Clinical Laboratory Educators Conference 2005 Abstracts

POSTER PRESENTATIONS

Authors listed in bold face type will be the presenters.

Cold Agglutinins: A Case Study of Patient's Condition and Its Effects on the Integrity of Laboratory Findings

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Although frequently seen in clinical practice, the diagnosis of patients who have cold reacting antibodies can be complicated. Cold agglutinins affect many areas of laboratory testing. Broad recognition of patient history, symptoms, and laboratory findings can guide one to include the possibility of a cold reacting antibody. A cold agglutinin has optimal reactivity at temperatures below those of normal body temperatures and is almost always IgM subclass. The case to be presented begins with a female patient having a pre-existing anemia and chronic obstructive pulmonary disorder. Laboratory findings include CBC and differential data with abnormally high WBC and platelets, and 90% neutrophils. The patient had a low RBC count, hemoglobin, and hematocrit. Measurement of arterial blood gas levels showed a low pO_2 and O_2 saturation, with a high pCO_2 and HCO_3. The patient's mycology cultures grew out a mold most characteristic of *Aspergillus spp.,* Latex agglutination D-dimer testing revealed a cold agglutinin. Due to the patient's low hematocrit, the physician ordered two units of packed red blood cells. Further details of laboratory results and treatment followed by how this case may have been misdiagnosed due to the presence of the cold agglutinin are presented.

The peer-reviewed Clinical Practice Section seeks to publish case studies, reports, and articles that are immediately useful, are of a practical nature, or contain information that could lead to improvement in the quality of the clinical laboratory's contribution to patient care, including brief reviews of books, computer programs, audiovisual materials, or other materials of interest to readers. Direct all inquiries to Bernadette Rodak MS CLS(NCA), Clin Lab Sci Clinical Practice Editor, Clinical Laboratory Science Program, Indiana University, Fesler 409, 1120 South Avenue, Indianapolis IN 46202-5113. brodak@iupui.edu.

Comparing Academic Performance, Learning Style, and Student Satisfaction in a Pre-CLS Biology Simulation Laboratory Course

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The purpose of this study was three-fold: 1) to determine if laboratory simulations can replace a traditional laboratory, 2) to determine if there are learning styles more responsive to computer simulations, and 3) to determine if students are more satisfied with computer simulations than traditional wet laboratories. The basic assumption that science laboratories help students gain a better understanding of concepts described in lectures and textbooks was not challenged. Unfortunately, ideal laboratory teaching conditions are often rare and complex experiments are expensive, hazardous, or time consuming to perform in introductory laboratory courses. Incorporating microcomputer technology enables a variety of teaching techniques that permits the instructor to become a resource person and facilitator of learning rather than the expert who imparts knowledge. Students enrolled in a pre-CLS physiology laboratory course participated in a pilot study July 2004. All wet laboratories were replaced using PhysioEx™ 5.0 laboratory simulation in physiology. Students learning styles and personality characteristics were identified using Kolb's Learning Style and the Meyers-Briggs inventories. Additionally, pre- and post-tests and final grades were compared to determine significant gains in cognition. Students were surveyed twice during the session. The results of the t-test and one-way analysis of variance (Anova) indicated that 'A' students were more satisfied with the course and knowledge gained (p <0.05) than 'B' and 'C' students. The results of this study have implications for clinical laboratory science education. Laboratory simulations may be an alternative way to introduce CLS students to advanced equipment and complex techniques not routinely performed in the laboratory.

Development and Delivery of an AS to BS Degree Completion Distance Learning Track in CLS

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The CLS Program at the University of Cincinnati introduced an AS to BS degree completion distance learning track (CLS DL) in June 2004. The track was designed to provide working laboratory professionals with an associate degree the opportunity to earn a bachelor's degree while continuing full- or part-time employment, and with minimal disruption in their lives. Previous laboratory and life experiences were considered in curriculum development, so students enter the program with advanced standing that includes complete fulfillment of the university's general education requirements. The curriculum includes upper division science content, didactic courses, and advanced clinical experiences that are completed in each student's community. The courses are taught using an interactive distance learning course model that includes audio and video PowerPoint presentations, regular discussions between the instructors and the students, and frequent learning assessments. The students matriculate through the curriculum in a learning community of 20 students that provides a natural support system and study group environment. Fifty-four students were admitted into the first quarter; 94% were retained. One hundred three new students were admitted into the second quarter. Funding, development, resources, the course model, and the curriculum will be discussed and sample course materials will be presented. Student demographic, assessment, and retention data will be shown. Preliminary data suggest that the distance learning course model and curricular structure utilized in the CLS DL track will successfully provide laboratory professionals who are not able to attend a traditional program with the means to continue their education and advance their careers.

Development and Implementation of an Innovative MLT/CLT to MT/CLS Articulation Program Using Synchronous and Asynchronous Delivery Formats

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It is well established that there is a shortage of certified medical technologists/clinical laboratory scientists (MTs/CLSs). The problem identified in this study is that there are limited programs that address the development of a curriculum format that is accessible by working medical laboratory technicians/clinical laboratory technicians (MLTs/CLTs) to earn a bachelor's degree. In 1996, a new model of curriculum delivery using synchronous and asynchronous formats to deliver the didactic components was developed and implemented by Old Dominion University. The program utilizes an interactive, televised, asynchronous weekend format to deliver courses to distant sites. The work sites of MLTs/CLTs provide the clinical component of the program. This study was a retrospective cross-sectional comparison of the scores of traditional and weekend students (n = 97) on the American Society of Clinical Pathology (ASCP) national certification examination over a 4½ year period beginning in 1998. In every comparison there was no difference, i.e., $p < 0.001$, between the scores of traditional and weekend students on the ASCP examination. Furthermore, the scores of traditional and weekend students in four of the six subject areas (hematology, blood bank, microbiology, and chemistry) exceeded not only the national average in these subject areas, but also the cumulative overall score. This suggests that the Old Dominion University MLT/CLT to MT/CLS Program, delivered in this innovative format, is effective. Further research needs to be conducted in order to examine the cost/benefit of this type of program as well as other delivery formats.

Educating Medical Students: It's Not Always "THE LAB'S FAULT!"

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Clinical laboratory scientists (CLSs) often complain that other healthcare providers, in particular physicians, do not recognize our educational level and underutilize our expertise. In addition, clinicians have little or no knowledge of the effects of pre-analytical errors, especially those resulting from improper specimen collection. As a result, when laboratory values do not match clinical diagnosis – it's the lab's fault! This project, directed by the Clinical Laboratory Science Program faculty, was part of a medical school course for students entering their junior year. We integrated phlebotomy, clinical data, and laboratory data to expose medical students to the value of laboratory data and the expertise of CLS. The class was divided into five groups, each of which met for a half day – one-half of the time was spent in small work groups, the remainder in phlebotomy. Twelve scenarios were developed covering reflex testing and sources of pre-analytical error in

all laboratory disciplines. Each student group identified the problem in the scenario and determined which laboratory professional could be consulted regarding questions about test ordering or interpretation. Students then presented the results to other members of the class. CLS faculty moderated the sessions. CLS students assisted with venipuncture. Medical students took a pre- and post-test that measured knowledge of laboratory testing. The difference between means of the pre- and post-test was significant. Comparison of the means of the pre- and post-test showed a 30% improvement in scores. Session evaluations were favorable with many students suggesting additional time for the activities.

Fostering the Development of Expertise in Clinical Laboratory Scientists (CLSs)

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The development of expertise is a phenomenon that is little understood. Although there is a body of research that examines the characteristics of experts, and compares experts to novices, the literature on the actual transition process lacks depth. This research describes an investigation of the transition from novice to expert in the clinical laboratory science community of practice using a phenomenological approach. The sample selection process consisted of soliciting names of expert CLSs from the members of the Clinical Laboratory Managers Association. The potential participants were randomly selected from the submitted names and asked to participate in the study. Data were collected from 11 participants by semi-structured interviews. The constant comparative method was used to analyze the interview transcripts. Four factors were determined to be essential to the transition process: Self-directedness in learning, storytelling, mentors and mentoring, and reflection. In addition, the transition from novice to expert requires being part of a vital, robust community of practice. Recommendations for helping novices with this transition include establishing a mentoring program for students and new employees, encouraging storytelling among laboratory personnel, and providing tools that will encourage reflection. This research has the potential to impact the education and training of CLSs, the enculturation of novice CLSs into the profession's community of practice, and the development of expertise in CLSs.

Integrating Education of MT/CLS Students and CP Residents in a Single Course

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It is unusual for undergraduate MT/CLS students to have the opportunity to interact on an equal basis with clinical pathology (CP) residents. Pathology residents in the University of Washington Department of Laboratory Medicine begin their CP training with a three-month structured core course covering all areas of the clinical laboratory. The microbiology portion begins with eight laboratory sessions taught by an experienced clinical technologist or a microbiology post-doctoral fellow. Following this introduction, the residents join the MT Program clinical microbiology laboratory class for three to four weeks. Following the core, they rotate through the clinical labs, including at least six weeks in microbiology. Many residents have no clinical laboratory or microbiology background; although they don't need to develop technical expertise, working up the same specimens as the MT/CLS students, from plating to final report, helps them to understand the testing performed in microbiology. Interactions between MT/CLS students and residents help both groups recognize the critical role that each plays in healthcare, and appreciate the expertise and limitations of each groups' training. MT/CLS students assist residents with laboratory procedures and colony morphology. Residents bring human organs from the Department of Pathology teaching organ collection and give demonstrations reviewing normal and abnormal anatomy, especially as it applies to infection. In addition to providing an opportunity for interprofessional interactions, combining MT/CLS students and CP residents in the same microbiology course consolidates teaching workload, improves resource utilization, and provides an opportunity for MT program faculty to contribute to a larger educational mission.

Moving from Traditional to Online Delivery: Creating a Hemostasis Course That Promotes Student Participation

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University clinical laboratory science programs are moving in the direction of distance learning to make courses more accessible to students. While there are advantages and disadvantages to both classroom-based courses and online courses, most undergraduate students prefer classroom-

based lectures to online delivery. The challenge to educators is to design online courses that engage students, accommodate various learning styles, incorporate a variety of learning activities, and build in accountability and student participation. A hemostasis course is described in which course content is placed online, with classroom follow-up. Each week's lesson material is placed online in the form of lesson objectives, PowerPoint slides with lecture audio, a Microsoft Word handout with slides accompanied by written text of the lecture, and assignments and supplemental material. There is one classroom meeting each week, which consists of a short quiz on the online material, an interactive discussion (no lecture) of the more difficult concepts and implications from the lesson material, a question and answer (Q&A) session, and various group activities. Examples of group activities include impromptu group presentations of short topics, games, student bowl competition, a Protein C Pathway skit, and case discussions. Each student is assigned one module to narrate the audio portion of the online lesson from the instructor's scripted text, and to lead the classroom Q&A session on his/her topic. Student interest and feedback is positive, and will guide future development of the course. Exam scores have shown improvement in grades over the previous course offered in a more traditional format.

A Novel Consortium Model for Delivering Clinical Laboratory Programs to Rural Regions

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Workforce problems including severe shortages of clinical laboratory technicians (CLTs) in surrounding rural regions and shortages of histology technicians (HTs) in both rural and urban regions, coupled with a state mandated initiative ("Closing the Gaps") to increase student participation and success within higher education institutions in the State of Texas, prompted the Clinical Laboratory Science (CLS) Department at this institution to generate and investigate alternative program and curriculum models in order to address these problems. The chosen solution was to design a unique consortium model that represents a novel cooperation between the two-year and four-year higher education sectors, and is supported by a unique curriculum design that facilitates access and participation. Four key outcomes of the resulting consortium model are that it 1) delivers two high need laboratory science programs (CLT and HT) and thus contributes to the "Closing the Gaps" initiative in three of four key objective areas; 2) utilizes a large community college partnership base with established clinical affiliations to serve a large, predominantly rural geographic region and to maintain sufficient student numbers for program viability; 3) realizes cost efficiencies by capitalizing on an existing infrastructure of resources and expertise already in place to support CLS programs; and 4) facilitates laboratory science student articulation between professional levels. This novel consortium model may be applied to institutions nationwide that are facing similar problems with diminishing state funding, program viability concerns due to low student numbers, workforce shortages, and increasing demands for student access, participation, and success.

The Relationship of Proficiency Test Performance to Personnel Credentials of Laboratory Testing Personnel

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Performance on proficiency test (PT) surveys provides an objective and consistent evaluation of laboratory quality. The goal of the study, a retrospective review of existing PT results performed at Virginia Commonwealth University Health System laboratories, was to determine the relationship of PT performance to the personnel credentials of the laboratory testing personnel. Predictor variables included the practitioner's major area of study, degree, certification, and years of laboratory experience. The study group consisted of 185 testing personnel. There were 3389 proficiency-testing results of which 3306 were graded acceptable (97.6%), 36 were unacceptable (1.1%), and 47 were not graded (1.4%). For those results performed by a single practitioner (n = 3266), the core laboratory performed 3161 (96.8%) of the PT results with 30 unacceptable (0.95%) results. The satellite laboratories staffed by non-laboratorians performed 105 (3.2%) of the results and 6 (5.7%) were unacceptable. Logistic regression analysis of the full model, with all predictors included, showed statistical significance ($\chi^2 = 18.581$, $p = 0.010$, df = 7) for years of experience and level of educational degree. Individuals with less than two years experience were over five times more likely to produce an erroneous result when compared to those with 20 years of clinical experience. Study limitations included the use of a single institution and incomplete demographics for six testing personnel who were responsible for two (5.5%) of the unacceptable PT results. As the laboratory workforce shortage intensifies, the performance of laboratory personnel with limited years of clinical experience or those lacking an educational degree may be important.

The Use of Games to Review in a Clinical Microbiology Class

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A method of reviewing material prior to tests in clinical microbiology was desired that did not involve reteaching. To meet this objective, games were developed such as "You Make Me Sick", "You Grow On Me", "Jeopardy", "Who Wants to be a Microbiologist?", "Go Streaking", "Microbiology Team Competition", "Enterobacteriaceae Squares", and "BACT" (bingo). The games provided opportunities for students to review material in a non-threatening, interactive, sometimes competitive, and fun way. The use of games was an effective means of reviewing/reinforcing material as indicated by students' mean scores on the four exams (82.6, 84.7, 87, and 86.1). On an evaluation, 100% of students responded that they enjoyed playing games, the games were a beneficial way to review for tests, the games helped them learn important facts/concepts, and the games were relevant to exam questions. All the students liked team games better than individual games. The games that students felt were most helpful in preparing for exams and learning facts and concepts were "You Grow on Me", "You Make Me Sick", "Jeopardy", and "Who Wants to be a Microbiologist?". Students' written comments about using the games were very positive and included such statements as "The games helped me a lot," "I really liked the games. They were very helpful in preparing for exams," and "The games were very good review tools." Based on these results I will continue using these games and others in the microbiology class as well as in the immunology class that I teach.

TECHNOLOGY DEMONSTRATIONS

Demonstration of Microsoft Producer for the Development of High Quality Recorded Lectures Based on PowerPoint Presentations

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For the past three years, the Clinical Laboratory Sciences Department at Weber State University has offered both CLT and CLS degrees online. Presently, one third of the courses offered through the Department deliver course lectures to the online student on a CD. The CD is mailed directly to the student prior to the beginning of the semester, eliminating problems associated with streaming video delivered over the Internet. The lectures are created by first writing a script which is then recorded and synchronized to PowerPoint slides using a program called Microsoft Producer for PowerPoint 2003. This technology demonstration will involve two computers; the first to play various examples of recorded lectures, and the second to demonstrate the relatively simple steps involved in creating high quality recorded lectures using the Microsoft Producer software (available for free at www.microsoft.com). The results of a student survey will be available describing the popularity of the recorded lectures, the ease of use, and convenience for the online student.

Integrating Learning Objects into Clinical Microbiology Teaching Materials

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Time to produce educational content is a major concern when planning lessons for CLS/CLT students. Learning objects (LOs) are an approach to producing content in which the instructional material is broken down into 'bite size' chunks. These chunks can be independently created, maintained, reused, and pulled apart and then stuck back together into many different forms like Lego toys. LOs are a high quality technical resource for lectures, reviews, or tests that can be used to structure a lesson individually or strung together to create interactive content. LOs may include a combination of pictures, graphics, animation, video, audio, and text components. Because they are visual in nature, they are an asset for the development of lesson structure in both distance learning and computer-assisted learning environments. The use of LOs can reduce the preparation time for lectures, examinations, and remediation materials, freeing instructors to focus on other tasks. The University of Texas Medical Branch Clinical Laboratory Science Program partnering with the University of Nebraska Medical Center Division of Medical Technology received a Fund for Improvement for Postsecondary Education Grant to create LOs and disseminate them via an online repository. The current focus of this repository is microbiology and provides instructional content on biochemical reactions, organism identification, panel selection, and gram stain quality control. The accompanying technology demonstration will provide the actual LOs and demonstrate the sequencing of LOs to form a cohesive lesson.