Clinical Laboratory Educators Conference 2004 Abstracts

POSTER PRESENTATIONS

Authors listed in bold face type will be the presenters

Applications of an Online Course Management System to Provide Consistent Clinical Educational Experiences for Clinical Laboratory Science Students Assigned to a Diverse Set of Affiliate Sites

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As part of the three-year Reaching Across Borders Grant (RAB), the University of Nebraska Medical Center's (UNMC) Clinical Laboratory Science (CLS) Program will increase by five its number of clinical affiliates for a total of nine in Wyoming, South Dakota, and Nebraska. Of the 46 weeks of CLS education, students complete 35 weeks at their assigned clinical site. Challenges arise in providing a similar clinical educational experience for the student in the large hospital reference laboratory, the full-service rural hospital laboratory, and the private laboratory. In addition, due to the shortage of laboratory professionals, a decreasing and or unstable resource is the bench instructor's time in providing quality, one-on-one instruction. With staffing at a minimum, it is a challenge to provide similar educational experiences from week to week within one site, let alone across several sites. The UNMC CLS program utilizes the online course management system, Blackboard™, to streamline clinical education across sites and provide support to efficiently utilize the bench instructor's teaching time. Independent learning is supported with online instructional units complete with objectives; audio-enhanced PowerPoint™ mini-lectures; archived video-streamed classroom sessions; higher-level process-focused activities; and reviews and self-assessments providing an all-inclusive study guide to be coordinated with clinical experience. The asynchronous environment allows for flexibility for the laboratory, clinical instructor and the learner for improved time management. Evaluation of the online learning environment by student and instructor provides specific issues of focus for continued curriculum development and improvement, including asynchronous flexibility and format standardization of learning materials.

Assessment of Small Group Discussion of Cases Integrated into a Traditional Clinical Immunology Lecture Course

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Development of critical thinking skills should be one of the essential goals of a clinical laboratory science curriculum. In the context of clinical immunology, critical thinking may entail assessing possible biologic false positive results, interpreting cross-reactivity that is inherent in many serological tests, and assessing the clinical significance of antigen-specific IgM and IgG in patient samples, among other interpretive challenges. However, teaching critical thinking can be a challenge to educators. The use of case studies presented to students in small groups has been widely accepted as a method for developing critical thinking skills. However, careful assessment of the effectiveness of case studies has been limited. In addition, we predicted that the case studies may also provide other secondary educational benefits such as increased class attendance, increased student motivation, improved student performance on examinations, and higher scores for overall student satisfaction with the course compared to lecture-only instruction. Each of these possible outcomes will be critically assessed and presented. In addition, a sample case study will also be presented, including student answers generated during the exercise. Finally, instructor experiences with group composition will also be presented.

Barriers to Successful Completion of Clinical Laboratory Science and Clinical Laboratory Technician Programs

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The United States is currently experiencing a clinical laboratory scientist (CLS) and clinical laboratory technician (CLT) shortage that is also reflected in the State of Mississippi. According to the Bureau of Labor Statistics, shortages are compounded by fewer CLS/CLT graduates than needed to fill increased numbers of open positions, coupled with imminent

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retirement for many practitioners in the current workforce. In addition to these factors, demands of CLS/CLT educational programs and financial difficulties have an effect on student enrollment. The purpose of this study is two-fold: 1) to collect data regarding barriers to successful completion of CLS/CLT education, and 2) to begin a process of obtaining funding for student scholarships that will serve to increase retention of students with barriers. Surveys for students and faculty were sent to all four CLS and six CLT programs in the state. Participants in the survey included 130 students, 87 CLT/ 43 CLS, and 41 faculty, 14 CLT/27 CLS. Some key areas of interest targeted the rate of preparedness and skills upon entry, recommendation of courses and skills needed prior to entry, study and clinical time, current job related activities, family obligations, plans for remaining in the local area, and barriers to successful completion of programs. The most frequently reported barriers were: lack of financial support, family issues, demands on student within the program, and the lack of ability to balance family, children, and school. This study will detail findings from faculty and student perceptions of academic needs and educational barriers that impact successful completion of CLS/CLT programs.

Clinical Correlations: A Course Designed to Interconnect Clinical Laboratory Science

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It is often difficult for CLS students to integrate discipline-specific clinical and technical knowledge, as well as education, management, and research skills. We developed a course, Clinical Correlations, at the University of Alabama at Birmingham to provide opportunities to integrate this knowledge, as well as enhance problem-solving, teamwork, written communication, and oral presentation skills. The course uses a problem-based learning approach, with progressive disclosure of case information and correlation of multidiscipline laboratory testing. Teams of three to four students interpret initial clinical and laboratory information and define a preliminary course of action to investigate the case. Students research the problem, determine the laboratory data and activities needed to resolve the case, and obtain additional information as needed to evaluate and reach their conclusions. Instructor-generated questions are provided to guide the students in interpreting and correlating the information throughout the process. Each team provides an oral illustrated presentation of their case to the class, including the pathogenesis and epidemiology of the condition, the clinical symptoms, treatment, and prognosis, a detailed description of laboratory diagnostic tests and interpretation, and a question-and-answer session. A written report is also submitted. Students' abilities to integrate and correlate information are evaluated through oral presentations and written responses to questions. Problem-solving and other process skills are evaluated using rubrics for rating oral presentations and contributions to the group. Achievement of course goals has been demonstrated by above average student grades and instructor and student evaluations of student progress throughout the course.

Clinical Laboratory Science Curriculum: A Method for Introduction of Cultural Competency

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Allied health professionals work under the auspices of normative ethical theory found interwoven into medical practice guidelines built on utilitarian beliefs. These medical practice guidelines are changing, and in an attempt to give quality care with compassion, it is necessary to assess cultural beliefs and/or behavior that affect diagnostic testing and/or treatment. Realizing the impact of cultural competency on medicine, medical and nursing education curricula have already begun to incorporate cultural competency issues. The technically competent CLS student without an introduction to cultural competency is potentially limited in his/her ability to be a full participant in this changing healthcare system. The purpose of this study was to determine the 'best fit' for such issues in the curricula for CLS students.

Methods: A problem directed instructional approach was designed. Students worked in a group format, completing a cultural competency related case study that was presented using a multimedia presentation.

Results: After completion of the case study, all students expressed an increase in their comfort level in addressing cultural competency issues. All students indicated post-professional practice was the optimal placement for this experience.

Conclusion: Knowledge and practice gained through inclusion of cultural competency issues allow CLS students to feel more comfortable in their healthcare role. In order to include students' clinical experiences, implementation of this model during professional practice or immediately following the professional practice experience was identified as best fit for this experience.

Comparing Frequency of Tasks Performed by Entry Level Medical Technologists with Program Directors' and Laboratory Managers' Perception of Tasks That Are Essential at Career Entry

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The tasks performed by medical technologists (MTs) with one year or less of work experience were examined for frequency and essentiality. The tasks were a subset of a practice analysis for laboratory professionals originally mailed in January and September 2002. The practice analysis was performed for MTs of all levels and types of experience. Those MTs surveyed were asked to rate how frequently they performed various tasks within the laboratory setting where they were employed. A separate survey was sent to MT program directors (PDs) and laboratory managers (LMs) in September 2002. The PDs and LMs were asked to indicate how essential the task was for an MT. A task is considered essential if an MT with one year or less of experience, is able to perform these tasks, independently. The frequency survey was sent to 7,011 MTs. Of those who responded, 286 (19%) had one year or less of working experience. The survey asking about essentiality was sent to 6,355 PDs and LMs; 995 (16%) responded. These comparisons show that many of the tasks ranked as frequent by the MTs, were also considered to be essential by the PDs and LMs. Those tasks indicated to be performed infrequently by the MTs, were also considered not as essential by the PDs and LMs. The responses of the PDs and LMs also correlated strongly positive. Agreement between the three groups, MTs, PDs, and LMs showed that they each have the same understanding of the tasks that are essential at entry into the field.

Comparison of Medical Terminology Class Academic Performance with or without an Online Blackboard™ Component

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The purpose of this project was to create an online component to supplement a face-to-face medical terminology course, and compare the academic performance and evaluation of students who had access to the additional resources with those who did not. PowerPoint™ lectures were created with audio clips inserted. These were linked to Blackboard™, an e-Education platform for course delivery. Class 1 (n = 47) without the Blackboard component was compared to the Class 2 (n = 42) with lectures on Blackboard. A significant drop in exam scores was seen for Class 2 compared to Class 1 (p <0.006). Class 3 (n = 34) without Blackboard and Class 4 (n = 60) with both lectures and most assignments available on Blackboard were compared. A significant increase in test scores was seen for Class 4 when compared to Class 3 (p <0.014) and to Class 2 (p <0.05). In addition, student evaluation of the Blackboard components was surveyed. For Class 2: 21 of 42 students responded to the survey and 12 of these 21 students reported using Blackboard. Most used it for convenience and more complete lecture notes. For Class 4: 40 out of 60 students responded to the survey and 38 of these 40 used Blackboard. As reasons for using Blackboard, most students reported that it was convenient (30/38) and that they missed classes (15/38). In conclusion, classes liked the convenience of having Blackboard resources for course materials but they performed better when all course documents were available, including assignments.

Cultural Competency for Clinical Laboratory Science Students

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The University of Nebraska Medical Center Division of Medical Technology/Clinical Laboratory Science designed, produced, and delivered three courses in Cultural Competency for clinical laboratory science (CLS) students and practitioners. Increasingly, CLS students encounter diverse populations in caring for patients and in working in healthcare teams. Phlebotomy is an example of the need for CLS students to communicate with and show respect for individuals from diverse backgrounds. The courses include Cultural Competency for the Allied Health Professional, a 4-videotape series with Web-based discussion, on basic concepts of building cultural competence; Clinical Case Conferences which features case studies of diseases found in high incidence in minority populations; and Community Healthcare Challenges, a 4-videotape series of interviews with minority practitioners and patients, that highlights issues including communication, navigating the American healthcare system, spirituality, and chronic diseases. For Community Healthcare Challenges, 'Lunch 'n Learn' sessions were conducted during which CLS students observed video interviews with practitioners and patients, followed by discussion of situations in which CLS students might have experience. More than 635 students and practitioners have participated in these courses. Of CLS participants, 91% rated the course as relevant to their work. With the rapid changing of patient demographics, it is essential that CLS curriculum includes cultural competence. This project was part of a Health Care Education Partners (HCEP) Grant funded by the United States Department of Health and Human Services through the Health and Human Services Resources Administration Allied Health Special Project Grants (#1 D37 AH 00697 01).

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Defining Research Design/Practice Competencies for Entry-Level CLS

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NAACLS standards include the preparation of graduates to evaluate published studies based on basic knowledge, skills, and relevant experiences. A standardized approach for assessing the quality of published diagnostic assay evaluations is not currently available. The aim of this project was to review current resources to improve an instructional tool for the evaluation of published comparison study reports. Resources describing diagnostic assay accuracy studies, minimum standards and guidelines related to clinical laboratory operations, certification agency materials, basic research designs, performance assessment methods, evidence-based laboratory medicine materials, the Standards for Reporting of Diagnostic Accuracy (STARD) initiative, and the Consolidated Standards of Reporting Trials (CONSORT) statement were reviewed. Key domains for rating the quality of individual articles and criteria for determining the validity of diagnostic assay accuracy studies were identified. Instructional tools must include knowledge and skill competencies such as elements of appropriate study designs, identification of bias sources, design flaws, clinical utility characteristics, statistical methods, and standards for the reporting of assay accuracy studies. Instructional tools must be structured to analyze the elements of empirical research reports and address evidence-based laboratory medicine and patient safety guidelines. This project identified research design and analysis competencies that were used to revise an instructional tool. The revised tool addresses cognitive, psychomotor, and affective objectives at the awareness and performance levels for student development. This critical analysis tool is the basis of written summaries and recommendations summarizing the clinical usefulness of published information about the assessment of new technologies for laboratory medicine services.

Enhancing High School Teacher and Student Awareness of the Clinical Laboratory Science Profession

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A variety of recruitment approaches is needed to introduce pre-college students to the profession of clinical laboratory science (CLS). This recruitment pilot project is funded by grant moneys from PacifiCorp Foundation for Learning and Associated Regional and University Pathologists (ARUP). It addresses the statewide need in Utah for educating high school students about the profession of CLS, with the hope of recruiting some into the education programs throughout the state. With this pilot project, lectures and laboratory sessions on topics in CLS were developed for Utah high school science teachers to experience in a workshop format and then take back to their classrooms and incorporate into their curricula. Twelve science teachers were selected to participate in the one day workshop at the University of Utah School of Medicine. Workshop activities centered around a case study and disease diagnosis. The workshop also introduced teachers to the CLS profession. Teachers received lecture syllabi, worksheets, summary questions, and directions for hands-on activities, as well as an 'activity kit' with all reagents and materials necessary to conduct each hands-on activity. Evaluation of the project is on-going and includes pre and post tests, written evaluation of the workshop by teachers, and on-site evaluation at high schools as the material is presented to the students. The teachers scores on the pre and post tests showed a significant difference (mean of pre test = 63; mean of post test = 83). Teacher evaluations of the workshop showed five statements received 'strongly agree' (100%) and seven other statements were 'strongly agree' (92%). Teacher-written comments included, "Content was extremely relevant and will be useful in advising our students on this highly interesting career opportunity." The teachers enthusiastically endorsed the workshop and asked for more in the future. Student evaluations will be done from January – April. It is estimated that as many as 2,000 high school students will learn about the profession of CLS this coming year as a result of the grant.

HIPAA Training for Students in a University-Based CLS Program

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As part of their mandatory orientation prior to clinical rotations, students at the University at Buffalo partake in a training session regarding regulations mandated by the Health Insurance Portability and Accountability Act (HIPAA). A HIPAA Compliance Committee was formed in the wake of the passage of this act to assure adherence to all regulations in the classroom, laboratory, and research. The department of Biotechnical and Clinical Laboratory Sciences at the University at Buffalo is not considered a covered entity under HIPAA regulations since it does not generate and transmit patient laboratory results. However, patient cases are often discussed

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in didactic courses and patient samples are obtained for laboratory courses and research. The clinical affiliation sites that train students are covered entities under HIPAA regulations and must ensure that students are familiar with privacy regulations concerning protected health information. As a service to the clinical sites, the departmental HIPAA compliance officer provides a training session for students prior to commencing their clinical training. Students are given an overview of HIPAA legislation, definitions of legal terms, rationale of the privacy, transaction code sets, identifiers and security regulations, and consequences of non-compliance. The application of HIPAA regulations in academic, clinical, and research settings is included in the training. After the presentation, student scenarios are discussed using potential situations when a patient's individually identifiable health information may require HIPAA compliance. Following the training session, students are asked to sign statements of non-disclosure in which they agree to keep confidential any patient information that they have access to during the clinical rotations. The original document is kept on file at the University and copies of these statements are forwarded to the clinical site coordinator. The effectiveness of this program was discussed during clinical site visits and clinical faculty meetings. The clinical faculty felt that the students were well versed in the HIPAA privacy regulations and this reduced the amount of training time needed at the affiliations.

Predictors of Service Behaviors by Clinical Laboratory Scientists

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Hospital-based clinical laboratories require organizational citizenship behaviors to achieve service excellence. Such behaviors are defined as all positive organizational relevant behaviors by individuals and as one element of work performance in system-based organizations. These service quality behaviors have not been reported for clinical laboratory scientists. This empirical study examined individual factors (continuous quality improvement principles knowledge and empowerment) and a system factor (perceived organizational support) as predictors of citizenship behaviors. Obedience, participation, and loyalty were measured for 404 certified technologists/scientists working in 28 hospital-based clinical laboratories. The hypotheses tested these relationships: Higher levels of continuous quality improvement knowledge, empowerment, and perceived organizational support will be associated with higher levels of obedience, participation, and loyalty. Hierarchical regression analysis showed perceived organizational support contributed 4.5% unique variance to participation dependent on tenure type. Empowerment was a significant contributor to participation and obedience. Practitioner competence and degree of perceived impact on work related activities and outcomes were significant predictors of participation behaviors. Continuous quality improvement knowledge was not a significant predictor for any of the three dependent variables. The predictor variables in this study explained 15% variance in citizenship behaviors by participants. Service quality behaviors by the participants were more likely determined by system variables rather than individual variables. Service quality competencies and management practices that enhance or inhibit an individual's work performance should be included in didactic and clinical learning experiences for technologists.

Preparing Students for Scientific Research Presentations

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The problem addressed in this study was how to teach medical technology students to present their research successfully. The overall goal was to introduce the students to both oral and written presentations of applied chemistry research. Criteria for the research problem included: 1) it must include the student's own research results, 2) it must introduce the student to a significant body of first source medical/scientific literature and teach the student how to evaluate that literature, 3) it must culminate in an oral presentation at a regional or national meeting, and 4) it must culminate in a written document which meets university standards for theses and/or a publishable peer review paper. Literature sources, writing and speaking tips, methods of evaluation of scientific hypotheses, design, data, and conclusions are discussed. The students' work resulted in eight papers (six national, two regional), three senior honors theses, 20 presentations with abstracts (seven national, 13 regional), and five student awards (two national, three regional) thus meeting all goals. Since their graduation, all (11) of the students have successfully worked in medical technology laboratories. Three are laboratory directors, one is a medical technology instructor, and one is a laboratory supervisor. It was concluded that experience in presenting scientific research proved successful, expanding the students' educational experience beyond the classroom and laboratory, providing the students an opportunity to participate in conferences, and enhancing the students' sense of honor for the CLS profession.

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Statistics: Transfer of Knowledge to Application

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Students often have difficulty applying the knowledge and skills that they gain in college statistics courses to the requirements of statistical analysis in practice as clinical laboratory scientists (CLSs). This session presents an educational approach for meeting this challenge. The authors have developed a learning module that provides detailed examples of the use of statistics in the clinical laboratory. Separate lessons cover topics in frequency, distribution, range, correlation, variation, and significant difference. For instance, the results of an evaluation for a new method in clinical chemistry are presented, in which calculations of the statistical analysis of the data are shown and, then, the use of the analysis to make decisions about the new methodology is provided. Following completion of the example, students are presented with practice scenarios for each topic. Through analysis of the scenarios, students practice using statistics in real world situations in the clinical laboratory. The modules have been presented to traditional CLS students, clinical laboratory technician-to-clinical laboratory scientist articulation students, and CLS graduate students. Students report through survey that the module helps prepare them for use of statistical analysis in a clinical setting. The module is presented in CD format so that students may refer to examples in clinical rotation practice. The authors conclude that the use of the learning module benefits the student in clinical practice.

A Student-tested Process for Textbook Selection

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A process was undertaken to identify textbook features of value to students and to use them in the selection of a hematology textbook for clinical laboratory science (CLS) students. Five student volunteers from a university-based baccalaureate program were recruited to participate in a focus group process to develop a rating form for use in evaluating textbooks for adoption. The rated areas included diagrams, photos, writing, organizing features like headings, special features like glossaries and practice questions, the index, and construction. The students then read selected chapters in candidate hematology textbooks and rated them using the form. Their ratings were summarized and used to select the textbook for use in a hematology course for CLS students. The textbook selected in this fashion was determined by student course evaluations to be far more readable and useful than the faculty-selected text used previously. The factors students considered to be important such as having a glossary, color photos and diagrams, readable text, can be applied to the selection of other textbooks by faculty evaluation alone. Other faculty may choose to conduct a similar process to develop a list of criteria of importance to their students. Textbook authors and publishers may wish to use a similar process in designing textbooks.

Using Students as Educational Research Subjects

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Many clinical laboratory science (CLS) educators are involved with educational research, which frequently involves data, such as students' opinions, information from student records, or information about student performance before and after a curriculum change. This kind of research may be subject to Federal human subjects regulations and Institutional Review Board (IRB) oversight. CLS educators may not be aware of the federal regulations, controversies over application of these regulations to educational research, and possible exemptions that may apply to educational research. Based on literature review and discussion with IRB representatives, this poster will describe the regulations and the ways they may be applied to educational research. The regulations are contained in Title 45 Code of Federal Regulations, Part 46, which lists a series of educational exemptions that apply to activities that are 'normal educational practice'. However this exemption requires interpretation based on the intent of the activity (research vs. program review), and the voluntariness of participation. Voluntariness is important if the researcher gathering data is the same individual who will assign student grades and possibly write letters of recommendation. Confidentiality of student records may also require oversight, even if all data is gathered without identifiers. Exemptions that can be used to streamline the process include expedited review, which requires less paperwork and has a faster turn-around-time, and waiver of consent. In conclusion, CLS educators performing educational research must be aware of how their IRB interprets Federal human subjects regulations and exemptions in order to avoid controversies.

Young Scholar Program - Professional Visibility

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To promote 'behind the scenes' medical careers such as clinical laboratory science (CLS), faculty at Marquette University instituted a Young Scholar Program (YSP) in 1986. Targeted for high school juniors and seniors, the course incorporates the diagnosis of diabetes and its complications to show the diversity of the clinical laboratory. The one credit course is held three consecutive Saturdays in November from 9:00 a.m. until 3:00 p.m. The first day is devoted to clinical chemistry and urinalysis. The hematological aspects of diabetes are presented the second day followed by microbiological aspects on the final day. Program announcements are sent to high school science teachers and prospective students within a two-hour driving distance to the Marquette campus. A nominal fee ($40) is charged to assure any student regardless of financial circumstances could attend. To date, 709 students have completed the course. Comparison of pretest results (raw mean = 12.96, s = 2.72) and post test results (raw mean = 18.16, s = 1.67) are significant at the *p* .01 level indicating significant learning occurs. Course evaluations have been positive and the program has been influential in students' career choices according to 62% of the respondents. The YSP has increased CLS enrollment at Marquette, of which 10% to 25% are former YSP students. Publicity about the Program has made high school counselors, science teachers and students more aware of career options in the diagnostic laboratory.

TECHNOLOGY DEMONSTRATION ABSTRACTS

Development of a Novel and Inexpensive Student-Centered Laboratory Information System for Medical Laboratory Science (MLS) Students

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Today, hospital laboratories utilize 'laboratory information systems' (LIS) extensively. After discussions with our clinical sites, we felt many students were leaving MLS programs without critical laboratory computer experience. And reasonably priced LIS systems were unavailable. With a small education grant, we purchased five computers and the expertise of a computer science student to write an LIS to address our needs. Our design has three kinds of users: administrator, students, and instructors, each with unique login names and password access. A circular data flow allows the instructor to post case assignments to student email. The student logs in and inspects the test request form for the case. Then he/she will perform the test(s) and submit results, which will be sent back to the faculty for a grade. Additionally, the student can access additional patient results for their case to confirm the 'correctness' of their results before submission, similar to delta checks. The use of free software: Debian GNU/Linux Stable, along with a MySQL database keeps the cost minimal. The front end is in Web format, served by Apache and PHP. Assessed with pre and post surveys, students have reported increased confidence (50%) after using the student developed LIS before going to clinical rotations. Clinical sites surveys are in the process of being evaluated. With the utilization of this simulated LIS, the student ultimately benefits. He/she utilizes critical thinking, associates results in all areas of the lab with a particular diagnosis, and develops additional computer skills that will aid in proper and timely reporting of results in the clinical setting.

Learning Objects in Microbiology: A New Resource

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The variety of models that exist in clinical laboratory science education creates a challenge for collaborative efforts between programs. Although the idea of sharing resources seems reasonable, design for effective implementation in a variety of settings can make the task seem overwhelming. Course scheduling becomes difficult for programs interested in sharing courses and faculty resources. This technology demonstration will show the use of a new type of computer-based instruction called Learning Objects (LOs) for teaching clinical microbiology. The principle of LOs is grounded in the object-oriented paradigm of computer science. Object-orientation highly values the creation of components (called 'objects') that can be reused in multiple contexts. The fundamental idea behind LOs is the creation of instructional components that can be reused numerous times in different learning contexts. In addition, these LOs can be delivered over the Internet and can be accessed by a number of individuals simultaneously, with minimal effort, reducing the need for instructors to develop their own instructional components. Instead they could use objects developed by others, bypassing the step of breaking down lessons developed by others in order to repackage in their own lesson format. This will allow for increased speed and efficiency of instructional development and decrease faculty preparation time. A Web-based resource center for faculty access to these learning objects has been established and will be demonstrated during this session. Individuals will be offered the opportunity to 'try out' and critique the LOs for their accuracy, clarity, interactivity, durability, and replicability.

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