

# Special Report

## Strategies for Sustainability of University-Based Medical Laboratory Sciences Programs

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### ABSTRACT

The COVID-19 pandemic has taken a major toll on the economy and funding for public education. For that reason, the pandemic has a worrisome effect on the sustainability of university/college based Medical Laboratory Sciences MLS training programs. Stakeholders of university-based MLS programs include university administrators, students, clinical affiliates and faculty. Each group has specific goals and challenges that affect the sustainability of the program.

This report details strategies that can be used to satisfy the goals specific to key stakeholders that lead to sustainability. These strategies apply in pandemic times and in the back-to-normal future.

**Keywords:** COVID-19, enrollment, pandemic, education, management/administration, sustainability, economy

The COVID-19 pandemic has put a spotlight on the role of medical laboratories. Even before the pandemic, the projected employment growth for medical laboratory scientists from 2019 to 2029 was expected to be 7%, higher than the average.<sup>1</sup> Whether medical laboratory sciences (MLS) programs in their current construct will be able to keep up with the projected growth remains to be seen. The number of National Accrediting Agency for Clinical Laboratory Sciences accredited MLS programs increased only slightly in the past 10 years, from 230 in 2009 to 235 in 2019.<sup>2,3</sup> The American Association for Clinical Chemistry recently asked Congress for funding to expand clinical laboratory training programs for future pandemic preparedness.<sup>4</sup> These efforts will take time to see fruition. In the meantime, the economy has suffered greatly, and so has funding for public education. Colleges and universities across the nation are making drastic budget cuts, restructuring their units and eliminating some degrees.<sup>5</sup> For that reason, the pandemic has a

worrisome effect on the sustainability of university-/college-based MLS training programs.

Stakeholders of university-based MLS programs include university administrators, students, clinical affiliates, and faculty. Each group has specific goals and challenges that affect the sustainability of the program. This report details strategies that are being used by 1 institution to satisfy the goals of those stakeholders, leading to a sustainable university-based MLS program. These strategies include changes made because of the COVID-19 pandemic. Herein they are organized by stakeholder, but there is significant overlap between the groups.

### Abbreviations:

MLS, medical laboratory sciences; BMS, biomedical science; ASCP, American Society for Clinical Pathology; MLT, medical laboratory technician; CLEC, Clinical Laboratory Educators' Conference; SIM, simulated

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## Administrators

University administrators scrutinize programs when the economy suffers. Criteria used to evaluate programs include demand (enrollment), quality, relevance to the workforce, compatibility with the university mission, and program cost.<sup>6,7</sup> It is important to ensure that administrators know about program quality, including the program outcomes of graduation rate, board examination pass rate, job placement rate, and community support. Administrators should be reminded of the university's National Accrediting Agency for Clinical Laboratory Sciences accreditation. These are

significant criteria to justify program cost, but program faculty must be aware that enrollment may be the final determinant.

### Strategy 1

Administrators and faculty must determine the minimum annual number of graduates or student credit hours that their program needs to be fiscally sound to their home institution and aim to exceed it. Increasing the number of students requires student recruitment and expansion of clinical affiliates. It also puts a major onus on the faculty for student success.

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## Students

The MLS profession has low visibility to the public at large.<sup>8,9</sup> Many students report that they have never heard of the major.

### Strategy 2

Faculty can promote their program to similar majors, eg, biomedical science (BMS)/biology, at their institution. An ideal method is to insert 1 or more MLS courses into the BMS curriculum, preferably as a required course. This strategy requires significant buy-in if the MLS program is not housed in the same department or college as the BMS program. Faculty can attend each others' faculty meetings, provide syllabi, and show how MLS course content will benefit the BMS students in their ultimate careers. In addition faculty can invite BMS faculty to tour a medical laboratory with them. As fellow scientists, this will help them gain an appreciation of the laboratory skills that the MLS courses provide. At the author's institution, the MLS and BMS programs had the same dean. The programs worked side by side to align their curricula.

Faculty should identify the goals of the nonmajor students early in the course and regularly relate course content to those goals. One way to do this is to ask students to introduce themselves early in the class and state their career goals. During the introduction process, the instructor can immediately relate the overall goals of the course to the student. Faculty may return to these goals when discussing specific topics and consider the lens through which a nonmajor is viewing the course while teaching.

For example, premedical students taking hematology are more interested in the disease acute myelogenous leukemia than in the difference between a metamyelocyte and a myelocyte. Faculty can discuss the big picture and how a physician will utilize the results of complete blood counts, cytogenetics, and flow cytometry in making a diagnosis. Prepharmacy students taking microbiology are interested in how antimicrobials work, and pre dental students should be tuned in to the importance of oropharyngeal flora and pathogens. Instructors should keep their learning goals aligned with the career goals of their audience, and show all their students that instructors respect their students' goals.

When nonmajors are incorporated into MLS courses, it benefits the program in 3 ways. First, it increases enrollment in courses. In spring 2020 at the author's institution, there were 24 MLS majors and 23 BMS majors taking diagnostic microbiology (a required course for BMS) and 24 BMS majors taking hematology (an elective). The BMS majors provided a significant increase in credit hours that was viewed favorably by upper administration. Second, nonmajor students may select MLS as an alternate career or change majors. Third, one expects that the students who become doctors, dentists, physician assistants, and pharmacists will have a deeper appreciation for the role and training of medical laboratory scientists. The author's institution has received thank-you cards from past students attending those professional schools in which they expressed appreciation for the deep learning they received from their MLS courses.

### Strategy 3

Faculty can recruit BMS/biology alumni to their MLS program and advertise MLS as a second degree on the departmental website. Earning a second degree appeals to many students. At the author's institution, the BMS degree aligns with the MLS degree, so that all of the MLS prerequisite courses have been completed by BMS graduates. Postbaccalaureate students are admitted to the program in the same manner as transfer students and complete the core courses to earn the second degree. Administrators can obtain the email list of those alumni from the registrar and contact them 1, 2, and 3 semesters after graduation. It is important to turn around phone and email queries quickly.

### Strategy 4

Faculty should add more start dates to their program, once in each semester if possible, which will minimize the amount of

time a prospective student has to wait to start, which leads to retention. Faculty at the author's institution realized the retention implication at a time when they were struggling to increase their student numbers. Historically, the program had begun in January only. Two students who missed the start date reported that they were applying to other programs. To retain them, the institution opened the second start date in May. They consequently gained 5 students that year from that modification. Multiple start dates also improve retention by providing wiggle room for students who get off-track for personal reasons.

The author's MLS program offers its courses once per year, and laboratory sections run in the same semester as the lectures. Instructors may need to revise certain aspects of their MLS core courses and repeat key topics accordingly so that courses do not have to be taken in a particular sequence. For example, some students will take hematology before hemostasis, but others will not. Faculty must keep this in mind when they design lectures and experiments. The nonsequential course design fits well with BMS students, because they do not have the advantage of an MLS background. Some laboratory skills are repeated every semester, such as laboratory safety and microscopy. Phlebotomy and specimen types are discussed in every laboratory section. The reiteration about preanalytical, analytical, and postanalytical issues is beneficial to students.

### Strategy 5

Faculty may consider adding categorical training to their program. Students with a bachelor of science degree can qualify for American Society for Clinical Pathology (ASCP) categorical training in microbiology, hematology, chemistry, or immunohematology by completing a structured program of the categorical requirements from an MLS curriculum. A survey of MLS program directors conducted in 2016 found that 29.0% of university programs accepted categorical students.<sup>10</sup>

### Strategy 6

Faculty can create opportunities to support community within the student groups. Students in their second or third semester of the program can lead study groups. This activity provides teaching practice for more seasoned students and support for new students, nonmajors, and faculty members. Its aim is to improve student retention in the course and to extend the reputation of the program to



**Image 1**

Building community. Students in their third semester (term 3) host weekly study sessions.

nonmajors. Study groups can be set up during laboratory time where attendance is graded. Study groups held outside class time are poorly attended without incentive, and a small amount of extra credit will increase participation. Weekly study groups help students stay on track, especially if classes are online and self-paced. Students also improve their communication and organizational skills by their participation. **Image 1** shows a student-led study group at the author's institution. Zoom, WebEx, and other virtual platforms are a convenient mechanism for student groups to meet. Virtual platforms became very popular after March 2020 because of COVID-19.

## Clinical Affiliates

The number of clinical seats is a limiting factor for program growth.<sup>10</sup> Some training hospitals accommodate MLS and medical laboratory technician (MLT) students from other programs. Local hospitals may not have a sufficient test menu to train students.

### Strategy 7

It is important to recruit more clinical sites. Faculty can use their state's hospital database to search out prospective sites for training, including Veterans Administration and military hospitals. Faculty should look outside of their own state, especially if they are located near the state border. Many hospitals will make the argument that they cannot train students because they have a personnel shortage themselves. This is an opportunity, not a drawback. The 2018 ASCP vacancy

survey<sup>11</sup> reported that the second and third top difficulties in hiring result from increased competition for well-trained personnel and because of applicants who do not have the necessary certification, education, and skills to perform the work. Faculty can emphasize to prospective affiliates that graduates are more likely to be hired by the hospital that trains them. Hospital human resources departments can be very helpful with this argument. Matching student profiles to training sites will facilitate their retention as employees. For example, if a student wants to be involved in research, then that student should be placed at a research institution. If a student is a veteran, then that student should be placed at a Veterans Administration facility. It is vital not to overlook smaller facilities. Hospitals that have a limited menu (eg, no microbiology training) can be paired with larger hospitals to complete student internship training. Courting new sites takes time, effort, training, and of course, an affiliation agreement. This may take more than 6 months to accomplish, so faculty should plan ahead.

### Strategy 8

Clinical affiliate training capacity should be increased, with staggered start dates for clinical rotations. Large facilities that take 4 students in a traditional program may be able to expand to 6 students when the start dates are staggered. Employers who are part of the author's institution's Program Advisory Committee initially resisted this idea but now express their appreciation for having prospective employees graduating every 4 months.

### Strategy 9

Faculty should consider how to shorten onsite training time. Four presentations at the February 2020 Clinical Laboratory Educators' Conference (CLEC) conference reported the benefits of a hybrid program that paired simulated (SIM) laboratories with shortened onsite training, and the presenters expressed their satisfaction with student outcomes.<sup>12-15</sup> The idea is to create a nonclinical semester on campus that utilizes robust SIM laboratory experiences that is paired with a second semester onsite. Utilizing this strategy, a program can double its student placement with the same number of affiliates. Designing SIM labs and supporting them is a significant effort in time and expense. Facilities, faculty, and materials must be considered and supported. Affiliate buy-in is essential to these changes. Program faculty can create a framework for discussion with their advisory board

and maximize the utility of their suggestions in the ultimate curriculum redesign.

In 2020, the COVID-19 pandemic has led to a rapid redesign of many programs as educators have held to their mission of graduating qualified medical laboratory scientists. A survey was sent to the MLS and MLT program directors who attended CLEC 2020 regarding changes they made because of the pandemic. Thirty-four out of the 46 programs that participated in the survey applied a hybrid approach, substituting virtual laboratories for some of the onsite clinical training. Many respondents provided comments that expressed their pride in their simulated laboratory sessions and their virtual meetings.<sup>16</sup>

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## Faculty

### Strategy 10

Curriculum design is an exciting and creative task. Faculty can strategize curriculum change as a group and expect that brainstorming will take several sessions over at least a semester. It is important to set an overarching schedule and a smaller agenda for each session. The following questions can be included: What are the essential skills that should be offered every semester? What can be offered as SIM laboratories? What can be offered as a virtual laboratory? How can instructors keep track of students in different cohorts? Which courses can be offered online, and which courses must be face-to-face? What clinical sites should be courted, and who will make the contact? Which courses best fit nonmajor students? What have other programs done that worked? A faculty member can be assigned as the devil's advocate during the strategizing. This assigned duty highlights potential pitfalls and avoids hard feelings. The program director can set timelines for task completion and assign faculty as needed to accomplish goals. Faculty should be encouraged to present their work at conferences and as publications on the scholarship of teaching and learning, an added benefit for tenure-track faculty members.

Note that the strategies for sustainability must satisfy all stakeholders. **Table 1** lists the strategies and relates them to specific stakeholders. The following case study discusses the author's program before and after utilizing these strategies.

**Table 1. Eleven Strategies for Sustainability (and their stakeholders)**

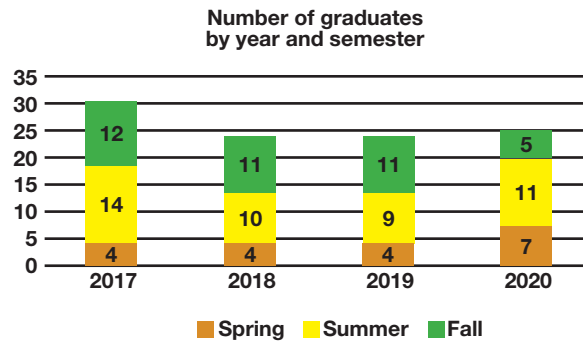
Strategy	Stakeholders
Fulfill enrollment goal of institution	Administrators
Promote the program to students in similar majors at institution	Students
Recruit alumni of similar majors from institution	Students
Add additional start dates to program	Students
Consider categorical training	Students
Create community within student groups to aid retention and expand program reputation	Students
Add clinical sites	Affiliates
Stretch clinical site capacity	Affiliates
Shorten onsite clinical training	Affiliates
Strategize curriculum changes creatively	Faculty and affiliates
Be flexible	Everyone

## Case Study: Strategies in Action

Before the recession of 2008, the author's MLS program graduated 12 to 16 students per year. The program was 2 + 2, part of a bachelor of science degree. It was 5 semesters long; the clinical year started in January. There were 6 full-service affiliates who took 1 to 4 students for a 29-week rotation. In 2008, university administrators threatened program closure because of the economy. The criterion for closure was low enrollment. Administrators and faculty followed a number of strategies to sustain the program.

The university's formula was used to determine that the minimum graduate number for sustainability was 24 students. A second start date in May was opened, enrolling postbaccalaureate students and students who were off-track by a semester. Eventually, another start date in August was added. To keep track of student cohorts, they were grouped by term and were oriented to specific requirements relevant to each term. Term 1 students had just joined, term 3 students were preparing for clinicals, and term 5 students were getting ready to graduate. A limit of 40 students per year was set, but no limit was set on the size of each cohort. **Figure 1** shows 4 years of enrollment by the semester that students graduated from the program. The fluctuation of the numbers by year is notable.

Nonmajor (BMS, biology, and chemistry) alumni were recruited with direct emails sent twice, at 6 months and at 12 months after their graduation. The MLS course in

**Figure 1**

Four-year summary of graduates of case study MLS program stratified by semester of graduation. Spring is orange, summer is yellow, and fall is green. Note the variability in enrollment across semesters. MLS, medical laboratory sciences.

diagnostic microbiology was added as a required course, and hematology was added as an elective to the BMS curriculum; these additions increased the program's visibility and added more student credit hours to the department. The exposure to the MLS curriculum has caused some students to change majors or come back to the MLS program postgraduation. Three more laboratory sections were added to select core courses because of the boost in enrollment, which also boosted the program's credit hours. The website advertises clinical laboratory sciences as a second degree.

Program faculty courted more clinical sites, especially focusing on hospitals in major cities that were experiencing workforce shortages. In addition, they expanded their geographic range; the program has 22 active affiliates that span more than 500 miles from east to west in 2 states. The program pairs large and small hospitals to fulfill curricular requirements. Faculty and administrators attempt to match student preferences to the sites, and so far, every student has been placed without a delay in progression to graduation. The larger affiliates take up to 6 students per year. Students with personal or health issues who need time off can more easily return, which reduces attrition. A recurring snag is that clinical sites cannot always accommodate the same number of students, and the number of students varies each semester. This variability can make scheduling clinical internships more difficult, but it is not insurmountable.

The COVID-19 pandemic has forced some rapid changes to program delivery and to the clinical internships. From

mid-March to July 2020, the university phase of the program pivoted to total online delivery. Virtual laboratories were purchased and/or developed, and alternate assignments were made. Students and faculty met regularly over WebEx, Google Hangouts, and Zoom. Several clinical sites were no longer able to accept students, and 3 students chose to postpone clinical training. Some of the affiliate hospitals that were experiencing workforce shortages recognized this crisis as a hiring opportunity, integrating the displaced trainees and eventually hiring them. Administrators and faculty shortened the onsite training time and created robust SIM laboratories and online practical exams for the clinical students. The customary end of program ASCP preparation “Review Week” was held using WebEx. The feedback from clinical affiliates during the redesign was considered, and alterations based on their input were made.

The MLS program has graduated 2 cohorts during the pandemic with a total of 20 students. All students took the ASCP Board of Certification examination, with a 95% pass rate on the first attempt. The median overall score for these students was 537, compared to the national mean scaled score of 503. It was also higher than the median score for the students who took the examination in 2019. All of the graduates who sought employment found it. Program faculty and administrators will continue to evaluate employer feedback through the Advisory Committee.

## Conclusion

For university-based MLS programs to remain viable, they must satisfy the demands of their stakeholders. To satisfy university administrators, they must meet certain enrollment goals. To boost enrollment, they must recruit more qualified applicants. To train applicants, they must increase the number of clinical training sites. This report shares multiple strategies that were used by the author’s MLS program to meet these requirements. These strategies take time and effort to put them in place. The COVID-19 pandemic has added additional constraints in 2020, especially regarding hands-on experience, and has required a rapid response. The impact of this response is still being evaluated, but so far it appears successful, leading to the final strategy: be flexible. **LM**

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