

January 6, 2010

MEMORANDUM

TO: State Board of Regents

FROM: William A. Sederburg

SUBJECT: Dixie State College–Associate of Applied Science in Clinical Laboratory Science–Action Item.

Issue

Dixie State College of Utah requests approval to offer an Associate of Applied Science Degree in Clinical Laboratory Science, beginning Fall Semester 2010. The program was approved by the Dixie State College Institutional Board of Trustees on September 18, 2009, and by the Regents' Program Review Committee on December 11, 2009.

Background

The proposed program at Dixie State College is designed to prepare medical laboratory technicians through the acquisition of a two-year Associate of Applied Science degree. The clinical laboratory professional is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. These professionals perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients.

The clinical laboratory professional has diverse and multi-level functions in the areas of analysis and clinical decision-making, information management, regulatory compliance, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed. Such specialists possess skills for financial, operations, marketing, and human resource management of the clinical laboratory.

The need for medical laboratory technicians in the state of Utah has continued to grow through the last 20 years. The ability to recruit in the southern Utah area has been difficult, resulting in the use of high cost temporary professionals to fill these positions. Recruiting for an open position has taken from six to 18 months. The current retirement of staff is creating an increased number of openings. At Dixie

Regional Medical Center, it is estimated that by 2015, 26 positions will be open because of attrition due to retirement, a 65% loss of staff. According to *Jobs Rated Almanac: The Best and Worst Jobs* by Les Krantz, laboratory technicians are in the top 20 on the list of best jobs. *Medical Laboratory Observer* in April 2008 indicates the average vacancy rate for staff medical technologists has increased 50% since 2003.

#### Policy Issues

Other Utah System of Higher Education institutions have reviewed this proposal, have given input, and are generally supportive of this degree.

#### Commissioner's Recommendation

The Commissioner recommends that the Regents approve the Request to Offer an Associate of Applied Science in Clinical Laboratory Science at Dixie State College, effective Fall Semester, 2010.

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William A. Sederburg, Commissioner

WAS/GW  
Attachment

Academic, Career and Technical Education and Student Success Committee

Action Item

Request to Offer an Associate of Applied Science Degree

in Clinical Laboratory Science

Dixie State College

Prepared for  
William A. Sederburg  
By  
Gary Wixom

January 6, 2010

## SECTION I: The Request

Dixie State College of Utah requests approval to offer an Associate of Applied Science Degree in Clinical Laboratory Science. This will be effective September 2010. The program was approved by the institutional Board of Trustees on September 18, 2009.

## SECTION II: Program Description (MLT)

### Description

The field of Clinical Laboratory Science is both diversified and stratified. According to the American Society for Clinical Laboratory Science, "The clinical laboratory staff is a team of skilled professionals with education in a variety of scientific areas. The majority of laboratory testing is performed by Clinical Laboratory Scientists (Medical Technologists) with four years of education and Clinical (Medical) Laboratory Technicians with two years of education. Other individuals involved in clinical laboratory practice include physicians (pathologists), other scientists (chemists, microbiologists), laboratory assistants and phlebotomists."<sup>1</sup> The titles of Clinical Laboratory Technician and Medical Laboratory Technician are used interchangeably within the profession. This proposal will use the initial "MLT" where appropriate.

The proposed program at Dixie State College is designed to prepare medical laboratory technicians for the field through the acquisition of a two-year associate of applied science degree. The MLT associate of applied science degree also is the first half of a 2-plus-2 Medical Technologist baccalaureate degree program. The clinical laboratory professional is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. These professionals perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients. The clinical laboratory professional has diverse and multi-level functions in the areas of analysis and clinical decision-making, information management, regulatory compliance, education, and quality assurance/ performance improvement wherever laboratory testing is researched, developed or performed. Such specialists possess skills for financial, operations, marketing, and human resource management of the clinical laboratory. Clinical laboratory professionals practice independently and collaboratively, being responsible for their own actions, as defined by the profession. They have the requisite knowledge and skills to educate laboratory professionals, other health care professionals, and others in laboratory practice as well as the public.

The ability to relate to people, a capacity for calm and reasoned judgment and a demonstration of commitment to the patient are essential qualities. Communications skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education. Laboratory professionals demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.<sup>2</sup>

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<sup>1</sup> Consumer Laboratory Testing Information Page available at <http://www.ascls.org/labtesting/index.asp>

<sup>2</sup> National Accrediting Agency for Clinical Laboratory Sciences, *Guide to Accreditation for Clinical Laboratory Technician/Medical Laboratory Technician Programs*, Chicago, Illinois: National Accrediting Agency for Clinical Laboratory Sciences, 2007) p. III-4.

The MLT program will meet discipline-specific accreditation requirements of the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), fully preparing students to successfully enter the profession at the completion of the program. Using both innovative and traditional strategies, this will be achieved by:

- a) General education coursework.
- b) Specific courses serving as prerequisites to program coursework.
- c) Theory courses founded in laboratory science.
- d) Laboratory classes conducted on campus.
- e) Clinical courses held in the field under the supervision of medical professionals.
- f) A cohort model to develop teaming expertise within the program.

### **Purpose of the Medical Technician Program**

The degree will prepare participants with the skills and tasks demanded by the field. At career entry, the medical laboratory technician will be able to perform routine clinical laboratory tests (such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation, molecular, and other emerging diagnostics) as the primary analyst making specimen oriented decisions on predetermined criteria, including a working knowledge of critical values. Communications skills will extend to frequent interactions with members of the healthcare team, external relations, customer service and patient education. The level of analysis ranges from waived and point of care testing to complex testing encompassing all major areas of the clinical laboratory. The medical laboratory technician will have diverse functions in areas of pre-analytical, analytical, and post-analytical processes. Such a professional will have responsibilities for information processing, training, and quality control monitoring wherever clinical laboratory testing is performed.<sup>3</sup> This conceptual framework and set of professional skills will be provided by the DSC program.

Geographically and professionally, there is a continuous need to provide trained and competent medical lab technicians both locally and beyond. This need and the changing demographics that drive it will be explained in greater detail in Section III. However, it should be noted here that approximately six years from the writing of this proposal, Intermountain Health Care in Washington County alone will retire over 65% of their medical lab technicians, creating a significant void to be filled. MLT programs in the state rapidly place their graduates in local and national markets. Dixie State College will contribute significantly to the stream of lab technicians entering the field.

### **Institutional Readiness**

The College now offers certificates, associate degrees, and baccalaureate degrees in practical nursing, registered nursing, and RN to BSN; certified nurse assistant (CNA); dental hygiene; medical radiography; surgical technology; phlebotomy; respiratory therapy and emergency services/paramedic programs. A physical therapist assistant program will begin spring 2010. This evolution of health science programs has produced an institutional infrastructure that remains prepared for expansion of new programs in the field of health sciences. The Medical Laboratory Technician Program is another step in Dixie State's pursuit of expanding its services to the healthcare professions locally and beyond.

Since 1995, Dixie State College has a history of providing quality health sciences programs. For example, the nursing program earned the highest pass rate among all programs in the state on the Registered Nurse Licensure Examination, with a collective pass rate of 96 percent in 2003, as reported by the Utah State Board

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<sup>3</sup> Ibid. p. III-4.

of Nursing. Since graduating its first class in 2000, DSC's dental hygiene program has now scored in the top 10 percent in the nation four of the past five years and in the top five percent three of those five years.<sup>4</sup>

The timing of the proposed MLT program is excellent since the new Russell L. Taylor Health Sciences Building was completed in the spring of 2008. It has sufficient facilities to provide classroom, laboratory space, and equipment for the program. The School of Science and Allied Health has the resources to support advising new and prospective students and to support the development and initiation of this program. A key component to the success of a new clinical practice program is the support of the local medical community and providers. The close and collegial working relationship between Dixie State and its medical associates has created a tapestry of collaboration for this degree. In turn, the program graduates will serve these establishments as the medical needs of the community continue to grow.

### **Faculty**

Presently, a nationwide search is underway for a qualified professional to be a shared director for the MLT and MT programs. This will be both an administrative and teaching position. Upon approval of the MLT proposal, a search will also be undertaken for a qualified fulltime tenure-track faculty member with a Master's Degree who will teach for both programs. Locally, there is an abundance of potential adjunct faculty with the background in clinical laboratory science needed to teach coursework. Intermountain Healthcare of Southern Utah accommodates a staff of medical laboratory technicians and a technologist who can teach selected courses at Dixie State. Many of these professionals will conduct the clinical experiences in the field for the program. A number of local physicians also qualify as adjunct faculty. They will be recruited as needed.

### **Staff**

The current administrative assistant to the Dean of Science and Allied Health will provide the necessary secretarial support for the program. The academic advisor for pre-professional, health sciences, and applied technology programs will also serve MLT program students.

### **Library and Laboratory Resources**

The years of healthcare initiatives conducted at Dixie State have produced a solid and growing foundation of library resources that serve each successive program undertaken. The Val A. Browning Library has extensive learning resources in Nursing and the Allied Health Sciences including books (virtual and electronic), online databases, DVDs and videotapes. Among these are full text articles including ProQuest Nursing and Allied Health Sources, MEDLINE, Clinical Pharmacology, Biomedical Reference Collection, Health Sources: Academic Addition, and others. Dixie Regional Medical Center also has a medical library that is available to Dixie State College students. These two sources will contribute to the scholarly work of the MLT program. Additional materials that specifically address the MLT curriculum will be added to the collection. These are listed in Appendix D along with the lab equipment to be purchased for the program and are accounted for in the budget referenced in Table 5.

### **Admission Requirements**

The standards established by Dixie State will be consistent across its health sciences offerings, holding the bar as high as possible to effectively meet the qualifications and preparation of students entering its programs. Academic performance in both general education coursework and in specific prerequisite courses is an important consideration for admission. Following are required criteria for admission to the MLT program:

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<sup>4</sup> See Dixie State College of Utah, *College Catalog*, (Saint George, Utah: Dixie State College of Utah, 2006).

- a) Submission of a complete program application on or before the deadline established by the department
- b) Cumulative GPA of 2.75 or higher in all college coursework taken
- c) Completion of a "C" or better in all program prerequisite courses
- d) Three letters of recommendation including at least one from an instructor in a prerequisite course
- e) The previous criteria must be met to qualify for an interview with the Selection Committee. Passing the interview will serve as the final criterion for entrance into the program.
- f) Completion of CLS 1110/1115
- g) Membership within a cohort group

Additional criteria to be considered for acceptance:

- Previous experience in healthcare
- Weighted GPA in specific prerequisite courses
- Clearance of both a drug screen and criminal background check
- Proof of selected immunizations

### **Student Advisement**

Presently, the college has an advisor for all of the health science programs with the exception of the nursing programs, which share their own advisor. The advisor for pre-professional, health sciences, and applied technology programs will also serve students in the MLT program. In addition, the program director and faculty will provide academic guidance and the college at large is served by advisors who assist students with general education and graduation requirements. The Division of Nursing and Allied Health works closely with all who advise its students.

### **Justification for the Number of Credits**

The total number of credit hours required by the MLT program will be 70-71, one to two more than is specified by the Board of Regents for an AAS degree. Seventy hours will be needed because of our commitment to provide congruent learning experiences in all three arenas, classroom, laboratory, and clinic. DSC has planned for clinical experiences to be integrated throughout the program and will house them in the lab courses, which requires only one additional hour of credit. Care has been taken as noted from Appendix B that the number of credit hours required each semester would be manageable for the student.

### **External Review and Accreditation**

Medical Laboratory Science had its origins in the formation the American Society of Clinical Pathologists (ASCP) formed in 1922. In an effort to bring about a degree of standardization to the education of laboratory personnel, ASCP created the Board of Registry (BOR) in 1928 to certify individual laboratory technicians and later the Board of Schools (BOS) for the accreditation of educational programs. As the field became stratified, each specialty grew toward independence and autonomy. In 1973, as a result of pressure from the U.S. Office of Education and the National Commission on Accrediting, ASCP agreed to disband the BOS and turn over its functions to an independently operated and governed board, the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS).<sup>5</sup>

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<sup>5</sup> See Frances A. Delwiche, *Mapping the Literature of Clinical Laboratory Science*, <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=164393>

Curricular guidelines for a medical laboratory technician program are determined by this accrediting arm of the medical laboratory sciences. NAACLS is an autonomous, nonprofit organization. ASCP and the American Society for Clinical Laboratory Science (ASCLS) are sponsoring organizations of NAACLS. The National Society for Histotechnology (NSH) and the Association of Genetic Technologists (AGT) are participating organizations. The American Association of Pathologists' Assistants (AAPA) is an affiliating organization. NAACLS is recognized by the Council for Higher Education Accreditation (CHEA). The proposed MLT program at Dixie has been developed in accordance with the standards as set down in the Guide to Accreditation for Clinical Laboratory Technician/ Medical Laboratory Technician Programs.<sup>6</sup>

Once underway, the new program will begin the process of seeking accreditation. It must make application to NAACLS no later than two months prior to graduating its first cohort in order for the process to be completed in time for graduates to take the ASCP registry exams. This will involve a self study/visitation process which will receive a five year award cycle upon proof of compliance. Once accredited, a progress report must be submitted every two years from that date. The tools and strategies to be employed by DSC in this procedure are found in Section IV of this proposal.

The use of advisory committees has helped steer the development and unfolding of the various health sciences programs that have evolved over the years here at Dixie State. Membership has included participants from the health sciences community, the public at large, and college faculty. Their work has resulted in a network of resources and professionalism that continues to raise the bar of excellence in the preparation of the next generation of health sciences professionals. An advisory committee will be established for the MLT program in order to provide community-wide interpretation of program needs; systematically assess and identify needs of the local and regional healthcare workforce; provide advice regarding curricular changes; assist in assessment of educational outcomes and continued program improvement; and assist in placing clinical students and graduates.

This proposal has been created by: 1.) David L. Loughmiller MBA, MT, (ASCP), SC, Medical Technologist and General Laboratory Supervisor at Dixie Regional Medical Center and CEO of The Scepter Media and Training Firm, and 2.) Douglas C. Godwin, Ph.D., The Scepter Media and Training Firm Director of Research and a former faculty member for the past 27 years of Texas A&M University and more recently, Dixie State College of Utah.

### **Projected Enrollment**

An examination of the ever expanding student interest in other healthcare programs at DSC and around the state suggests that there will be more than an adequate pool of students interested in the MLT program. Based upon the number of clinical lab placements available among our medical affiliates, we will accommodate 12 new students each fall semester. A screening process will be conducted and the most qualified will form a cohort, moving through the program together. Following is the enrollment plan for the first five years and the faculty/student ratios required for each.

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<sup>6</sup> See National Accrediting Agency for Clinical Laboratory Sciences, *Guide to Accreditation for Clinical Laboratory Technician/Medical Laboratory Technician Programs*, Chicago, Illinois: National Accrediting Agency for Clinical Laboratory Sciences, 2007).

Table I: Projected Enrollment

Year	Student Headcount	# of Faculty	Student-to-Faculty Ratio	Accreditation Req'd Ratio
2010- 2011	12	2	6:1	Not applicable
2011- 2012	24	2	12:1	Not applicable
2012- 2013	24	2	12:1	Not applicable
2013- 2014	24	2	12:1	Not applicable
2014- 2015	24	2	12:1	Not applicable

### Section III: Need

#### Program Need

Clinical Laboratory Science is an area of healthcare that supports greater than 70% of all diagnostic testing. There are over 319,000 Clinical laboratory personnel in the United States and more throughout the world. A large percentage of these laboratory personnel were trained over 30 years ago and are fast approaching the age of retirement. As with other areas of healthcare, a significant shortage has occurred due to decreased preparation programs nationwide, focus on automation, and a move for consolidation of highly specialized procedures. It is estimated that by 2012, about 50% of all Clinical Laboratory Scientists will have left the workplace leaving an extreme need to train new technicians.

Todd Smith in *Advance Magazine* indicates that more physicians are requesting highly specialized analyses, items that in the past were considered low volume. In today's practice, the evaluation of nutritional status, genetic markers, and identification of infectious agents using complex techniques are processes that heretofore have been restricted to large referral centers. These technologies are making their way into the clinical laboratory settings in many hospitals and smaller central laboratories.<sup>7</sup> With the advent of automated processes and greater computerization of analytical procedures, the need for laboratory scientists well versed in many aspects of laboratory medicine is critical.

Weber State University and the University of Utah are currently the USHE institutions that offer degrees in the Clinical Laboratory Sciences. Medical establishments throughout the country heavily recruit many of the students graduating from these programs. Currently the Mayo Medical group actively recruits from Weber State and University of Utah graduates. Due to the magnitude of the shortage of accredited offerings nationwide, students are sought after by medical organizations upon admittance into their institutions' academic programs.

Dixie Regional Medical Center and other hospital laboratories throughout southern Utah, southern Nevada, and northern Arizona are at a disadvantage trying to recruit some of the students coming out of the schools on the Wasatch Front. Individuals residing in southern Utah must relocate to the Wasatch Front to study these areas of healthcare or choose a different line of work. David Loughmiller, Laboratory General Supervisor for Dixie Regional Medical Center, indicates many graduates in biology from schools in the southern part of the

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<sup>7</sup> T. Smith, "Automating the Hematology Lab", *Advance for Administrators of the Laboratory*, (Vol. 17, Issue 4, April 2008), p. 68.

state find it a challenge to get jobs in their field of study. Their training is not specific enough to meet the needs of healthcare and they end up moving out of the area to find employment. The MLT program will provide them with a marketable option.

### Labor Market Demand

The need for medical laboratory technicians in the state of Utah has continued to grow through the last 20 years. The ability to recruit in the southern Utah area has been difficult, resulting in the use of high cost temporary professionals to fill these positions. Recruiting for an open position has taken from 6 to 18 months. The current retirement of staff is creating an increased number of openings. At Dixie Regional Medical Center it is estimated that by 2015, twenty-six positions will be open as a result of attrition due to retirement, a 65% loss of staff. According to *Jobs Rated Almanac: The Best and Worst Jobs* by Les Krantz, laboratory technicians are on the top 20 on the list of best jobs.<sup>8</sup> *Medical Laboratory Observer* in April 2008, indicates the average vacancy rate for staff medical technologists has increased 50% since 2003.<sup>9</sup>

There are a number of agencies that provide projections for employment as a medical laboratory technician. The Utah Department of Workforce Services rates this profession as a 3-star occupation on a scale of 1 to 5 meaning that it has a moderate to strong employment outlook with low to moderate wages.<sup>10</sup> The Department of Labor projects a 15% increase in the need for medical lab technicians in the next 8 years (See Table 2).<sup>11</sup> It is estimated that there is a need for 16,500 clinical Laboratory personnel per year and only 5000 are being produced through institutions of higher learning.<sup>12</sup>

Table 2: MLT Growth Trends

Occupational Titles	Employment 2006	Projected Employment 2016	Change, 2006-16	
			Number	Percent
MLT, CLT	151,000	174,000	23,000	15%

### Student Demand

The trends in enrollment here at Dixie State and across the state seem to be the best indicators for student interest in the field of healthcare. The number of applicants for all healthcare programs at DSC exceeds the number of students that can be admitted. This is also true for other institutions of higher education in the state and those nearby. For example, current enrollments in the Introduction to Physical Therapy course at the College of Southern Nevada are 38 in the Internet course and 26 in the on-campus course. Over the past 4 years, first year enrollments in the physical therapist assistant program have resulted in full classes. Most recently, students enrolled in the program have traveled from Bullhead City, Arizona, Battle Mountain, and Mesquite, Nevada. The program has also received student inquiries from here in St. George.

<sup>8</sup> See L. Krantz, *Jobs Rated Almanac: the Best and Worst Jobs*, 6<sup>th</sup> Edition, (Ft. Lane, New Jersey: Barricade Books, 2002).

<sup>9</sup> Staff Writer, "Labs Are Vital: Industry Takes Aim at Lab Workforce Shortage", *Medical Laboratory Observer*, (April 2008) p. 42.

<sup>10</sup> The Utah Department of Workforce Services, <http://jobs.utah.gov> (accessed January 2009).

<sup>11</sup> See National Employment Matrix, *Clinical Laboratory Technologists and Technicians, 2006 and Projected to 2016*. Department of Labor Statistics. <http://www.bls.gov/oco/ocos096.htm>

<sup>12</sup> Staff Writer, *Advance Laboratory*, (King of Prussia, Pennsylvania, Dec. 2008) p. 35.

DSC's School of Science and Allied Health has a designated advisor to interview students who express an interest in this profession. There has been a consistent pool of over 200 students per year that have sought information and academic advising about the health sciences professions and the courses that would likely fulfill prerequisite requirements. Additionally, there are students who apply for the nursing program but cannot be admitted due to class size limits. Many of these applicants would meet prerequisite requirements for the MLT program and often have been more than willing to apply to a related program.

The key factor seems not to be student interest as much as providing the adequate laboratory and clinical experiences that require low instructor/student ratios. The creation of the new Russell Taylor Health Sciences Center along with the collaboration between Dixie State and community health services has moved DSC significantly forward in the ability to meet the increasing interest in the healthcare professions. The MLT program should be able to adequately accommodate 12 new students each year and 24 pursuing the degree at any time beginning with the second year.

### **Similar Programs**

Presently, Weber State University and the University of Utah are the USHE institutions that offer a program in Clinical Laboratory Science. Salt Lake Community College has discontinued their program, having accepted their final set of students in 2006. The proposed program at Dixie State will be similar to but unique from WSU's program. The similarity will permit students to matriculate between schools and from other programs when relocating without a significant loss of credit hours. The uniqueness emerges from the College's special use of affiliate resources to personalize the development of laboratory skills among its students.

This distinctiveness in curricular design is an important one. The clinical experiences occur throughout the program rather than becoming a single event at the end of the coursework. To plan field experiences that take place concurrently with classroom curriculum, local institutions must be willing to accommodate an ongoing flow of students. Community medical affiliates are enthusiastic participants. Such an approach provides a mentoring system for learners that guide the growth of professionalism simultaneously within three areas: the classroom, the laboratory, and the clinic.

Finally, Section III lays down an important foundation of need, justifying the creation of a MLT program here at DSC. Such a program is vital in meeting not only local employment requirements but those throughout the state and beyond. The evidence makes it difficult to overstate this position.

### **Collaboration and Impact on Other USHE Institutions**

Because of the need for laboratory technicians, no USHE institution in the state will unduly compete in the placement of graduates beyond normal institutional competition. This is also true for applicants to their programs since the interest of the public in healthcare careers shows no sign of diminishing. The previous Dean of Business, Science, and Health held informal discussions with CLS program chairs at the University of Utah and Weber State University with regard to DSC beginning its own MLT and MT programs. As well, the Associate Dean of Nursing and Allied Health consulted with these same individuals through the laboratory personnel Committee of the Utah Graduate Medical Education Council.

As stated earlier, the need for a program in southern Utah is also important geographically. The DSC program should have no effect on enrollments at Weber State or the University of Utah because of its location in southern Utah. The population growth and trends in the Washington County demand a local expansion in educational opportunities. The need for such options was foreseen by the Board of Regents when first permitting Dixie State to become a college that provides baccalaureate degrees.

## Benefits

Much of what has been written in this proposal reveals many of the benefits that a MLT program will be to the College as it continues its role among other USHE institutions in the state. In response to community needs, the pursuit of this degree will be an ongoing service to the populace. As Dixie State continues to grow, the importance of its contributions to this county and the state will continue to grow proportionally.

## Consistency with the Institutional Mission

A key element of Dixie State College's Mission is to "transmit knowledge and skills primarily through education and training programs at the certificate and associate degree level, including applied technology education programs." As a result, DSC has taken steps to develop a core of healthcare professions programs. The proposed Associate of Applied Science degree in Medical Laboratory Technician is the college's response to meeting the southern Utah community need as well as meeting the DSC and USHE missions. The proposed AAS degree in Medical Laboratory Technology here at Dixie State is in a high demand profession and satisfies the role assignment for a Type II institution in concurrence with the mission of the Board of Regents. The MLT program meets these requirements by providing specialized, high-quality, and technical educational opportunities for students resulting in knowledgeable, competent, caring, ethical, and quality-oriented graduates.

## Section IV: Program Assessment

### Program Assessment

There has been a movement in institutions of higher education over the past four decades to enhance the pedagogical, assessment, and curriculum expertise in the professional preparation programs they offer. As the professions continue to refine their standards, they have gravitated to common principles of what now is known as "best practice." Many of these are generic educational strategies that address new discoveries in brain theory and how such theory translates into cognition and behavior. Learning has been divided into the cognitive, psychomotor and affective domains.

The standards addressing best practice set down by NAACLS require the creation of program goals and objectives along with assessment strategies that measure the attainment of them. Assessment is to focus on outcomes. For student performance, this entails both formative assessment of ongoing progress and summative assessment of exit mastery. The plan must include a mechanism for continually and systematically reviewing the effectiveness of the program to include survey and evaluation procedures that incorporate information from students, employers, faculty, graduates, formative and exit examinations, and accreditation reviews. The MLT Program at Dixie State will account for all such standards.

For assessment purposes, standardized Employer and Graduate Satisfaction Surveys are available from ASCP and will be utilized by the program. Graduate performance on credentialing examinations is available to the program from ASCP. It includes statistics comparing general graduate performance taken from many programs and is specific to content areas contained in the examination. The content areas refer to accreditation standards set down by ASCP.<sup>13</sup>

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<sup>13</sup> See National Accrediting Agency for Clinical Laboratory Sciences, *Guide to Accreditation for Clinical Laboratory Technician/Medical Laboratory Technician Programs*, Chicago, Illinois: National Accrediting Agency for Clinical Laboratory Sciences, 2007).

Following is the overall goal of the MLT program. Table 3 presents the evaluation strategies to be utilized to access its attainment.

*Program Goal: The MLT program is designed to (1) provide its students with the foundation of a liberal education and (2) prepare graduates to competently enter the workforce possessing the cognitive, psychomotor, and affective skills required by the profession.*

**Table 3: Program Standards and Appraisal Strategies**

DOMAIN	INTERNAL ASSESSMENT	EXTERNAL ASSESSMENT	OUTCOME/ ANALYSIS & REPORTING
<b>Cognitive</b>	<ul style="list-style-type: none"> <li>• Graduates performance on registry exams               <ul style="list-style-type: none"> <li>○ MLT (ASCP)</li> <li>○ CLT (NCA)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Employers Surveys- [satisfaction with grad. knowledge base]</li> <li>• Advisory Committee assessment input</li> <li>• Grades from clinical lab. experiences</li> <li>• Students will present a portfolio of their work for review by professionals from the field &amp; the faculty</li> </ul>	<ul style="list-style-type: none"> <li>• Reporting of analysis of pass rates on 3 registry exams</li> <li>• Reporting of analysis of employer feedback &amp; satisfaction</li> <li>• Summary of clinical performance</li> </ul>
<b>Psychomotor</b>	<ul style="list-style-type: none"> <li>• Graduates must demonstrate competency in all skills required by the curriculum</li> </ul>	<ul style="list-style-type: none"> <li>• Employers Surveys- [satisfaction with grad. competency in performing all skills required]</li> </ul>	<ul style="list-style-type: none"> <li>• The program will assess student competence on random selected skills prior to exiting the program.</li> <li>• Employers' responses will also be analyzed and both will be reported.</li> </ul>

<p><b>Affective</b></p>	<ul style="list-style-type: none"> <li>• Faculty will assess students' behaviors specific to communication skills, ethics, work habits, interpersonal relations and collaborative skills.</li> <li>• Student surveys- [Upon graduation, students will provide feedback about program.]</li> </ul>	<ul style="list-style-type: none"> <li>• Employer surveys- Satisfaction with:             <ol style="list-style-type: none"> <li>1) graduates ability to effectively interact with staff and colleagues, &amp;</li> <li>2) compliance with work expectations</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• Affective findings will be analyzed and summarized prior to graduation.</li> <li>• Graduates' performance in the workplace will also be summarized and both findings will be reported.</li> </ul>
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**Educational Standards and Student Performance**

NAACLS has established the following standards for the preparation of Medical Laboratory Technicians.<sup>14</sup> Several of these have been summarized previously.

**A. Curricular Structure**

Instruction must follow a plan which documents a structured curriculum composed of general education, basic sciences, mathematics, and professional courses including applied (clinical) education. The curriculum must include clearly written program goals and competencies and course syllabi which must include individual course goals and objectives.

The curriculum must include all the major subject areas currently offered in the contemporary clinical laboratory. Behavioral objectives which address cognitive, psychomotor, and affective domains must be provided for didactic and applied (clinical practice) aspects of the program and must include clinical significance and correlation. Course objectives must show progression to the level consistent with entry into the profession. The applied courses must be taught in a clinically equipped teaching laboratory on the college campus, in an affiliated clinical facility, or in both facilities sufficient for developing basic skills, understanding principles, and mastering the procedures involved.

**B. Instructional Areas**

The curriculum must include principles of:

1. Methodologies for all major areas currently practiced by a modern clinical laboratory, including problem solving and troubleshooting techniques;
2. Collecting, processing, and analyzing biological specimens and other substances;
3. Laboratory results capable of use in diagnosis and treatment;
4. Communications sufficient to serve the needs of patients and the public;

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<sup>14</sup> Ibid pp. III- 10-11

5. The required competencies to participate in the orientation of new employees;
6. Quality assessment in the laboratory;
7. Laboratory safety and regulatory compliance;
8. Information processing in the clinical laboratory;
9. Ethical and professional conduct, and;
10. Significance of continued professional development.

### C. Learning Experiences

The learning experiences needed in the curriculum to develop and support entry level competencies must be properly sequenced and include instructional materials, classrooms, presentations, discussions, demonstrations, laboratory sessions, supervised practice and experience.

1. Student experiences must be educational and balanced so that all competencies can be achieved.
2. Student experiences at different clinical sites must be comparable to enable all students to achieve entry level competencies.
3. Policies and processes by which students may perform service work must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. After demonstrating proficiency, students, with qualified supervision, may be permitted to perform procedures. Service work by students in clinical settings outside of academic hours must be noncompulsory.

### D. Evaluations

Written criteria for passing, failing, and progression in the program must be provided. These must be given to each student at the time of entry into the program. Evaluation systems must be related to the objectives and competencies described in the curriculum for both didactic and applied education components. They must be employed frequently enough to provide students and faculty with timely indications of the students' academic standing and progress and to serve as a reliable indicator of the effectiveness of instruction and course design.

Dixie State is prepared to meet these standards through planned experiences for its students. These will be housed in four modes of educational activity.

A. Structured Cohorts—Each semester, students entering the program are formed into a cohort. They will remain together throughout the program, allowing for relationships to form. This structure allows for team activity that cuts across courses where appropriate. The Cohort Model provides an ideal infrastructure to develop leadership, professionalism, and collaborative skills among the students.<sup>15</sup>

B. Didactic courses—In addition to the methods suggested in item C above, additional strategies will be employed such as team projects, simulations, role play, pairing strategies, study sessions, quizzes, exams,

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<sup>15</sup> See Peter R. Scholtes, Brian L. Joiner, Barbara J. Streibel, *The Team Handbook* [Third Edition], (Madison, Wisconsin: Oriel Incorporated, 2003).

task-conferencing and more. Care has been taken to sequence the coursework and space the offerings to build on prerequisite knowledge allowing time for adequate learning of the esoteric concepts and language of the profession.

C. Laboratory courses—The new medical facilities offer optimum space and equipment for the lab experiences that will be provided. These will be conducted by faculty and will address both conceptual understanding and skill acquisition.

D. Clinical experiences—A number of medical facilities in southern Utah will provide the clinical experiences for students. Working in collaboration, on-site clinical involvement will be woven into the coursework so that new concepts learned in class will be explored first in the campus labs and second in the field under the direction of a laboratory technologist.

E. Table 4 addresses the assessment strategies to be utilized in this program.

**Table 4: Student Formative and Summative Assessment**

<b>DOMAIN</b>	<b>FORMATIVE ASSESSMENT</b>	<b>SUMMATIVE ASSESSMENT</b>
<b>Cognitive</b>	<ul style="list-style-type: none"> <li>• Course examinations- pass = 74% or above</li> <li>• Laboratory projects- pass = 80% mastery or above</li> <li>• Clinical projects- pass = 100% mastery or above</li> </ul>	<ul style="list-style-type: none"> <li>• Capstone Performance Assessment               <ul style="list-style-type: none"> <li>○ A "C" or above in each course</li> <li>○ Take the MLT &amp; CLT practice exams during the final semester and achieve a grade = to or higher than 5% below the national cut score</li> <li>○ Present a portfolio of work achieved in the program to local clinical professionals &amp; faculty</li> </ul> </li> </ul>
<b>Psychomotor</b>	<ul style="list-style-type: none"> <li>• Students must demonstrate competency in all skills practiced in the lab. (85% efficiency)</li> <li>• Students must demonstrate competency in skills performed in the clinical settings. (85% efficiency)</li> </ul>	<ul style="list-style-type: none"> <li>• Exit Exam—Students will be required to perform a set of randomly selected skills to demonstrate continuing competence.</li> <li>• Students will be required to re-demonstrate previously learned skills at any time during the program.</li> </ul>
<b>Affective</b>	<ul style="list-style-type: none"> <li>• Student grading rubrics for all courses (didactic, laboratory, and clinical practice) will include a section addressing professionalism, attitudes, and work habits.</li> <li>• Student evaluations in clinical courses will include a section on interpersonal skills, attitudes, work habits and</li> </ul>	<ul style="list-style-type: none"> <li>• A summary assessment, compiling affective data gathered throughout the student's program will be conducted during the final semester. Results will be factored into outcomes of the other two domains of learning. Findings will be compared to the employer survey data to help fine-tune the assessment process of</li> </ul>

	professionalism. • Faculty will conduct observations of student acquisition of collaborative skills during team and field activities.	the program.
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## Section V: Finance

Table 5

### Financial Analysis

Dixie State College MLT Program					
	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Students</b>					
Projected FTE Enrollment	12.0	24.0	24.0	24.0	24.0
Cost Per FTE	\$34,698.00	\$ 9,139.00	\$ 9,143.00	\$ 9,363.00	\$ 9,380.00
Student/Faculty Ratio	6 to 1	12 to 1	12 to 1	12 to 1	12 to 1
Projected Headcount	12.0	24.0	24.0	24.0	24.0
<b>Projected Tuition</b>					
Projected Gross Tuition	\$ 34,728.00	\$ 69,456.00	\$ 73,623.00	\$ 78,040.00	\$ 82,723.00
Tuition Allocated to Program	\$ 8,682.00	\$ 17,364.00	\$ 18,405.00	\$ 19,510.00	\$ 20,680.00
Student Lab Fees	\$ 3,600.00	\$ 7,200.00	\$ 7,200.00	\$ 7,200.00	\$ 7,200.00
<b>5 Year Budget Projection</b>					
	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Expense</b>					
Salaries & Wages	\$ 135,000.00	\$ 139,050.00	\$ 143,221.00	\$147,518.00	\$151,943.00
Benefits	\$ 56,375.00	\$ 57,286.00	\$ 58,224.00	\$ 59,191.00	\$ 60,187.00
Total Personnel					
Current Expense	\$ 3,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00
Travel		\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00
Capital	\$ 212,000.00	\$ 10,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00
Library Expense	\$ 10,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00
<b>Total Expense</b>	<b>\$ 416,375.00</b>	<b>\$ 219,336.00</b>	<b>\$ 219,445.00</b>	<b>\$224,709.00</b>	<b>\$225,130.00</b>
<b>Revenue</b>					
Legislative Appropriation	\$ 175,000.00	\$ 114,772.00	\$ 113,840.00	\$138,000.00	\$ 138,000.00
Grants (DRMC Donation)	\$ 80,000.00	\$ 80,000.00	\$ 80,000.00		
Reallocated Funds	\$ 149,093.00			\$ 59,999.00	\$ 59,250.00
Tuition Allocated to Program	\$ 8,682.00	\$ 17,364.00	\$ 18,405.00	\$ 19,510.00	\$ 20,680.00
Other (Lab Fees)	\$ 3,600.00	\$ 7,200.00	\$ 7,200.00	\$ 7,200.00	\$ 7,200.00

<b>Total Revenue</b>	\$416,375.00	\$ 219,336.00	\$ 219,445.00	\$224,709.00	\$ 225,130.00
<b>Difference</b>					
<b>Revenue-Expense</b>	\$ 0	0\$	0 \$	0\$	0\$
<b>Comments</b>					

**Funding Sources**

The program will be funded through state appropriation, tuition, reallocated funds, donation, and lab fees. The 2008 Utah State Legislature awarded \$400,000 ongoing Health Science initiative funding to DSC. Dixie Regional Medical Center will donate \$240,000 over three years to this program which will be used for equipment and accreditation expenses. The residual expense will come from cost savings and reallocation.

**Reallocation**

The MLT program will be supported partially through internal reallocation. The source for the reallocated funds will be a previously existing Health Sciences account created by a Dixie Regional Medical Center donation for instruction in the health sciences.

**Impact on Existing Budgets**

No other programs' base budgets will be affected by costs for the Medical Laboratory Technician Program.

## APPENDIX A

### Program Curriculum

Course Prefix and Number	Title	Credit Hours
Core Courses		
CLS 1110	Introduction to Clinical Laboratory Science	3
CLS 1115	Introduction to Clinical Laboratory Science Lab	1
CLS 1120	Principles of Clinical Hematology and Hemostasis	4
CLS 1125	Principles of Clinical Hematology and Hemostasis Lab	1
CLS 1155	Supervised Clinical Experience	1
CLS 2210	Principles of Clinical Chemistry I	4
CLS 2215	Principles of Clinical Chemistry I Lab	1
CLS 2310	Principles of Clinical Microbiology I	3
CLS 2315	Principles of Clinical Microbiology I Lab	1
CLS 2410	Principles of Clinical Chemistry II	4
CLS 2415	Principles of Clinical Chemistry II Lab	1
CLS 2510	Principles of Clinical Microbiology II	3
CLS 2515	Principles of Clinical Microbiology II Lab	1
CLS 2610	Principles of Clinical Immunohematology	3
CLS 2615	Principles of Clinical Immunohematology Lab	1
CLS 2715	Supervised Clinical Experience I	1
CLS 2815	Supervised Clinical Experience II	1
	Sub-total	34
General Education Courses		
ENGL 1010	Introduction to Writing	3
LIB 1010	Information Literacy	1
ENGL 2010	Intermediate Writing	3
COMM 2110	Interpersonal Communication	3
BIOL 1610/1615	Principles of Biology	5
BIOL 2420/2425	Human Physiology/Lab	4
BIOL 2060/2065	Introduction to Microbiology/Lab	4
MATH 1040 or MATH 1050	Introduction to Statistics or College Alg/Pre-Calculus	3 4
CHEM 1110/1115 and CHEM 1120/1125 or CHEM 1210/1215 and CHEM 1220/1225	Elem Gen/Organic Chemistry and Elem Organic/Bio Chemistry or Principles of Chemistry I and Principles of Chemistry II	5 5 5 5
	Sub-total	36-37
	Total Number of Credits	70-71

## MLT New Course Descriptions

- CLS 1110 Introduction to Clinical Laboratory Science (3)**  
Principles and applications to laboratory testing including safe practices for the laboratory practitioner; specimen quality assurance, phlebotomy, urinalysis, basic concepts in clinical immunology, and clinical approaches to immunological testing are introduced.
- CLS 1115 Introduction to the Clinical Laboratory Science Laboratory (1)**  
Laboratory sessions address the principles and applications to laboratory testing including safe practices for the laboratory practitioner, specimen quality assurance, phlebotomy, urinalysis, basic concepts in clinical immunology, and clinical approaches to immunological testing. Periodic sessions at a clinic will be conducted.
- CLS 1120 Principles of Clinical Hematology and Hemostasis (4)**  
Fundamental theories of hematopoiesis, routine laboratory evaluation of blood components using standard instrumentation and microscopic methods, including safety and quality control theories of hemostasis and introduction to abnormal hematology.
- CLS 1125 Principles of Clinical Hematology and Hemostasis Laboratory (1)**  
Microscopic and instrumental approach to routine evaluations of hematology and Hemostasis. Visitation to a clinic will be conducted.
- CLS 1155 Supervised Clinical Experience (1)**  
Off-campus supervised clinical experiences administered in conjunction with clinical faculty in DSC affiliated health care institutions. Prerequisite: CLS 1110, 1115, 1120 and 1125
- CLS 2210 Principles of Clinical Chemistry I (4)**  
Basic concepts and techniques in clinical chemistry and quality control utilizing manual and automated laboratory procedures. Emphasis on blood and body fluid assessments of carbohydrates, bilirubin, non-protein nitrogen testing and electrolyte acid/base balance. Prerequisite: Chem 1110, 1115 and Math 1040.
- CLS 2215 Principles of Clinical Chemistry I Laboratory (1)**  
Basic laboratory techniques in clinical chemistry and quality control using manual and automated procedures. The laboratory portion provides direct analytical interaction with the procedures. Provides concepts of basic laboratory mathematics and quality control in a practical setting.
- CLS 2310 Principles of Clinical Microbiology I (3)**  
This course provides an in-depth coverage of clinically significant bacteria including epidemiology, pathogenicity, and procedures for traditional laboratory identification.
- CLS 2315 Principles of Clinical Microbiology I Laboratory (1)**  
The laboratory provides practical identification of clinically significant bacteria. Specific procedures for identification are introduced and practiced.
- CLS 2410 Principles of Clinical Chemistry II (3)**  
Continuation of CLS 2210 with the introduction to methods for the assessment of proteins, lipids, enzymology,

therapeutic drug monitoring, toxicology and basic endocrinology. Prerequisite: CLS 2210.

**CLS 2415 Principles of Clinical Chemistry II Laboratory (1)**

The lab portion of this course provides specific practical applications to each of the assessment of proteins, lipids, enzymology, therapeutic drug monitoring, toxicology and basic endocrinology. Periodic clinical experiences will be conducted.

**CLS 2510 Principles of Clinical Microbiology II (3)**

This course is a continuation of CLS 2315 including, clinical mycology, virology, parasitology and miscellaneous clinical bacteria. Prerequisites: CLS 2315, BIOL 2060 and BIOL 2065.

**CLS 2515 Principles of Clinical Microbiology II Laboratory (1)**

The focus of the laboratory is to provide practical identification of clinically significant fungi, viruses and parasites. Both morphologic and serological determinations will be presented. Periodic visits to the clinic will be conducted.

**CLS 2610 Principles of Clinical Immunohematology (3)**

Lecture covering the theory and principles of Immunohematology relevant to blood group serology, antibody detection and identification, compatibility testing, component preparation and therapy in blood transfusion service, quality control parameters, donor screening and phlebotomy, transfusion reactions and hemolytic disease of the newborn. Prerequisite: CLS 1110.

**CLS 2615 Principles of Clinical Immunohematology Laboratory (1)**

Laboratory covering the practical aspects relevant to blood group serology, antibody detection and identification, compatibility testing and quality control parameters. Donor and component preparation, screening and phlebotomy will be handled in cooperation with the Red Cross Blood Services. Periodic sessions at a clinic will be conducted.

**CLS 2715 Supervised Clinical Experience I (1)**

Off-campus supervised clinical experiences administered in conjunction with clinical faculty in DSC affiliated health care institutions. Prerequisite: CLS 1110, 1115, 1120 and 1125.

**CLS 2815 Supervised Clinical Experience II (1)**

Off campus supervised clinical experiences administered in conjunction with clinical faculty in DSC affiliated health care institutions. Prerequisites: CLS 2210, 2215, 2310, 2315, 2410, 2415, 2510, 2515, 2610, and 2615.

## APPENDIX B

### Program Schedule for the MLT Degree

Course Number	Title	Credit Hours
<b>Cohort Semester I</b>		
CHEM 1110/1115 or CHEM 1210/1215	Elem/Gen/Organic Chemistry/Lab or Principles of Chemistry I	5 5
CLS 1110/1115	Introduction to Clinical Laboratory Science/Lab	4
BIOL 1610/1615	Principles of Biology/Lab	5
MATH 1040 or MATH 1050	Introduction to Statistics or College Alg/Pre-Calculus	3 4
TOTAL CREDITS		17-18
<b>Cohort Semester II</b>		
CHEM 1120/1125 or CHEM 1220/1225	Elem Organic/Bio Chemistry/Lab or Principles of Chemistry II	5 5
CLS 1120/1125	Principles of Clinical Hematology and Hemostasis/Lab	5
BIOL 2420/2425	Human Physiology/Lab	4
ENGL 1010	Introduction to Writing	3
LIB 1010	Information Literacy	1
TOTAL CREDITS		18
<b>Cohort Semester III</b>		
CLS 2210/2215	Principles of Clinical Chemistry I	5
CLS 2310/2315	Principles of Clinical Microbiology I	4
BIOL 2060/2065	Introduction to Microbiology/Lab	4
CLS 1155	Supervised Clinical Experience	1
ENGL 2010	Intermediate Writing	3
TOTAL CREDITS		17
<b>Cohort Semester IV</b>		
CLS 2410/2415	Principles of Clinical Chemistry II	5
CLS 2510/2515	Principles of Clinical Microbiology II	4
CLS 2610/2615	Principles of Clinical Immunohematology	4
CLS 2715	Supervised Clinical Experience I	1
CLS 2815	Supervised Clinical Experience II	1
COMM 2110	Interpersonal Communication	3
TOTAL CREDITS		18
<b>TOTAL DEGREE CREDITS</b>		<b>70-71</b>

## APPENDIX C

### Faculty

At this writing, specific full time and adjunct MLT faculty have not been identified. As previously mentioned however, the community has a rich supply of physicians and clinical science professionals who are a potential source for adjunct instruction in the MLT program. The following is a list of current faculty at DSC who will be able to support the prerequisite education requirements of the MLT program:

Diane Albertini, MA, Associate Professor English  
Brad Barry, PhD, Professor of English  
Terre Burton, MA, Associate Professor of English and Humanities  
Timothy Bywater, PhD, Professor of English  
AmiJo Comeford, PhD, Assistant Professor of English  
Ross Decker, MA, Associate Professor of Mathematics  
David Feller, PhD, Professor of Chemistry  
Kristin Hunt, PhD, Assistant Professor of Communication  
Linda Jones, MA, MLS, Assistant Librarian  
Thomas McNeillis, MS, DO, Assistant Professor of Biology  
Bonnie Percival, MA, MLS, Associate Librarian  
Donald Warner, PhD, Assistant Professor of Biology  
Eric Young, MEd, Assistant Professor of Communication

## APPENDIX D

### Library & Laboratory Resources

#### Reference Material

Betty A. Forbes, Daniel F. Sahm, Alice S. Weissfeld, <i>Bailey &amp; Scott's, Diagnostic Microbiology</i> (Diagnostic Microbiology Bailey), 2007. ISBN 0323030653	\$100.00
Robert W Colman (Editor), Victor J Marder (Editor), Alexander W, <i>Clowes Hemostasis and Thrombosis:Basic Principles and Clinical Practice</i> , 2003. ISBN 0781749964	\$359.00
ASCP Board of Registry (Editor), Barbara M. Castleberry (Editor), Mary E., <i>Board of Registry Study Guide: Clinical Laboratory Certification</i> , 1996. ISBN 0891894160	\$50.00
Connie R. Mahon (Author), George Manuselis (Author), Donald C. Lehman, <i>Textbook of Diagnostic Microbiology</i> (Hardcover), 2006. ISBN 1416025812	\$99.00
Carl A. Burtis, Edward R. Ashwood, & David E. Bruns Tietz, <i>Fundamentals of Clinical Chemistry</i> , 6th Edition, 2007. ISBN 9780721638652	\$97.00
Bruns Tietz, David, <i>Textbook of Clinical Chemistry and Molecular Diagnostics</i> , 4 <sup>th</sup> Edition , 2008. ISBN 9780721601892	\$97.00
Christopher D. Hillyer (Author), Leslie E. Silberstein (Author), Paul M. Ness, <i>Blood Banking and Transfusion Medicine: Basic Principles and Practice</i> , 2006. ISBN 0443069816	\$199.00
Denise M. Harmening, <i>Clinical Hematology and Fundamentals of Hemostasis</i> , 2008. ISBN 0803617321	\$92.00
Denise M. Harmening, <i>Modern Blood Banking and Transfusion Practices</i> , 2005. ISBN 0803612486	\$83.00
Douglas C Tkachuk and Jan V Hirschmann, <i>Wintrobe's Atlas of Clinical Hematology</i> , 2006. ISBN 0781770238	\$215.00
Elmer W. Koneman, <i>Koneman's Color Atlas and Textbook of Diagnostic Microbiology</i> (Color), 2005. ISBN 0781730147	\$100.00
George F. Brooks, <i>Medical Microbiology</i> , 24th edition, 2007. ISBN 0071476660	\$50.00
Jeffery McCullough, <i>Transfusion Medicine</i> , 2006, ISBN 0443066485	\$72.00
John G. Webster (Editor), <i>Medical Instrumentation: Application and Design</i> (Paperback), 1997. ISBN 0471153680	\$100.00

John L. Carey III, MD; J. Philip McCoy Jr, PhD; David F. Keren, MD, <i>FASCP Flow Cytometry in Clinical Diagnosis</i> (4th edition), 2008. ISBN 9780891895480	\$155.00
John T. Sullivan, <i>A Color Atlas of Parasitology</i> , 7th Edition (Spiral-bound), 2007. ISBN 0966580761	\$44.00
Kathy D. Blaney & Paula R. Howard, <i>Basic and Applied Concepts of Immunohematology</i> , 2nd Edition, 2008. ISBN 9780323048057	\$61.00
Larry Roberts, Jr., John Janovy, P. Schmidt, <i>Foundations of Parasitology</i> (Hardcover), 2004. ISBN 0072348984	\$125.00
Lawrence A Kaplan, Amadeo J Pesce and Steven Kazmierczak, <i>Clinical Chemistry Theory, Analysis, Correlation</i> , 4th Edition, 2002 ISBN 9780323017169	\$100.00
Lorraine J. Doucette, <i>Mathematics for the Clinical Laboratory</i> (Paperback), 1997, ISBN 0721644589	\$45.00
Lynne Shore Garcia, <i>Diagnostic Medical Parasitology</i> (Hardcover), 2006 ISBN 1555813801	\$160.00
Marshall Lichtman, Ernest Beutler, Kenneth Williams, <i>Hematology</i> , Seventh Edition, 2005. ISBN 0070703973	\$215.00
Mary Louise Turgeon, <i>Immunology &amp; Serology in Laboratory Medicine (Immunology &amp; Serology)</i> , 2008. ISBN 0323043828	\$65.00
Nancy A. Brunzel, <i>Fundamentals of Urine and Body Fluids</i> , 2004 ISBN 0721601782	\$58.00
Patrick R., Ph.D. Murray, Ellen Jo Baron, James H. Jorgensen, et al., <i>Manual of Clinical Microbiology</i> (2 Volume Set) (Hardcover), 2007. ISBN 1555813712	\$209.00
Richard A. McPherson and Matthew R. Pincus, <i>Henry's Clinical Diagnosis and Management by Laboratory Methods</i> , 2006. ISBN 1416002871	\$140.00
Ruth E McCall (Author), Cathee M Tankersley, <i>Phlebotomy Essentials</i> (Paperback), 2007. ISBN 0781761387	\$58.00
Shauna Anderson, Susan Cockayne, <i>Clinical Chemistry: Concepts and Applications</i> , 2007. ISBN 1577665147	\$72.00
Shauna C Anderson and Keila B Poulsen, <i>Anderson's Atlas of Hematology</i> , 2003. ISBN 078172662X	\$63.00
Sister Laurine Graff, <i>A Handbook of Routine Urinalysis</i> , 1983. ISBN 0397521111	\$56.00

Susan King Strasinger, Marjorie Schaub Di Lorenzo, *Urinalysis and Body Fluids*  
(Paperback), 2008. ISBN 080361697X \$59.00

William E. Dismukes (Editor), Peter G. Pappas (Editor), Jack D. Sobel (Editor),  
*Clinical Mycology* (Hardcover), 2003 ISBN 0195148096 \$155.00

**Periodicals**

*American Journal of Clinical Pathology* ASCP ISSN 0002-9173 \$650.00

*Blood* American Society of Hematology ISSN 1528-0020 \$1,220.00

*Clinical Chemistry* AACC ISSN: 1530-8561 \$1,061.00

*Journal of Analytical Toxicology* Preston Publications ISSN 0146-4760 \$630.00

*Journal of Clinical Microbiology* ASM \$573.00

*Laboratory Medicine* ASCP ISSN 0007-5027 \$115.00

*Transfusion* AABB Online-ISSN: 1537-2995 \$639.00

**Total \$8441.00**

### Suggested Instrumentation for the MLT Program

Description	Quantity	Unit Price	Extended Price
Hematology Counter	1	\$20,000.00	\$ 20,000.00
Immuno Assay Analyzer	1	\$10,000.00	\$10,000.00
Chemistry Instrument	1	\$20,000.00	\$20,000.00
Coagulation Instrument	1	\$ 5,000.00	\$ 5,000.00
Microscopes	24	\$ 800.00	\$19,200.00
Electrophoresis chamber -Cellulose Acetate	1	\$ 1,300.00	\$ 1,300.00
Spectrophotometer	2	\$ 5,500.00	\$11,000.00
Centrifuge	3	\$ 4,000.00	\$12,000.00
Serofuge	2	\$ 3,100.00	\$ 6,200.00
Slide Stainer	1	\$ 3,000.00	\$ 3,000.00
Osmometer	1	\$ 5,000.00	\$ 5,000.00
Hemocytometer	3	\$ 320.00	\$ 960.00
Gas Chromatograph-FID/NPD	1	\$23,000.00	\$23,000.00
Incubator 37 C	2	\$ 3,000.00	\$ 6,000.00
Refrigerator	2	\$ 5,400.00	\$10,800.00
Incinerators	12	\$ 300.00	\$ 3,600.00
Freezer - 25C	2	\$ 4,960.00	\$9,920.00
Biological Hood	1	\$11,500.00	\$11,500.00
Chemical Hood	1	\$ 7,500.00	\$ 7,500.00
Heat Blocks	5	\$ 1,100.00	\$5,500.00
Safety Cabinet	1	\$ 2,000.00	\$ 2,000.00
Vortex Mixers	6	\$ 1,000.00	\$ 6,000.00
Pipettors	10	\$ 304.00	\$ 3,040.00
<b>Total</b>			<b>\$202,520.00</b>

## APPENDIX E

### Course Comparison between Dixie State and Weber State MLT Programs

#### Dixie State College MLT Courses

#### Weber State University MLT Courses

Course Number	Title	Cd. Hrs.	Course Number	Title	Cd. Hrs.
CLS 1110	Introduction to Clinical Laboratory Science	3	CLS 1113	Intro to Clinical Lab Practices	4
CLS 1115	Introduction to Clinical Laboratory Science Lab	1			
CLS 1120	Principles of Clinical Hematology and Hemostasis	4	CLS 1123	Principles of Clinical Hematology and Hemostasis	5
CLS 1125	Principles of Clinical Hematology and Hemostasis Lab	1			
CLS 1154	Supervised Clinical Experience I	1	CLS 1155	Supervised Clinical Experience	1
CLS 2210	Principles of Clinical Chemistry I	4	CLS 2211	Principles of Clinical Chemistry I	5
CLS 2215	Principles of Clinical Chemistry I Lab	1			
CLS 2310	Principles of Clinical Microbiology I	3	CLS 2212	Principles of Clinical Microbiology I	4
CLS 2315	Principles of Clinical Microbiology I Lab	1			
CLS 2410	Principles of Clinical Chemistry II	4	CLS 2213	Principles of Clinical Chemistry II	5
CLS 2415	Principles of Clinical Chemistry II Lab	1			
CLS 2510	Principles of Clinical Microbiology II	3	CLS 2214	Principles of Clinical Microbiology II	4
CLS 2515	Principles of Clinical Microbiology II Lab	1			
CLS 2610	Principles of Clinical Immunohematology	3	CLS 2215	Principles of Clinical Immunohematology	4
CLS 2615	Principles of Clinical Immunohematology Lab	1			
CLS 2715	Supervised Clinical Experience I	1	CLS 2256	Supervised Clinical Experience I	1
CLS 2815	Supervised Clinical Experience II	1	CLS 2257	Supervised Clinical Experience II	1