Clinical Laboratory Educators' Conference 2014 Abstracts

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The following abstracts were presented during the 2014 American Society for Clinical Laboratory Science (ASCLS) Clinical Laboratory Educators' Conference February 20-22, 2014 in San Jose, California. Abstracts are reviewed by appropriate representatives of the ASCLS Educational Scientific Assembly. They are the final authority in selecting or rejecting an abstract. (*- indicates presenter)

Poster Presentations

Add Creativity and Fun to your Student's Capstone Project

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Previously, during the final semester of our Associate Degree Clinical Laboratory Technician (CLT) Program, our students were required to complete a research paper as their capstone project. Grading of this assignment was frustrating for faculty due to the weak writing skills of the students. In addition, students expressed dislike for the assignment. Three years ago, a decision was made to join our Dental Hygiene and Diagnostic Medical Imaging Students in a poster presentation session opened to the College community and employees from our clinical sites. Students are graded for the poster and for orally presenting their research to a faculty member. From an informal survey of the students, they seem to embrace the more creative method to demonstrate knowledge gained from their research. The students also reported enjoying viewing the projects from their classmates and students from the other programs. Future plans include scheduling a free continuing education presentation for our clinical faculty to encourage more of them to come to our campus during the poster presentations of our students. Changing our capstone project from a formal research paper to a poster presentation format has improved the experience for our students and our college faculty.

CLS Students' Perceptions of the Clinical Experience

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In 2009-2010 our CLS program changed from a traditional bench training internship to a clinical experience. The University-based curriculum provided extensive hands-on experience in our campus laboratories, but we lacked the ability to recreate the real work environment. Although students must still meet testing performance requirements, this format focuses students' learning on the general work flow of the laboratory, test volume management, quality assurance, preventative maintenance, and interprofessional communications. Students are assigned to four 3 week rotations; a mixture of large, small, urban or rural hospitals. To investigate the value of this model from the student's perspective, we developed an open-ended survey asking them to reflect on what they learned during the clinical experience that was not part of the standardized checklist and their perceived readiness to join the workforce. Students felt well prepared for their clinical experiences in all topic areas with some passing the employee competency checks on the first or second day. Although we expected students to be working independently by the end of each rotation, many students were working with minimal supervision by the end of the first week (~70%). Common themes in student comments included increased confidence (82%); recognition of common procedures in different laboratory settings (68%); and a heightened awareness of the laboratory's integrated role in patient care (43%). All but a few (7%) believed they were well prepared for employment. This study shows that the clinical experience model provides students with the technical and professional education they need for employment readiness.

Curriculum Revision Incorporates Competency Based Education in Lesotho

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As part of the Lesotho Ministry of Health and Social Welfare (MOHSW) strategic plan, the medical laboratory program in Maseru, Lesotho was scheduled to undergo curriculum revision, enhancing student training and faculty development. The MOHSW suggested the curriculum be revised to a competency based education and training (CBET). The Center for Global Health of ASCP partnered with MOHSW to provide consultation and training, support and mentorship to meet the country's strategic plan for improved laboratory services. This was achieved through

stakeholder's meetings, initial laboratory school and clinical site assessments, training workshops for 6 fulltime and 14 part-time faculty in teaching methods. The various aspects of CBET versus subject based curriculum were discussed at length. Due to challenges in transferring CBET courses to other institutions, the decision was made to incorporate competency requirements within subject based courses. Outcomes are as follows: the laboratory school added modern technology applications, quality systems and best laboratory practice to their curricula and enhanced the teaching methodologies of their faculty. The new curriculum contains 32 modules and measureable assessment of competencies. The impact of this lab school curriculum revision include increased competencies and knowledge of 20 students who recently graduated and 27 students soon to graduate and enter into MLT positions as measured by survey of 10 stakeholders and 27 graduating students. Six fulltime faculty were assessed and demonstrated best teaching practices and facilitation of learning with the new curriculum. The collaboration for curriculum revision, implementation, and now evaluation has spanned six years.

Evaluation of R/RStudio in Teaching Biostatistics to Medical Laboratory Scientists

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Medical Laboratory Science (MLS) students are required to know a range of statistical techniques used in the clinical laboratory. This study examines the use of RStudio as statistical analysis software in a MLS biostatistics course. Statistical analysis, historically, has been taught with the use of Microsoft Excel. This approach has worked well but Excel is limited when compared to other software such as SPSS, SAS, and STATA. These packages are more powerful but that capability comes with a price tag. The R statistical package is a free and open source computing language that is available across all computer operating systems. A recent complementary software program, RStudio, has been developed to make the use of R user-friendlier. A study population of 27 third year MLS students in a four-year bachelors program was selected in the Fall semester of 2013. RStudio was introduced and used as statistical analysis software utilizing weekly computer labs and online walkthroughs. Students were given a questionnaire based on a seven-point Likert rating scale that focused on three areas; usefulness, ease of use, and ease of learning. Of the students surveyed, 93%, 65%, and 85% responded positively to the usefulness, ease of use, and ease of learning RStudio respectively. The strongest student disagreement was in response to using RStudio without instruction or supervision. Overall the student responses were strongly positive with regard to the RStudio software. Although it is clear that teaching RStudio includes a steep learning curve that requires close guidance and supervision by the instructor.

Formula for Success in a Clinical Laboratory Science Program

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Clinical Laboratory Initiative to Mentor Baccalaureate Students (CLIMBS) is a program that is funded by U.S. Department of Labor and funds tuition and other resources for unemployed or underemployed individuals who are interested in pursuing an undergraduate degree or post-baccalaureate certificate in Clinical laboratory Science (CLS). One of the major goals of this program is to make sure that these students complete the CLS program successfully which requires tracking of variables that predict student success. The goal of this study was to create a model that predicts success of CLIMBS students in the UTMB CLS program, with CLS GPA (clsgpa) as the outcome variable. The study population included all students enrolled in the CLIMBS program that have completed at least one semester in the CLS program. The scientific question under investigation was: Are cumulative GPA (cgpa), incoming science GPA (sgpa), age (age), gender (sex, 0=male, 1=female), minimum B.S. degree obtained before starting the CLS program (minbs, 0=no, 1=yes) and medical laboratory technician degree before beginning the CLS program (mlt, 0=no, 1=yes) strong predictors for clsgpa which is a measure of success in the CLS program. The full regression model produced an R square of 0.407 with p-value of 0.003, at alpha of 0.05, indicating statistical significance. This model can be used to predict the likelihood of success of students in the CLS program and could be a model for success in CLS education in any university based program.

Impact of Mobile Devices on Clinical Laboratory Data

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Recent advancements in mobile wireless devices (smart phones and tablets) have given these products the potential to drastically alter the practice of healthcare. The project described determined how these devices would assist in improving diagnosis, treatment and therapeutic outcomes in the delivery of healthcare. Also, it seeks to determine if the healthcare community feels these devices will make healthcare more cost effective and affordable. To cover multiple aspects of healthcare, several groups have been targeted: clinical laboratory; emergency, dental, rehabilitation, and surgical medicine; hospital administration; diagnostic imaging technology; public health; and veterinary medicine. This presentation will focus on our current results pertaining to

the clinical laboratory. A questionnaire was distributed to clinical laboratory personnel both domestic and international. Questionnaire data was analyzed. The overall response rate was significant. The respondents concluded the use of mobile wireless devices have and will improve the dissemination of laboratory data in the coming years. The devices will assist in direct clinical assessment of reported test results even directly to the patient. Additionally responders noted such devices should allow greater and improved access to medical literature that is web-based such as test procedures, treatment protocols and guidelines. Also, responders reported these devices should improve laboratory work productivity and efficiency; In the future, the project will to continue monitor the impact of mobile devices in these areas of health care in order to help define the effect of mobile wireless devices to improve future healthcare delivery and practice. The Clemson University undergraduate Creative Inquiry Program supported this project.

Incorporating a Laboratory Information System in a Simulated Laboratory

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Laboratory Information Systems (LIS) have become the main avenue for laboratory staff to provide results to health care providers. This project examines student feedback resulting from the implementation of a LIS in an institution where simulated laboratories are the core of Medical Laboratory Science (MLS) education. The LIS was introduced fall semester of 2013 in a Simulated Laboratory course taught to 18 students in the 3rd year of their 4-year program. Students used the LIS as part of their weekly simulated laboratory. After 10 weeks students were given a questionnaire rating the software's *ease of use* in these areas: order entry, sample identification, result entry, work in progress, printing extra labels, adding tests, and printing reports. Students responded positively rating the overall ease of use as *fairly easy* (38.9%), *easy* (50%) and *very easy* (11.1%). Dislikes included manually inputting results and using older laptop computers. The ease of patient identification through generating labels, and the absence of paper reports were expressed among the positive aspects. Ordering tests, adding tests, editing results, and printing extra labels were listed as areas where students desired more practice. Overall, students welcomed the exposure to the software with an overwhelming 88.9% responding that its use helped to better simulate a real laboratory environment. Feedback from this study confirms that the LIS implementation was a positive addition. Based on the results of this study, future considerations involve the purchase of new computers, interfacing instrumentation, and further exposure to other features of the software in student labs.

Lecture Enhancement by Specific Abbreviated Videos

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Faculty members within the Medical Laboratory Science Program have experienced difficulty effectively teaching the principles of the newer laboratory instrumentation verbally. However it is not possible to provide hands-on opportunities within the program and only a few students will receive these opportunities in their practicums due to the number of rural practicum sites utilized. Faculty members received an educational enhancement grant to conduct a pilot study of incorporating videos of current instrumentation into a clinical microbiology lecture course. With the grant a laptop and student worker, skilled in digital photography and movie editing, was acquired while a high-quality digital camcorder was borrowed. The support of a local hospital laboratory was gained and the instrumentation that would most benefit the students was selected. Four brief video clips (10 minutes or less) including the BACTEC blood culture system, Phoenix, E-testing, and MALDI-TOF were made and presented in clinical microbiology. Students in the microbiology course were surveyed and overwhelmingly results indicated that the videos contributed to student knowledge of the topic, provided a learning opportunity that was not available in the student laboratory, and should be shown to future classes. Due to the results of this pilot project other faculty members are in the process of or are planning to enhance their lecture courses with brief videos. Faculty members believe this approach appeals to the new generation of college student and provides an opportunity for all students to gain exposure to the latest technology available with a minimal impact on program budget.

Pros and Cons of "Flipping" an Undergraduate Clinical Immunology Course

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The author wished to improve student content retention from one course to the next. To do so, she created the ultimate active learning course by adopting the "flipped classroom" model for up to 200 students a semester. Lectures were recorded and students spent classroom time on various exercises. The overall course design included: 1) lecture recordings available in a course management site, 2) detailed learning objective lists, 3) instructor-assigned student teams, 4) iClickers practice questions at the end of each class, 5) peer assessments of team mate effort & performance, 6) patient case study discussions, and 7) a cell model hands-on exercise. Pros identified included: 1) students can discuss learning objective answers in class, 2) students have team peer pressure to keep up, 3) students can work ahead if they choose, 4) students make new friends in the teams, 5) students can assess

knowledge with practice iClicker questions, 6) professor can identify and correct student misconceptions prior to an examination, and 7) the students and the instructor enjoy class sessions. The main cons were that intelligent students could learn on their own and stopped attending, necessitating a strict attendance policy, and teaching the course requires assistance in the classroom to work with teams. Pros greatly outweigh the cons, and the course is popular with students after three semesters serving more than 500 students. The instructor is enthusiastically continuing to teach in this manner and other instructors on campus are adopting parts of the course design.

Quality Improvement Projects Utilizing Evidence-Based Practice Research

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This CLEC poster demonstrates how students may assess and incorporate evidence-based strategies through quality improvement projects and inter-professional collaborations. Clinical Laboratory Science (CLS) programs currently prepare students for their careers in highly automated laboratories, but future laboratorians will be challenged to develop effective laboratory medicine practices that will link clinical concepts and evidence to outcomes that define patient-centered care. Evidence-based practice (EBP) research will provide the analytic framework. The Laboratory Medicine Best Practices (LMBP™) and the Clinical Laboratory Integration into Healthcare Collaborative (CLIHC™), two CDC initiatives, are exploring approaches to advance collaboration between laboratorians and other healthcare professionals. The evidence-based systematic reviews conducted by LMBP™ could enhance this collaboration. The LMBP™ A6 cycle method is a reliable method for implementing evidence-based quality improvement linked to improved patient outcomes. Currently there are four laboratory-related systematic review publications; reduction of hemolysis in EDs, timely reporting of critical values, barcoding to reduce identification errors, and reduction of blood culture contamination. Data from these reviews will illustrate how quality improvement projects may serve as evidence of practice effectiveness. Inclusion of the A6 cycle method in a student QI project could result in a more rigorously constructed clinical study and begin CLS educators' conversation on inclusion of evidence-based research within the curricula.

A Quality Model for Successful Competency-based Clinical Rotations

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Stevenson University is one of eight laboratory professional programs in the state of Maryland (4-MLS and 4-MLT). With increasing numbers of students needing clinical rotations and the pressing economic issues of most laboratories, maintaining clinical affiliates has become increasingly challenging. Our university maintained a pro-active stance by developing competency-based clinical rotations. Using our clinical and didactic instructors as expert resources, we re-purposed the days in each clinical rotation from 21 to an average of 10-13 days. Standardized clinical rotation objectives were developed in each discipline area and clinical expectations were proposed to meet entry-level without sacrificing quality. Since students spend less physical time at the clinical affiliate, they prepare by passing pre-rotation competency testing and submitting answers to pre-rotation objectives to the clinical supervisor, assuring that their time spent in each rotation focuses on work flow, prioritizing, multi-tasking, problem- solving and automation. During each rotation, students complete homework problems, online review modules and practice tests. Prior to initiating this model (2007-2010), student outcomes were: 16 graduates, 15 ASCP-BOC certified with a 4-year program mean average of 483 (national all universities = 489), and 100% employment. In three years of testing the new rotation model (2011-2013), student outcomes are: 17 graduates, 16 ASCP-BOC certified, with a program mean average of 491 (national = 504), and 100% employment. Employers also rank Stevenson graduates as highly capable. This initiative has increased the number of available rotations, focused on the clinical experience without sacrificing quality, and provided meaningful input and investment from laboratory leaders.

SaBLE - A Scenario Based Learning Environment for Immunology Instruction

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The immune system is an often overlooked but critical organ system in some traditional undergraduate Anatomy and Physiology courses. Immunological theory and techniques are ubiquitous in medical and research laboratories. Thus, the inclusion of comprehensive immunology instruction in medical laboratory science programs provides a foundation for understanding many of today's laboratory tests. The complexity and breadth of the immune system can be overwhelming for undergraduate students as they try to both learn the details of immunology and comprehend the intricacies of the system. To help students organize and practice application of fundamental immunology concepts we created a self-directed digital learning environment to facilitate student learning and enhance critical thinking skills. SaBLE is comprised of a webpage engine that can be used to challenge student thinking in almost any scenario based instruction. It includes randomly selected multiple scenarios so that students are rechallenged with each interaction.

Feedback to the student can be immediate or delayed to have the maximum impact on student learning. Student progress is recorded to allow comprehensive data analysis of changes in student performance from the beginning to the end of instruction. Consistent with game theory, interaction is incentivized using a point system and digital badges or awards. The system was deployed during the fall semester of 2013 in a newly designed three credit immunology course. Data demonstrates increased student engagement and equivalent student outcomes. Application of game theory to laboratory instruction can be an effective means of improving student engagement with course content.

Service Learning Experience to Enhance Medical Laboratory Science Curriculum

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Medical laboratory science (MLS) clinical preceptors perceive MLS students need more practical laboratory experience to improve critical thinking, analytical skill, and interpersonal and team building competencies. A study using Q methodology was used to investigate and evaluate the perceptions of MLS preceptors about the skill level of MLS students for medical laboratory practice. The study identified laboratory competencies (N=23) needed by entry-level MLS professionals in the clinical laboratory. Data was factor analyzed (r = 0.80/SE (0.069). Distinctive and characterizing statements emerged ($p<0.01$) about the MLS curriculum and the need to provide students with more practical laboratory experience and development of interpersonal and teambuilding skills. In response to the study, medical laboratory science educators developed a service learning strategy to address these competency needs. Under direct supervision of a certified medical laboratory scientist, students engaged in community outreach experiences in underserved and diverse populations by routinely participating in laboratory services offered on a mobile health clinic, at a university student health center, and community health fairs. Students expanded an overall knowledge foundation of the daily operations of a community based medical laboratory and developed interpersonal, interdisciplinary and team building skill sets necessary for professional success in the field of medical laboratory science. Based on previous and current quantitative and qualitative service learning research results, the service learning participation was a predictor of increased student learning outcomes.

Using an e-Learning Module to Teach Evidence-based Approaches

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The Laboratory Medicine Best Practices program (LMBP™) engages physicians, nurses, laboratory professionals, scientists, researchers, and other health care system representatives. These experts serve the LMBP™ process in capacities of an LMBP™ Workgroup, Expert Panels, and Systematic Review Teams. To meet the shared goal of increasing evidence-based practices, the groups employ two approaches developed by LMBP™, the A-6 cycle method for systematic reviews and the six basic steps of quality improvement. Key concepts and important points from each approach are summarized in two LMBP™ e-learning modules. This poster focuses on the second module in the series, "Application of Laboratory Medicine Best Practices Initiative (LMBP™) A-6 Methods for Laboratory Practitioners." The second module outlines quality improvement study design and implementation. This free, one-hour module uses scenarios from LMBP™ published articles, periodic knowledge checks, and hyperlinks to resources (journal articles, modifiable templates, and collaborative websites) to provide a framework for users to acquire knowledge while immediately accessing tools. The module builds knowledge and skills for the practical application of scientific methods. The module is among the first to focus specifically on the collection of unpublished data for use in LMBP™ systematic reviews. Upon module completion, users are connected to the LMBP™ website, www.futurelabmedicine.org, to explore opportunities to engage in collaborative and educative efforts.

Using an Interdisciplinary Case Based Approach to Promote Inter-Professional Learning Among Undergraduate Allied Health Students

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Students who participate in interdisciplinary education experiences develop an enhanced understanding of their own professions. This poster reviews the program planning, development, and outcomes associated with the College of Allied Health Sciences Interdisciplinary Mid-Collegiate event at the University of Cincinnati. This undergraduate workshop's primary objective was to expose pre-professional students to the importance of interdisciplinary teams and patient centered care as an approach that most effectively addresses the multifaceted health challenges of a complex patient. A half day conference was planned and coordinated by an interdisciplinary committee of faculty and staff members who interviewed a former traumatic brain injured patient and her family to produce videos vignettes around which interactive group discussion questions and activities were written. The immersive educational event combined the expertise and perspectives of former patients, health practitioners and faculty. The 286 students surveyed who

participated responded 99.3% in the affirmative that the primary conference objectives of the conference were met. The active participative delivery method succeeded in meeting its objectives of introducing the importance of successful collaboration and interdisciplinary "patient centered" care practices to future health care practitioners. This tenet is central to an integrated learning model and applicable to every health major's pre-professional and professional training curriculum.

Utilizing a Digital Microscope Eyepiece Camera to Enhance Distance Education

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With the increasing amount of educational technology available, students are seeking distant education sites as an alternative to traditional on-campus classes. Laboratory sciences educators need to find an appropriate method for delivering laboratory instruction (with an emphasis on active learning) to distant students. To enhance the distant learning model, the Department of Laboratory Sciences at UAMS purchased a digital microscopic eye-piece camera (Dino-Eye AM-4023X) to capture images/videos from laboratory slide sets. The instructors developed online labs and reinforcement activities for the distant students using this microscope camera. The distant students were able to view images/videos taken from specimen slides chosen by the instructor to emphasize a specific concept (cell counts, differentials, gram stains, nuclear structures, parasites, urine sediments, etc.). To provide quality education to distance students enrolled in a laboratory science program. A study was completed to evaluate the effectiveness of the Parasitology online labs created by the microscope eyepiece camera. The 14 distant students completed an ordinal scale questionnaire, in which their perceptions of the online labs were evaluated. The questionnaire consisted of six questions with a 100% response rate. A majority of the respondents agreed that the images and videos used in the online labs enhanced their learning, reinforced the lecture material, and preferred a course that integrated online labs into the curriculum.

Technology Demonstrations

Application of Real-Time Online Streaming Technology in a CLS Curriculum

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Cell identification and microscopy can be challenging skills to grasp for Clinical Laboratory Science (CLS) students. Additional practice with an instructor and a multi-head microscope is often needed for students to gain proficiency in these areas. In CLS programs with a large number of students or small faculty size, individualized time with the instructor at the microscope may not always be feasible. One CLS program investigated the use of Livestream© technology in combination with a microscope, camera, and computer to host cell review sessions with students online in real-time. Livestream© is a live streaming video platform that allowed the instructor to broadcast video of microscope views of peripheral blood, bone marrow, urine wet preps, and body fluid cytosmears. The instructor also used a microphone to record corresponding audio detailing cellular characteristics and identification with these specimens. Students could access the live stream feed of video off-campus via a website and/or app on a smartphone or tablet device. Students were also able to access previously recorded videos at their convenience for additional review. The instructor hosted six, hour-long microscope review sessions during the semester, decreased from 24 sessions held in the past. Students also performed, on average, higher on practical exams than previous classes in which this technology was not used. Positive comments regarding feasibility and accessibility were received from the students. As a result, the Livestream© technology served as an innovative and efficient alternative in providing additional instruction in cell identification and microscopy for students.

Creation of an annual "Blood Bank Bowl" to enhance BS and MS MLS learning

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The Rush University MLS program prepares both Bachelor's and Master's level students in all the introductory courses necessary to become a certified medical laboratory scientist. Distinctions are required to define the master's level from the bachelor's level objectives, and one way in which this is accomplished is the "Blood Bank Bowl." During this assignment, Master of Science students develop an appreciation for the difficulty in writing exam questions. M.S. students in the course were divided up into groups of 4 or 5 and were required to prepare test questions from various areas of the course and at three defined levels of taxonomy. These were submitted to the instructor who reviewed them for accuracy, edited them as needed, and then incorporated them into 'Blood Bank Bowl' games. Students in the course were then divided up into teams (including the B.S. students). Two teams played each other in round robin style until a winner was determined. No additional points were given to the B.S. students for participating in the bowl, but were required to be present for participation points. Comments from the students to the instructor indicated they found it useful as a review for the final exam. After going through the process of writing test questions and participating in the bowl games, students felt they were better prepared for the final course practical and exam.