

Obtaining a Clinical Laboratory Science Degree via Distance Technology

SUZANNE CAMPBELL

OBJECTIVE: To identify institutions and program officials associated with clinical laboratory science (CLS) academic programs available via distance technology; to collect and summarize data from these programs with regard to on-line instructional methodologies; to determine the level of success of educational strategies and methodologies utilized in on-line CLS programs; to determine the feasibility of developing an on-line program at Seward County Community College (SCCC), Liberal, Kansas.

DESIGN: An on-line CLS program survey tool was sent to eight higher education institutions which had previously indicated that they offer a CLS academic program at the associate, bachelor, or master level via distance technology. Program officials were asked to answer questions pertaining to areas such as program format, on-line admission requirements, program costs, student costs, faculty workload, and on-campus versus on-line student performance.

SETTING AND PARTICIPANTS: The survey was sent to eight program officials who identified their institutions as having a CLS program available through distance technology.

MAIN OUTCOME MEASURES: Responses from current distance technology CLS program officials were collected and tallied. Responses were recorded as 'yes' or 'no' in categories such as program format, program and student costs, and comparison of on-campus versus on-line student performance. The two groups of students were compared in areas of success rate, retention rate, graduation rate, external certification pass rate, employment placement rate, and employer satisfaction level.

RESULTS: The response rate for the survey was 87.5% (7/8). Program officials indicated that various educational methodologies were incorporated in providing CLS education via distance technology. All of the respondents utilize some type of Web-enhanced, Internet based access to deliver course material. Clinical laboratory procedures are taught via instruction within a cooperative laboratory, program clinical affiliate laboratory, or during on-campus student laboratories. Program officials indicated that student enrollment has increased due to the availability of the distance technology.

Students enrolled via distance technology perform as well or better than the on-campus students on certification exams and in the clinical setting. Data from these institutions indicate that it is feasible to develop an on-line program at SCCC in an effort to increase student enrollment.

CONCLUSION: The results indicate that CLS programs which offer the curriculum via distance technology have experienced increased student enrollment thus graduating more students to fill the employment needs. These current distance technology programs are leading the future trends in CLS education of the 21st century.

ABBREVIATIONS: AD = associate degree; BS = Bachelor of Science degree; CLS = clinical laboratory science; CLS/MT = clinical laboratory scientist/medical technologist; CLT/MLT = clinical laboratory technician/medical laboratory technician; MS = Master of Science degree; SCCC = Seward County Community College.

INDEX TERMS: articulation; CLS degree; distance technology; Web-enhanced programs.

Clin Lab Sci 2003;16(4):214

Suzanne Campbell MS is the CLT/MLT-AD Program Coordinator, Seward County Community College, Liberal KS.

Address for correspondence: Suzanne Campbell MS, CLT/MLT-AD Program Coordinator, Seward County Community College, 520 N Washington, Liberal KS 67901. (620) 626-3077, (620) 626-3040 (fax). scampbel@sccc.edu

The purpose of this research project was to gather comprehensive data pertaining to the implementation and success of Web-enhanced CLS programs at the Bachelor of Science (BS) – clinical laboratory scientist/medical technologist (CLS/MT) level and the associate of science (AS) – clinical laboratory technician/medical laboratory technician (CLT/MLT) level. This data will be utilized to develop and implement a Web-enhanced option for the CLT/MLT program at Seward County Community College (SCCC), Liberal KS. The CLT/MLT program at SCCC is a well-established pro-

gram with a strong academic course of study and a reputation of graduating competent entry-level CLTs/MLTs. Currently the CLT/MLT program at SCCC has a low number of students enrolled in the program. In order to make the program fiscally responsible, the number of students enrolled in the program needs to increase. Upon the review of options to increase enrollment, it was determined by input from the program advisory board and faculty, that offering the CLT/MLT courses via a Web-enhanced method is the best course of action. The Web-enhanced option will allow the CLT/MLT program to serve new students at a distance and to better serve the existing populations.

EMPLOYMENT OPPORTUNITIES

In June 2001, the American Hospital Association (AHA) reported a 12% vacancy rate in the laboratory workforce based on the percent of unfilled, budgeted positions. By comparison, there was an 11% vacancy rate for registered nurses. This survey reported that the shortage of clinical laboratory professionals is getting worse and affecting access to care in hospitals across America. Other surveys have reported a laboratory personnel shortage as high as 20%. The AHA also reported that 43% of all hospitals were having more difficulty than last year recruiting selected healthcare professionals which include laboratory personnel.¹ The Bureau of Labor Statistics has projected a 17% growth rate in the number of laboratory personnel between 1998-2008. This is compared to a growth rate of 14.4% for other professions.² During this period, there will be 53,000 new jobs in the field with 40,000 vacancies due to retirement and employees leaving the field. This equals 93,000 total positions, thus the need for 9,300 positions per year. Currently there are only 4,110 total graduates per year from CLS/MT and CLT/MLT programs. This leaves 5,190 unfilled positions per year in the field of medical technology.³ The current vacancy rate for CLTs/MLTs in Oklahoma and Texas is 14.3% and in Kansas it is 15.8%.⁴

CLTs/MLTs are trained to perform a variety of laboratory tests. These tests include the typing and crossmatching of blood and blood components; drug monitoring (both for therapeutic monitoring of drugs and detection of drugs of abuse); identifying anemias, leukemias, and other blood disorders; identifying infectious organisms and determining their susceptibility to specific antibiotics; and performing procedures for various blood and body fluid analysis. In this time of concern regarding bioterrorism, CLSs/MTs and CLTs/MLTs are the laboratory personnel who will be isolating and identifying the anthrax bacillus and other biological weapons. It is estimated that 80% of all physician decisions

are based on laboratory test results produced by CLSs/MTs and CLTs/MLTs. Without these results, the physician would be unable to accurately diagnose, and in many cases, effectively treat the patient.⁵

ON-LINE LEARNING

According to William A Draves, the author of *Teaching On-line*, half of all learning in the 21st century will be on-line. On-line learning will be better than in-person learning for obtaining cognitive skills. On-line learning allows the student to determine their peak learning time and to learn at their own speed. On-line learning allows more interaction; thus 100% of students can be talking on-line versus the 33% that will participate in a traditional face-to-face course. Course participants will be worldwide with the instructors being the foremost experts and authorities in their respective fields. On-line courses will become less expensive and will offer more resources and ways to learn on-line.⁶

For students to be successful in a Web-enhanced course, they must be result oriented, self motivated, and demonstrate self-discipline. They must have time management skills which allow them to stay on task without direct supervision. They must have a manageable balance of academic course work, employment, and family commitments.

The student must also have access to a computer with reliable Internet service.⁷ The student must possess basic computer skills to install software; create, save, and manage files; post text to an asynchronous threaded discussion; and send and receive e-mail.

BEST PRACTICES

The Higher Learning Commission has published a document titled *Best Practices for Electronically Offered Degree and Certificate Programs*. These *Best Practices* were developed by the eight regional accrediting commissions in response to higher education institutions offering technology-mediated instruction at a distance. The *Best Practices* are intended to assist higher education in planning distance education activities for electronically offered programs and to provide an assessment framework once the program is implemented. The *Best Practices* are identified as:

- education is best experienced within a community of learning where competent professionals are actively and cooperatively involved with creating, providing, and improving the instructional program;
- learning is dynamic and interactive, regardless of the setting in which it occurs;

- instructional programs leading to degrees having integrity are organized around substantive and coherent curricula which define expected learning outcomes;
- institutions accept the obligation to address student needs related to, and to provide the resources necessary for, their academic success;
- institutions are responsible for the education provided in their name;
- institutions undertake the assessment and improvement of their quality, giving particular emphasis to student learning; and
- institutions voluntarily subject themselves to peer review.⁸

The *Best Practices* can be divided into five separate components: institutional context and commitment, curriculum and instruction, faculty support, student support, and evaluation and assessment. Through the implementation of a Web-enhanced option for the CLT/MLT program at SCCC, the college is further supporting its mission statement with regard to providing higher education as an investment in future societies and as a college that responds to the interests and needs of the community. Several advisory board members, who represent area healthcare facilities, indicated their support for the Web-enhanced CLT/MLT program option. The college has made the commitment to support this option with the needed budgetary requirements. The major need for additional funding is a contract with a Web-authoring platform which would provide the electronic means of delivering the course material and provide the technical support for faculty and students. Once this contract is negotiated and the college commits the needed funds, the CLT/MLT program faculty will move forward with course development and implementation for Web-enhanced delivery beginning fall 2002.

In order to ensure the same level of learning outcomes for the Web-enhanced option as is currently experienced on-campus, students will need to secure a clinical laboratory site in which they will be instructed to perform the required psychomotor course competencies. Designated clinical instructors will work one-on-one with the student to assure correct performance of quality control, procedures, and reporting of results. There will also be an on-campus face-to-face portion required for the laboratory sessions. Students will be required to come to campus one day per month to work with the course instructor. This will allow the student to acquire exposure to procedures that may not be available in the clinical site and to interact with the instructor and other students. Cognitive skills will be delivered by placing

the course material on the Web via a Web-authoring platform. The course syllabus, competencies, unit objectives, topics for asynchronous discussion, and exams will be available to the student in a Web-enhanced environment.

Faculty support is described in the *Best Practices* document as an ongoing program of appropriate technical, design, and production support. The institution should also provide the orientation and training to help faculty become proficient in the uses of the program's technologies including changes in course design and management. Other issues to be reviewed include faculty workload, compensation, ownership of intellectual property, and professional evaluation processes.⁸ An administrative decision has been made to support a Web-enhanced option, so the CLT/MLT faculty at SCCC has begun to modify the current course material to accommodate Web-enhanced delivery. The faculty will also participate in a training workshop sponsored by the selected Web-authoring platform to obtain technical skills to enable them to become proficient in this type of course delivery.

Student support should include an institutional commitment for continuation of the program to enable all students to complete the degree in the recommended timeframe. The institution should also provide students with advising, an on-line application process, placement testing, on-line enrollment, and access to financial aid, bookstore services, and library resources. The students will also require ongoing technical support 24-hours per day.⁸ SCCC currently is able to provide students with Web-based enrollment, bookstore services, and library resources. The contract with a designated Web-authoring platform will include 24-hour technical service for the student.

The assessment of student learning and evaluation of program effectiveness will be conducted through methods such as achievement of course competencies, written examinations, student attitude assessment to determine affective behavior, evaluation of student skills utilizing the CLT/MLT occupational profile and career development skills profile, and graduate performance on an external national certification exam.⁹ Course evaluations completed by the student will also be considered in the evaluation of program effectiveness. The CLT/MLT program will continue to participate in an external accreditation process with the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) by submitting a self study document and hosting a site visit.

CURRENT DISTANCE LEARNING PROGRAMS

This researcher has identified eight CLS programs that offer Web-enhanced options. These programs are listed in Table 1. Of these eight programs, St Petersburg College (SPC) and Weber State University (WSU) have just completed the first year of the on-line option at the CLT/MLT level, with George Washington University Medical Center (GWUMC) offering the on-line option at the CLT/MLT level beginning fall 2002. The other programs have conducted a distance technology delivery method for over one year.

In order to identify these programs, the researcher posted a request for information via a clinical laboratory educators list serve. The program officials who responded to the request were then contacted via email and telephone. They were asked to complete a survey tool designed to collect data targeted at program format, on-line admission requirements, credit hour requirements, program costs, student costs, faculty workload recording, and student performance comparing on-campus versus Web-enhanced delivery. Of the eight programs identified, seven program officials responded to the survey for an 87.5% participation rate. These Web-enhanced programs offer degrees at the CLT/MLT associate degree level, the CLS/MT bachelor degree level, and the CLS/MT master degree level.

SURVEY ANALYSIS

The Web-enhanced programs utilize Web-based instruction as their primary means of delivery of the cognitive skills. Additional means of instruction include course material on compact disc (CD), video conferencing, conference calls, on-campus student laboratory sessions, asynchronous discussions, and chat rooms. The lecture portion of each course usually contains lecture notes in a PowerPoint format, unit outlines, and unit objectives. The Web-authoring platforms that are utilized include eCollege, WebCT, Blackboard, Prometheus, and WSU's eCampus. Student examinations are administered by paper/pencil either on-campus or off-campus in a proctored setting or via computer assisted testing.

Students obtain the necessary skills by performing clinical laboratory procedures in various methods. These include attending on-campus student laboratories, performing laboratory procedures where the student is employed, receiving credit for previous work experience, and receiving credit for meeting psychomotor competencies as documented by an employer. In addition to the course associated laboratory sessions, students are also required to complete a clinical rotation or clinical projects to fulfill program requirements.

Fifty percent of the programs surveyed provide the option of a shortened clinical rotation contact hour requirement if the student is already employed in a clinical laboratory.

Web-enhanced CLT/MLT program admission requirements include grade point average, references, a computer with minimum technical requirements as identified by each institution, reliable Internet access, and a clinical laboratory in which to perform student training. WSU requires the on-line student to be employed in or sponsored by a clinical laboratory. The other responding programs indicated that the student or program officials must secure a cooperative clinical laboratory or develop a clinical affiliation agreement with a laboratory in the same geographical area as the student. The credit hour requirements for completion of a Web-enhanced CLT/MLT associate degree varies from 71 credit hours to 76 credit hours.

There are five Web-enhanced CLS/MT programs that allow articulation from the CLT/MLT to the CLS/MT. These programs include the WSU, the University of North Dakota (UND), Winston-Salem State University (WSSU), GWUMC, and the University of Arkansas for Medical Sciences (UAMS). Students making application for admission to these programs must possess an associate degree as a CLT/MLT with a minimum of 64 credit hours. The UAMS and WSU require national certification as a CLT/MLT. WSU and WSSU also require a minimum of three years work experience. GWUMC accepts CLT/MLT to CLS/MT candidates as long as they are graduates of an accredited CLT/MLT program. The applicants may be graduates of a civilian program or military CLT/MLT graduates who do not hold an AD but do have 60 or more credit hours on their transcript. The total credit hour requirements for the completion of a Web-enhanced CLS/MT BS varies from 120 credit hours to 129 credit hours.

Of the programs that responded to the survey questions pertaining to program start up costs, 75% indicated costs related to equipment, faculty course development stipends, and technology. Start up costs ranged from \$3,000 to over \$25,000. Equipment included video technology, microscope camera, digital camera, and CD burners. Faculty stipends for developing courses for the Web-enhanced format varied from no additional wages to \$1,200 per credit hour. An additional cost for Web-enhanced delivery is a contract fee for the Web-authoring platform. Six of the programs surveyed indicated that program start up costs have been offset by the increased number of students enrolled in the Web-enhanced option.

Table 1. Current on-line CLT/MLT and CLS/MT programs

Institution	Contact Information	Program Level
Barton County Community College 245 NE 30 Road Great Bend KS 67530	Leonard Bunselmeyer MS MT(ASCP) Program Director bunselmeyerl@barton.ccc.edu (620) 792-2701 x 329	CLT/MLT-AD
St Petersburg College P.O. Box 13489 St Petersburg FL 33733	Valerie Polansky MEd MT(ASCP) Program Director polanskyv@spjc.edu (626) 341-3714	CLT/MLT-AD
Weber State University 3905 University Circle Ogden UT 84408-3905	Kara Hansen-Suchy MT(ASCP)SH CLS Online Programs Coordinator khansen-suchy@weber.edu (800) 848-7770 x 8138	CLT/MLT-AD CLT/MLT-AD to CLS/MT - BS
University of North Dakota School of Medicine and Health Services P.O. Box 9037 Grand Forks ND 58202	A Wayne Bruce PhD Director of Med Lab Science wbruce@medicine.nodak.edu (701) 777-2636	CLT/MLT-AD to CLS/MT -BS CLS/MT - MS
Winston-Salem State University P.O. Box 19461 Winston-Salem NC 27110	Donna Leach EdD MT(ASCP) DLM Department Chair, CLS Dept leachd@wssu.edu (336) 750-2510	CLT/MLT-AD to CLS/MT-BS
George Washington University Medical Center 2300 I Street NW, Room 512A Washington DC 20037	Sylvia Silver DA Assistant Dean for Health Services patsds@gwumc.edu Carol Smith MS MT(ASCP) CLS Education Coordinator patcas@gwumc.edu (202) 994-3186	CLT/MLT-AD to CLS/MT-BS CLS/MT-BS
University of Arkansas for Medical Science 4301 W Markham, Slot 597 Little Rock AR 72205	Cherry Childs MS MT(ASCP) MLT to MT Distance Learning Program childsjuanitac@uams.edu (501) 686-5776, (800) 981-4427	CLT/MLT-AD to CLS/MT-BS
University of Texas Medical Branch at Galveston 301 University Blvd Galveston TX 77555-1028	Vicki S Freeman PhD CLS(NCA) vfreeman@utmb.edu (409) 772-3056 Cynthia Martinez MEd Camellia St John MEd etclark@utmb.edu	CLS/MT-BS

In addition to tuition and fees, students enrolled in Web-enhanced courses will incur a \$20 to \$50 per credit hour or per course technology fee. Other costs to students may include upgrading to a computer that will meet Web-enhanced program requirements and maintaining a reliable Internet service connection. The UND requires a \$500 per semester program fee. Students enrolled at UND may purchase course material on CD for \$100 per course. As of fall 2002, WSU will charge a one time on-line program application fee of \$150.

Survey respondents indicated that faculty workload recording is conducted by various methods. However, the majority indicated that faculty workload is based on credit hours taught per semester and that faculty workload for the Web-enhanced courses is equal to the traditional on-campus courses. WSU provides an on-line supplemental salary which is determined by a specific dollar amount per student per credit hour. All but one of the programs that currently have a Web-enhanced option have increased the number of on-campus and/or adjunct faculty to handle the increased student enrollment.

The final questions of the survey asked program officials to compare the performance of the traditional on-campus student to the Web-enhanced student. A small number of the respondents indicated that these questions were difficult to answer as they felt that these groups of students were entirely different. The on-campus student is the traditional, recent high school graduate with little or no work experience in the clinical laboratory. The Web-enhanced student is older, more committed to obtaining a degree, and often has work experience as a phlebotomist, clinical laboratory assistant, or CLT/MLT. Fifty-seven percent of the respondents believe that the majority of the students enrolled via a Web-enhanced course perform better than the on-campus students. However, attrition rates are higher in the first or second semester for the Web-enhanced students. The UND, WSSU, and the UAMS indicated that their graduates of distance education programs scored higher on a national certification exam. Barton County Community College (BCCC), along with UND, WSSU, and UAMS responded that the level of employability of graduates of the distance education program format equals that of the on-campus graduate.

Because 50% of the survey respondents indicated that their programs are still in the first one to two years of offering the on-line format, there are not enough data at this point to provide specific statistics regarding on-campus versus on-line student academic performance, laboratory performance, certification examination performance, and average time of

on-line program completion. This author would propose that a follow up study of these on-line programs in the year 2007 would allow for more specific data regarding on-campus versus on-line overall student performance.

SUMMARY

There are a handful of CLT/MLT and CLS/MT programs that are leading the future trend of distance education via the Web and distance technology. With the advent of Web-enhanced learning and the severe clinical laboratory professional shortage, initiating a Web-enhanced program format at SCCC is feasible. Preliminary data indicate that there is an initial cost to the institution to implement the Web-enhanced format but that student enrollment increases offset this expense and make this a viable option. Providing degree options for laboratory personnel via distance education is important to students and current clinical laboratory employees who desire an advanced degree but cannot terminate their employment or relocate. Graduates of the Web-enhanced programs perform at the same level as, or better than, on-campus graduates on national certification exams and with regard to their entry level laboratory competencies.

ACKNOWLEDGEMENT

Sincere appreciation is extended to Leonard Bunselmeyer, Valerie Polansky, Kathryn Newton, A Wayne Bruce, Donna Leach, Carol Smith, and Cherry Childs for providing individual program information.

REFERENCES

1. Griffith JT. Coordinating council on the clinical laboratory workforce. Paper presented at the meeting of the Clinical Laboratory Educators Conference, Honolulu HI. February 2002.
2. Employment Projections. Bureau of Labor Statistics. <http://www.bls.gov/asp/oem/noeted/emoccp.asp>. Accessed May 30, 2002
3. Castleberry BM, Wargelin LL. ASCP vacancy rate data. *Lab Med* 1999;30:174-8.
4. Ward-Cook K, Tanner S. ASCP 2000 wage and vacancy survey of medical laboratories. *Lab Med* 2001;32:124-8.
5. Glenn D. The life you save could be your own. *Am Soc Clin Pathol* 2002. <http://www.ascp.org>. Accessed May 21, 2002
6. Draves WA. Teaching On-line. River Falls WI: Learning Resources Network. Accessed May 2002.
7. Bunselmeyer L. Critical success factors for MLT distance learners. Great Bend KS: Barton County Community College (2000).
8. Best practices for electronically offered degree and certificate programs. Chicago: North Central Association Commission on Institutions of Higher Education. 2000.
9. Campbell S. Seward County Community College CLT/MLT occupational profile/ career development skills profile. Liberal KS: Seward County Community College. 2000.