Chair
Jane K. Strauss, FCPS School Board Member

Program Subcommittee
Richard Moniuszko, Deputy Superintendent, FCPS, and Co-Facilitator
Evan Glazer, Principal, TJHSST, and Co-Facilitator

Dan Bannister, Northern Virginia Technology Council Board Member
Jack D. Dale, Superintendent of Schools, FCPS
Hollye Doane, Parent, TJHSST
Craig Herring, Math Specialist, FCPS
Debbie Kilpatrick, Immediate Past PTSA President and Alumni Parent, TJHSST
Cecelia Krill, Assistant Superintendent, Cluster III, FCPS
Janice Leslie, Director, Office of HS Instruction and K-12 Curriculum Services, FCPS
Maribeth Luftglass, Assistant Superintendent, Information Technology, FCPS
Ilryong Moon, School Board Member, FCPS
Stephen Rattien, Emeritus Director for Science &Technology, RAND Corporation
Melissa Schoeplein, Humanities Teacher, TJHSST
Linda Schwartzstein, Vice President, Enrollment Services & Vice Provost, Academic Affairs, George Mason University
Jane K. Strauss, FCPS School Board Member
James Swoboda, Parent, TJHSST
Myra Thayer, Science Coordinator, FCPS

Facilities Subcommittee
Jack D. Dale, Superintendent of Schools, FCPS, and Facilitator
Phil Niedzielski-Eichner, School Board Member, FCPS
Ed Saperstein, Parent, TJHSST
Jane K. Strauss, School Board Member, FCPS
Dean Tistadt, Chief Operating Officer, FCPS
Douglas Tyson, Assistant Principal, TJHSST

The work of the program subcommittee was supported by the work of a TJ Futures Committee consisting of 17 members of the TJHSST faculty and administration who created and analyzed survey data and developed strategies to obtain input from the TJHSST faculty and staff. In addition, the faculty and staff have been simultaneously engaged in a year-long self study as part of the Southern Association of Colleges and Schools accreditation process.

Processes Used

The program subcommittee reviewed the current mission, beliefs and goals[2]:

> "The mission of Thomas Jefferson High School for Science and Technology is to provide students a challenging learning environment focused on math, science, and technology, to inspire joy at the prospect of discovery, and to foster a culture of innovation based on ethical behavior and the shared interests of humanity."

The beliefs and current goals for the school are included in Appendix B. Following a review of some innovative math, science, and technology secondary programs, as well as state and national trends, a series of surveys was created for TJHSST students, parents and alumni as well as members of the education, science and technology communities. These surveys provided the Task Force with the thinking of the school's various constituencies regarding the values and skills desired in TJHSST students upon graduation, and regarding the programs desired in the TJHSST curriculum of the future.

The Task Force identified the following ranked values as essential:

1. ***Intellectual Curiosity*** – explore the world in a way that tolerates ambiguities, finds value in failure as well as success and promotes life-long learning
2. ***Social Responsibility*** – take responsibility for one's place in the world as future leaders, thinkers and protectors of the environment; ability to participate socially, ethically and with a mindset of "giving back"

Other values rated important included:

3. ***Continual Innovation***
4. ***Leadership***
5. ***Suspended Judgment***
6. ***Intrinsic Academic Pursuits***
7. ***Global Citizenship***
8. ***Cultural Awareness***

The corresponding skills associated with these values also were identified:

[2] The current mission statement has been modified from the school's inception, but has not changed its primary focus.

1. ***Problem Solving*** – ability to solve problems systematically, creatively, and in such a way that the solution can be simulated or tested in a natural context
2. ***Critical Inquiry and Research*** – ability to investigate previously unknown situations by acquiring knowledge, critically assessing its value, and making judgments about an uncertain reality

Other skills rated important included:

3. Versatile Communication Skills
4. Interdisciplinary Thinking in Authentic Contexts
5. Character Education
6. Collaborative Skills
7. Creative Adaptation to Advancements in Technology
8. Information Management
9. Interacting with and Designing for Diverse

The programs subcommittee also investigated and discussed science and technology programs and components of schools and school-based programs (both public and private sector) from throughout the nation. The following table outlines future program components, as well as corresponding facility and resource needs recommended by the program subcommittee. Some of these recommendations are currently in practice and supported by school's stakeholder groups, while others are proposed practices that will prepare this unique student population to lead and contribute to the development of an evolving society.

Program Subcommittee Recommendations

The recommendations of the program subcommittee are organized in the following areas, and presented in the tables on pages 8 through 12:

1. Student Population
2. Research Focus
3. Curriculum and Instruction
4. Student Activities
5. Equipment and Resources
6. Human Resources
7. Innovation
8. Professional Development
9. Community Partnerships
10. Scheduling and Grading
11. Global Citizenship
12. Outreach Programs

Program Component	***Recommendation***	***Examples***	***Facility and Resource Needs***
Student Population	1. Serve a projected population of 1920 students with an aptitude and passion for science and technology on a central campus. 2. Extend the services provided to the greater FCPS community by opening up research and science and technology labs outside of the school day, weekends, and summer to middle and high school students who do not attend TJHSST full-time.	• TJ classes to non-TJ students • Summer institutes	• Additional laboratories, office, meeting, and storage space to accommodate community use • Additional staffing to teach classes beyond TJ's primary curriculum • Facility to accommodate 1920 students, additional teaching staff • Additional parking
Research Focus	1. Increase the number and quality of partnerships with higher education and mentorship sites in the community. 2. Upgraded research labs to provide students with current developments in science and technology. 3. Request assistance from FCPS to assist TJHSST staff in pursuing grants to work with real-world problems and issues. 4. Widen research opportunities across the curriculum, and draw interdisciplinary co connections. 5. Increase availability and access to professional and scientific literature through electronic databases.	• Expanded mentorship program • Collaboration with universities on grant initiatives	• Updated research equipment in laboratories • Storage units • Enough lab space to accommodate special projects and new trends in science and technology • Offices to support mentorship and professional mentors on site visits • Library collection and technology resources to accommodate at least 60 student researchers at a time
Curriculum and Instruction	1. Ensure that students are well-grounded in the fundamentals of science and technology by working with higher education and other community partners. 2. Work with curriculum, industry, and higher education partners to design interdisciplinary and higher-level	• Integrated Biology English and Technology (IBET) • Evolving topics to reflect innovative scientific trends	• Small lecture halls to bring together interdisciplinary groups • Resource rooms to work on projects • Videoconferencing facility • Computer labs

	coursework that is not limited by the current Advanced Placement format. 3. Communicate the nature of dual-Credit (high school and college) courses to the colleges and universities TJHSST students attend so that the admissions offices understand the rigorous nature of the courses. 4. Expand videoconferencing and other media to further develop opportunities for students through distance learning. 5. Review the four-year sequence of courses to balance the workload in grades 9-12. 6. Early admission agreements with state and local colleges and universities should be pursued to increase focus on learning rather than grades during junior and senior years.	and current events • Advanced courses accredited by higher education institutions	dedicated for each curriculum division • Extended teacher contract or summer stipends for curriculum development • Some flexible classroom spaces to accommodate different size groups of students
Student Activities	1. Promote activities that develop physical and social skills important to well-rounded graduates. Continue the current focus on student activities; continue the arts and athletics and enhance them to ensure that all students have the opportunity to be participants. 2. Promote the belief that community service is a necessary component for TJHSST graduates to understand people from all segments of society, including those with limited knowledge and/or interest in science and technology.	• Comprehensive athletics program • 8th period activities to support academic competitions and general interest clubs • Homecoming festivities • Art, music, band, and chorus programs	• Athletics and physical education facilities next to the school • 8th period activities office • Auditorium to hold at least 1920 people • Gymnasium to hold 1920 people • Studio and performance space to support fine arts programs • Staffing for a community service liaison • Increased storage to support the largest number of activity programs across the school district
Equipment and Resources	1. Conduct an annual assessment of the equipment in the research laboratories, with an inventory compiled of needed items.	• Evolving programs to support research in innovative areas of science	• Updated equipment needs lists • Modern computers with enough power to run software for

	2. Inform corporate partners of these needs on an annual basis, requesting donated equipment or funds to supplement the school budget for these items.	and technology • Research and Development Advisory Board with corporate, scientific, and university affiliates	modeling, high-end computing, CAD, simulations, and other innovative tools for science and technology.
Human Resources	1. Enhance connections with researchers in the fields of science and technology, as well as faculty in higher education to provide students with meaningful relationships beyond the walls of the school. Explore videoconferencing/distance education. 2. Utilize parent connections and the TJHSST Partnership Fund Liaison more fully to expand opportunities for students.	• Mentorship program • Additional course/program options to students in specialized areas not available at TJ	• Staffing to support student research, outreach, and professional/curricular development efforts • Community room for visitors and volunteers • Technology tools to support distance learning and communication
Innovation	1. Employ individualized and collaborative student projects that require original thinking as a component of each student's coursework; these projects should engage students in developing solutions to real-world problems. 2. Expand partnerships with science and technology schools around the world to examine global issues.	• Student research projects • Science Fair • Community projects (such as in IBET) • Projects with corporate teams	• Large general labs to host ongoing projects • Smaller specialized labs to explore advanced and innovative areas of science and technology. • Videoconferencing tools
Professional Development	1. Develop TJHSST as a laboratory for best practices in teaching and learning, with intervisitation between teachers at TJHSST and other FCPS schools. 2. Involve visiting lecturers from the National Laboratories, the science and technology community as well as area colleges and universities, in teaching courses as well as special programs. 3. Provide the school's faculty with ongoing opportunities to attend specialized workshops and conferences, take courses, work in professional environments, and	• Visiting scholars program • Sabbatical program • Teaching institutes	• Professional development seminar room • Office space for visiting scholars • Additional laboratories to accommodate community use • Budget to support TJ professional development • Staffing to support professional development of TJ and non-TJ staff

	engage in other research to remain current in their skills.		
Community Partnerships	1. Strengthen the relationship between TJHSST and its community partners through different mechanisms, such as school committees and the Partnership Fund. 2. Form a Research and Development Advisory Board to involve the local technology and science communities in curriculum development and other school affairs, such as a guest lecturer series or ethics forum.	• Research and Development Advisory Board • Guest lecture series • Ethics forum • Internship program • Visiting researcher	• Community room for visitors and volunteers • Large conference room • Office space for visiting scholars • Conference rooms of varying sizes
Scheduling and Grading	1. Utilize the late schedule to involve students from other schools in the research component at TJHSST in addition to early bird and after-school coursework. 2. Use the remaining 5-6 weeks of schools, after AP exams, for alternative curriculum activities that support the development of desirable student outcomes. 3. Investigate an intersession during the year if the school year could start earlier in August and end earlier in June. 4. Investigate Pass/Fail grading for some courses to increase emphasis on student learning rather than earned grades, as long as any changes to grading procedures would be endorsed by college and university admissions offices to support the current acceptance rates to selective colleges and universities.	• TJ classes to non-TJ students • Specialized P/F courses to support intensive and alternative learning opportunities, including service, leadership, sustained field experiences, and research skills.	• Additional staffing and supplies to support more coursework • Student work rooms to house projects • Lecture halls for presentations
Global Citizenship	1. Encourage students to organize an annual science symposium to examine world issues and possible solutions. 2. Establish community service as a graduation requirement for all students, using the teacher advisory structure to implement this requirement.	• Collaborative research with other schools • International exchange opportunities • Science Fair • Service learning program	• Technology tools to support distance learning and communication • Service learning coordinator • Videoconferencing and network infrastructure to support global

	3. Coordinate exchanges and cultural experiences with foreign schools and international agencies.		interactions • Foreign language lab
Outreach	1. Provide learning opportunities for non-TJ teachers through offering workshops, presentations, seminars, and courses. 2. Offer tutoring and specialized mini-courses to younger students.	• Teaching institutes • Public seminars and lectures • Tutoring programs • Summer mini-courses	• Lecture halls for community presentations • Videoconferencing and network infrastructure to support distance learning. • Classrooms for outreach programs • Storage to maintain additional equipment • Tutoring and quiet study rooms • Dedicated buses for TJ • Staffing for outreach coordinator

Facilities Implications

The Facilities Subcommittee reviewed the following:

1) Co-location of a new TJHSST facility on or adjacent to the George Mason University (GMU) campus
2) Vacant land sufficient to house a comprehensive high school campus for approximately 2,000 students
3) Acceleration of an addition to the current TJHSST ahead of the complete renovation

There were two other options, but both were deemed not to be viable in maintaining and supporting a high quality, comprehensive high school. One of these was to contemplate building a new facility on a site that would require the elimination of athletic and theater programs in order to minimize facility needs. This would result in an extremely diminished breadth of programs and a significantly diminished comprehensive high school. As noted, this was deemed inappropriate, so further exploration did not occur.

The second of these options deemed not to be viable was to contemplate a new physical structure with minimal grounds that would require busing of students to suitable fields for outdoor athletic events. With a severely taxed transportation system, not to mention the less than desirable situation, this was deemed impossible to implement, so further exploration of this option did not occur.

1) Co-location at GMU

This option has been discussed, in various forms, for several years. To bring closure to the issue, the President and Provost of GMU were asked to determine the viability of GMU donating sufficient land or selling sufficient land to house a new TJHSST.

Over the past several years, GMU has studied its long term facility and land needs to meet the increasing size of the student body, its quest to be a major research institution in the region, and its desire to meet regional cultural opportunities. As a result of that long range analysis, GMU determined it was not interested in diminishing any of its current land holdings. They believed all current land would be necessary to accomplish their mission.

2) Identify other vacant land for TJHSST

FCPS has recently reviewed available parcels in the western portion of the county and found none of sufficient size to build a comprehensive high school. A similar review of the rest of the county produced the same result – no available land of sufficient size for a comprehensive high school.

3) Acceleration of addition ahead of renovation

With the additional bonding capacity of the School Board, several projects can be considered for acceleration. Included in this set of accelerated projects is the addition to TJHSST to accommodate the additional students attending TJ (as a result of the expanded enrollment approved by the School Board in 2005). The revised CIP is now before the School Board and community. If approved, the School Board will move up the start date of construction by about one year.

Conclusions

The TJ Task Force recognizes TJHSST will constantly be evolving with innovative programs since its role/mission is to provide leadership and service to faculty and students in Fairfax County Public Schools and six additional school divisions in Northern Virginia. The Task Force recognizes the school's need and responsibility to explore new curriculum areas, approaches to teaching and learning, and cutting edge technology in order to share best practices with other schools while providing unique learning opportunities to its specialized student body.

This report paints a picture of the school's future programs and needs based on the input and feedback from over 1500 stakeholders. According to these program ideas, the next evolution of TJHSST cannot be served with its existing facility and human and equipment resources because the current facility was designed for a non-specialized high school in 1964. The ideas brought forward in this report highlight resource needs to complement the mission and progress of this specialized high school for science and technology.

Therefore, the Task Force program subcommittee recommends that a new or reconstructed facility be designed on its existing site, with the support of the School Board, scientific institutions, and TJHSST community, to accommodate these program recommendations. This new school has potential to be a national model high school for Science, Technology, Engineering, and Mathematics (STEM) -- pursuing innovation, preparing future leaders, and serving a broader student and teacher population at a critical time when the United States' economic prosperity depends on the education system's ability to overcome the shortage of future STEM professionals and innovators.

Appendix A

Description of Special Programs

Program Overview

The 9th grade Integrated Biology, English, and Technology Program (IBET) is comprised of six teams of approximately seventy to eighty students each. Three teachers from each required subject (Biology, English 9, and Principles of Engineering and Technology) are teamed together with a counselor. The curriculum units of each discipline may be re-sequenced to complement the interdisciplinary focus. Approximately 80% of instruction is discipline-specific, with 20% focused on integrated environmental projects. As the school year progresses teachers become facilitators of learning as projects shift from teacher-directed to student-directed.

Symposium

In the spring, IBET students make formal presentations of their year-long collaborative research projects. Students work in teams of two to five students to conduct real-world research on topics such as stream water quality, forest health, salamander egg masses, and the like. Students search scientific literature for information about their topics and then design and conduct original experiments and field studies based on the literature search. After collecting and analyzing data, student groups collaborate to create a formal presentation of their work. These 20 minute presentations are given during the IBET Symposium, where students and parents have the opportunity to hear about the research of teams from other IBETs.

Research Laboratories

A distinguishing characteristic of Thomas Jefferson High School for Science and Technology is its specialized science and technology research laboratories. They are designed to enhance the academic curriculum as well as provide students with unique learning experiences in technological environments, opportunities for independent research, experimentation, and interaction with professionals from the scientific, engineering, technological, and industrial communities.

Astronomy

Students in the Astronomy Laboratory are involved in projects related to planetary geology, deep space image processing, and telescopic observations. Students are able to investigate astronomical images on CD ROM for their planetary projects. The Astronomy Laboratory participates in the Telescopes in Education program based on Mount Wilson in California. Students are permitted to remotely control Mt. Wilson's 24-inch telescope. Students access the telescope by modem and download the images in real time. Using "The Sky" software enables the students to do image processing. Other projects center on analyzing data provided by astronomers who are doing fundamental research on topics such as: light curves of variable stars, spectroscopic analysis, and investigating planetary features.

Automation and Robotics

In the Automation and Robotics Laboratory students apply engineering concepts to the design and fabrication of automated and robotic systems. They investigate the building blocks of those systems including sensors, analyzers, actuators, drivers, controllers, and power supplies. Students identify and solve problems aimed at integrating the concepts of automation and robotic systems, with a view to electronics, computer programming, and manufacturing. Applications are viewed with consideration of their social, cultural and ethical impacts.

Biotechnology

The Biotechnology Laboratory provides a unique technology experience for a large portion of the Jefferson student body. The program offers a biotechnology training and research program designed to transform traditional secondary molecular biology studies into an applications program that helps students experience the power of newly discovered research tools associated with recombinant DNA technologies. The laboratory's primary mission is to supply a laboratory research-based program that allows its students to experience topics from bacterial transformation to DNA mapping. In addition, the program provides students with the experience of new, leading-edge technologies including bioinformatics, western blotting, PCR and DNA sequencing.

Chemical Analysis

In the Chemical Analysis Laboratory students take three years of chemistry from basic chemistry to more advanced topics which allow them to pursue independent research. For some students their chemistry experience culminates in an introductory organic chemistry with instrumental analysis course. For others, an independent research project rounds out their chemistry study.

Computer Assisted Design

The Computer Assisted Design Laboratory allows students to interact with the computer to produce various three dimensional designs. Seniors conducting research projects in CAD are free to pursue their interests through independent studies in a variety of technical fields.

Computer Systems

The Computer Systems Laboratory supports advanced studies in applied computer science, computer architecture, artificial intelligence and supercomputing applications. Working in a UNIX environment with full Internet access, students are able to investigate a broad range of pure and applied research topics which emphasize high performance computing and graphics visualization techniques.

Energy Systems

In the Energy Systems Laboratory students apply the knowledge, problem-solving skills and project management skills acquired during their previous three years. Students may pursue projects of interest in a wide range of engineering disciplines, such as heat transfer, fluid dynamics, direct and indirect energy conversion, and mechanical systems. The laboratory accommodates both individual and team projects requiring specific knowledge in such diversified subjects as design, materials, testing, computer interfacing and planning.

Microelectronics

The Microelectronics Laboratory provides the opportunity for students to develop research and engineering projects involving the design of electronic circuitry. Areas of focus include digital signal processing, digital control, instrumentation, analog and digital audio, and communications.

Neuroscience

The Neuroscience Laboratory, starting in fall 2007, will be interdisciplinary, incorporating skills from the areas of biology, electronics, robotics, computer science, mathematics, chemistry, and physics. Research projects can involve brainwave analysis, conversion of brainwaves into electronic signals that would perform various physical or computer tasks, the biochemistry and physiology of axon action potential propagation and of synaptic transmission, nerve regeneration, computational neurobiology, and other exciting endeavors.

Oceanography and Geophysics

The Oceanography and Geophysics Research Laboratory focuses on the biological and physical aspects of oceanography and the geophysical systems. Biological oceanography students work on projects in taxonomy, morphology, ecology, biogeography and evolutionary biology. Physical Oceanography students work on projects in tidal dynamics, ocean currents and ocean acoustics. Geophysical students work on projects in hydrology, geographical mapping, sedimentation and geophysical fluid dynamics. Students are expected to collect their own data from the marine environment on research vessels.

Optics and Modern Physics

The Optics and Modern Physics Laboratory provides exciting opportunities for students to develop research and engineering projects in the areas of pure and applied physics that include lens systems, fiber optics, human vision, interferometry, photography, color science, holography, optical computing, or other laser and optical systems. Research projects in modern physics explore areas of nuclear, atomic, electromagnetic, solid state, wave and quantum physics.

Prototyping and Engineering Materials

The Prototyping and Engineering Materials Laboratory allow students, through research, to increase their understanding of the nature of a wide range of engineering materials. Students can also explore processes that are used to fabricate these materials. In addition to the research classes, two electives are taught through this laboratory. One, the Nature of Materials, is designed to introduce students to the families of engineering materials and to expose them to the physical properties of each. The second elective is Materials Processing, is designed to allow students to explore the various ways engineering materials can be fabricated.

Video technology and Communications

Students in the Video technology and Communications Laboratory, a non-research resource facility, are involved in the technical side of developing video projects which inform or entertain the viewer. They adapt video technology to convert ideas into a finished visual product, including videos for Fairfax County Public Schools, promotional videos for community agencies and programs that cable-cast throughout the school. Serving as a resource facility, the Television Studio is used in a variety of interdisciplinary activities throughout the school. Students are given instruction on equipment operation and ongoing guidance as the projects progress. A study of the fundamentals of audio and video telecommunications equipment is incorporated.

Appendix B

THOMAS JEFFERSON HIGH SCHOOL FOR SCIENCE AND TECHNOLOGY

[Under Review January 2007]

Mission Statement:

- The mission of Thomas Jefferson High School for Science and Technology is to provide students a challenging learning environment focused on math, science, and technology, to inspire joy at the prospect of discovery, and to foster a culture of innovation based on ethical behavior and the shared interests of humanity.

As the Mission Statement drives the goals of our school community, so do the Beliefs that follow from our mission guide individual learning experiences in the classroom. At Thomas Jefferson High School for Science and Technology, we believe

1. Critical thinking and problem solving skills are vital in addressing the complex societal and ethical issues of our time.

2. Students learn best in a community where academic disciplines are integrated, fostering an appreciation of how they interact and form a whole.

3. Global interdependence compels us to understand the languages, systems and diverse cultures of people throughout the world.

4. Literature, music and the arts are essential, timeless aspects of human existence.

5. The methods of science provide discipline to our search for structure in the world.

6. Research stems from a combination of fundamental knowledge, individual creativity, and curiosity.

7. Effective communication is often the only difference between a good idea and a successful initiative.

8. Collaborative learning, athletics, and extracurricular activities develop leadership and interpersonal skills.

9. Responsibility and integrity are core principles in the pursuit of excellence.

10. Learning never ends.