

# TechnoFair and Expo: Abstracts of Presentations and Demonstrations

The following abstracts were peer-reviewed by members of the Section on Dental Informatics following established criteria.

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## Tech Tracks

### Multimedia Utilization

#### M1. Using Virtual Computer Models for Operative Dentistry

Robert G. Rashid, The Ohio State University; Joshua Merrill, The Ohio State University; Mary Cliett, The Ohio State University; Pooja Misra, The Ohio State University; Christopher Gamble, The Ohio State University; Lindsay Pabst, The Ohio State University

Operative dentistry teaching combines both didactic and laboratory instruction. An important part of the understanding of the different techniques in both lecture and laboratory is a model of the preparation being discussed. When the instructors can assure themselves that students are viewing the same part of the preparation as they are, then communication is more reliable. The use of computer-based three-dimensional models allows faculty to show different views of operative preparations in the lecture hall and laboratory and change that view to illustrate steps of the preparation or answer questions raised by the students. Toward that end, the development of three-dimensional computer models has been addressed in this project, with the deployment in various media all from a common set of images. One preparation, or multiple steps in the same preparation, can be imaged, merged, and developed into a single computer 3-D model. This model, essentially a learning asset, can be enhanced with additional information, both for evaluation and student direction. Finally, this learning object can be used in lecture presentations and websites, available for students to further explore. The goal of this presentation will be to illustrate the tools and procedures used to create web pages and presentations with interactive three-dimensional models of operative dental preparations. Each of the steps will be illustrated, along with the tools used (and alternatives in some cases). Two very specific models of outcomes will be illustrated: one model of a final preparation in a typodont tooth that can be viewed from many angles, and a second of the different stages of the same preparation, viewed from one rotational angle. Examples of the different stages of development can be found at [www.dent.ohio-state.edu/operativedent/vr](http://www.dent.ohio-state.edu/operativedent/vr). An important aspect of the protocol is the ability to image any tooth as necessary. Once the tooth is imaged, the procedure for adding information to create the learning object and the procedure for embedding into web pages and PowerPoint presentations is the same. This allows customization of instructional material by photographing specific teeth, while maintaining simplicity in development, using the same tools and procedures to add information to the custom 3-D tooth image. At this stage, the process has been determined and a number of tooth preparations have been imaged as 3-D models, along with the addition of evaluation text. The process of embedding into web pages has been streamlined. This presentation will demonstrate the steps of the procedures and discuss hardware and software requirements along with the discussion of alternative applications (dental anatomy, for example) for the process. At the presentation a demonstration CD will be shown with the steps

and examples; a website with examples and links for software will also be shown.

*Table-top demonstration also available in the Expo.*

#### M2. Enhancing Dental Education Through 3D Modeling and Animation

Jared R. Gianquinto, Temple University; Francis C. Mecadon, Temple University; Kenneth Boberick, Temple University; Leslie M. Salkin, Temple University; Howard B. Gross, University of Detroit Mercy; John V. Esposito, Temple University

Multimedia presentations have become a mainstay of dental education. Video, while a ubiquitous medium in both digital and analog formats, can present significant technical challenges and physical impossibilities when illustrating complex or abstract concepts and procedures. Many of these obstacles can be overcome through 3D modeling and animation. Given recent advancements in computer processing power and improvements in modeling software, production of professional quality 3D animations and interactive models are within the economic and technical reach of educational institutions. With the increasing use of online media as an alternative to traditional text and subsequent increase in computer knowledge throughout the educational community, 3D modeling and animation are now a logical and feasible evolution in curricular enhancement. Current applications in the areas of operative dentistry, endodontics, and periodontics will be presented detailing the required resources and production cycle necessary to create 3D models and animations. These highly visual, interactive electronic media can be produced in a cost-effective and timely manner. Through their use, these media should help students develop those areas of learning requiring expanded conceptual understanding such as cavity design, discrimination learning, and procedural critique in a self-directed, self-paced learning environment.

*Table-top demonstration also available in the Expo.*

#### M3. Interactive Electronic Faculty Standardization in Prosthodontics

Leila Jahangiri, New York University; Daryl Styner, New York University

Faculty and students often criticize lack of faculty standardization in teaching concepts and techniques in undergraduate dental curriculum. The interdisciplinary approach in teaching dentistry, as well as introduction of new procedures and techniques, demands a wider range of faculty responsibility than in the past. It is therefore recognized that faculty standardization and development are essential for optimal care of patients and teaching of up-to-date techniques. The software program, Macromedia Director, was selected as a platform for program development and delivery of material. This program allows faculty to review and learn new and old procedures in their own time, followed by participation in an interactive self-assessment. The program allows for uniform delivery to all faculty, for the tracking of participation through a log-in, log-out system and enables the department to perform item analysis of faculty input, interactivity, and identify areas of weakness. Although short and long-term outcomes are not yet evaluated, it is evident that this method of faculty standardization has certain benefits including a uniform delivery of contents, availability as a teaching tool for students, and an easy mechanism for updating teaching contents.

*Table-top demonstration also available in the Expo.*

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#### **M4. Utilizing Computer 3D Models for Classification of Complete Edentulism**

Toni T. Neumeier, University of Alabama at Birmingham; Katie R. Ball, University of Alabama at Birmingham

The American College of Prosthodontists (ACP) established a diagnostic classification of complete edentulism in 1994: "The diagnostic criteria are ordered by their objective nature and not in their rank of significance. Objective criteria will allow for the most accurate application of the classification system and measurement of its efficiency. Objectivity will also provide reliable outcome data and mechanisms for the review by the administrative panels." A 3-D computer generated e-model was designed to aid in the achievement of the previously stated objectives. Four edentulous patients were selected according to the ACP classification I through IV system, and their denture treatment was completed by the faculty. A duplication of each patient's edentulous arches and newly fabricated complete dentures was made with Microstone (WhipMix). Aquasil (DENTSPLY) heavy body putty impression material was used to record the patient's jaw relation using WhipMix semi-adjustable articulators for mounting. Bite registrations were trimmed and verified with only alveolar ridge contact between maxillary and mandibular arches. Casts and bite registrations were marked and sent to GeoDigm Company for scanning the models and creating 3-D emodels of the edentulous arches and complete dentures. The e-model information was received through Internet service. After evaluating the accuracy of the emodels, they were incorporated into a PowerPoint presentation according to the classification established by the ACP. All of the above information was recorded on a compact disc and given to the faculty and students for evaluation.

*Table-top demonstration also available in the Expo.*

#### **M5. A Multimedia Tutorial for the Anatomy of Oral Local Anesthesia**

Pamela A. Stein, University of Kentucky; Jennifer Brueckner, University of Kentucky; John Mink, University of Kentucky

Learning the art and science of successfully delivering local anesthesia is critical in the practice of dentistry. It requires a solid understanding of the anatomy of the head, including neuroanatomy, vascular anatomy, muscles, and bony landmarks. Traditionally, gross anatomy and/or head and neck anatomy is taught in the first year of dental school, and local anesthesia is taught in the second year. It would seem prudent, therefore, to provide dental students with a review of relevant anatomy right before or during their course in local anesthesia. To meet this need, we have developed a multimedia tutorial, "The Anatomy of Oral Local Anesthesia," using Macromedia Director 8.5. A national survey of dental professors directing courses in local anesthesia confirms the need for such a tool. This program demonstrates injections, specifically needle placement, on both cadavers and dry skulls. The tutorial uses still, labeled photographs with accompanying text as well as narrated videos. The target branch of the trigeminal nerve is demonstrated on cadaveric specimens, and a review of the branches follows. Surrounding structures, such as the pterygoid plexus, parotid gland, and facial nerves, are shown to demonstrate potential complications of a misplaced injection. This tutorial is designed to improve the student dentist's preparation for their local anesthesia course and ultimately enhance their ability to successfully anesthetize patients. This tutorial will improve the student dentist's preparation for coursework and clinical experiences in oral local anesthesia and thereby enhance their ability to successfully anesthetize patients.

#### **M6. Integrating Streaming Video into an Online Restorative Dentistry Technique Course**

Kenneth Boberick, Temple University

Videos were captured from HI-8 and VHS tapes using a video capture card (Radeon AIW 8500DV), edited using Pinnacle Studio 8.0, and rendered as windows media files (wmv) for online delivery. Current technology forces streaming video developers to choose between image quality and accessibility to remote users. In this project, access was guaranteed using the university intranet; therefore, image quality was more important than accessibility. High-quality videos rendered at 1500 Kbs were integrated as hyperlinks into PowerPoint presentations and an online laboratory manual and were made available for viewing over the university intranet. Regarding the streaming video, 99 percent of the students found the quality adequate to excellent. Regarding Internet connections and video viewing, 59 percent of students successfully viewed the videos from a remote site. Cable connections were most reliable, dial-up connections inadequate, and DSL connections variable. Multiple bit rate rendering (xDSL) may provide the best accessibility; however, quality compromises may be unacceptable. Seventy-three percent of students felt the videos were an effective substitute for in-class demonstrations. Fifty-five percent of the students reported owning a laptop, and 72 percent indicated they would consider bringing their laptop to lab if wireless Internet was available. Acceptable wireless connectivity was tested and is possible in the preclinic laboratory. The availability of wireless intranet in the lab would greatly increase the potential for student driven self-paced learning. The results showed it is possible to develop and deliver high-quality streaming video in a preclinic restorative technique lab using a university intranet connection. Remote access to videos varied depending on file size and connection speed. Developing wireless connectivity in the laboratory would greatly increase the potential for student-driven self-paced learning. Student response to the video project was very favorable.

*Table-top demonstration also available in the Expo.*

### **Technology Integration**

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#### **T1. Creation of a Dental Electronic Case Study Library and Authoring Tool: An Internet Case-Based Educational Resource**

Michelle A. Robinson, Marquette University; Gary F. Guest, University of Texas Health Science Center at San Antonio

Dentistry, like the other health professions, is being forced to deal with ever-increasing and ever-changing streams of information, and dental educators are subsequently being forced to prepare students not only with information, but also with how best to manage it. If dental educational programs are to become more efficient, they must consider more active learning strategies such as integrating problem-based scenarios and evidence-based health care in a manner that stimulates development of critical thinking skills. Dental educators must find new mechanisms for distributing and managing their information; in order to do this, information technology resources and skills must be incorporated more routinely into the educational setting. One of the possible mechanisms for integrating computer-based resources in the support of active learning strategies is the development of digital clinical problem-based scenarios and cases. An impediment for many faculty in creating and using clinical cases is the lack of an effective and intuitive authoring tool. The Section on Dental Informatics of the American Dental Education Association has proposed to develop the first version of an Internet-based tool

that could be used by faculty from ADEA member institutions to enhance their ability to incorporate clinical cases in their teaching activities. To accomplish the project, a web-based client/server application will be created to allow users to create, search, and view dental cases online. The production system will have web interface utilizing Apache and PHP connecting to an Oracle 9i database both running on UNIX servers. A proof of concept prototype has been successfully created. A number of completed and archived cases (10-12) will be available to users when they first log in to the program. Each user will have an account managed by the project administrator. The user will select a unique user name and password to access the account. Users can view an existing archived case or create their own cases including patient information and digital images. The program guides users through the process of uploading their case information. The user can choose from existing case types with pre-defined sections that are dynamically generated based on the content they choose or design an original case structure with customized sections. Once all information has been entered and verified, the user can submit the case for publication on the website. The site allows for viewing of published cases by defined user groups or for "global" viewing, which allows faculty to share cases across institutions. All cases are indexed and searchable. During case construction, users are prompted to input information such as case title, author, disciplines involved, and standardized keywords such as those used in the National Library of Medicine's Mesh Terms. These fields are all indexed to allow for advanced case searching. The cases will be stored within a database on a central server that is maintained with the user accounts, thus establishing an electronic library of cases for dental education. This is a two-year funded project with a completion date in Fall 2006. The beta program is currently being demonstrated and will be tested with selected schools over the final project year. The tool will be made freely available to ADEA member schools to create an "e-case consortium." A small subscription fee will cover service, technical support, maintenance, and upgrades after the grant period. Several upgrades are planned, and the project team will be responsive to suggestions of faculty in order to nurture and improve the program on a long-term basis.

### **T2. Institutional Collaboration Toward an Instrument Atlas for D.D.S. Students**

Melissa J. Miszkiewicz, University at Buffalo; Jennifer A. Bauer, University at Buffalo

After developing a strategic plan, the University at Buffalo School of Dental Medicine implemented an electronic curriculum in the fall of 2000. The centerpiece of the e-Curriculum was the curriculum DVD developed in collaboration with Vital Source Technologies (Raleigh, NC). Since then, the school has implemented and expanded a campus-wide wireless network and an electronic clinic management system and established a digital media center to assist faculty in producing websites and instructional video to enhance preclinic and clinic instruction. The university has also implemented and expanded electronic course delivery tools, technology (including wireless) classrooms, online databases, and other resources through the libraries. Student academic advisory groups were established for each class, facilitating student input into the process and from which came the suggestion for an atlas of commonly used dental instruments. The atlas, developed largely in Macromedia Flash with digital pictures, drew on the school's in-house resources including faculty. Through this collaborative process a tool for students was created. This tabletop demonstration and poster will outline the collaborative process, its phases and demonstrate the tool as it exists today. Implementation and expansion of an e-curriculum requires good digital tools, active and engaged faculty and excellent technical

support. This project showcases the collaborative process illustrating an engaged faculty and student body as well as a desire on the part of the school's administration to develop tools that students can use effectively in pursuit of their education. It's not just technology for technology's sake.

*Table-top demonstration also available in the Expo.*

### **T3. Access to Local Anesthesia Instruction at Each Clinic Operatory via Nodentalpain.com**

James S. Dower, University of the Pacific

The students and their patients benefit from immediate, chairside access to local anesthesia instruction at every operatory in the University of the Pacific Arthur A. Dugoni School of Dentistry. This is provided through integrating the technology of nodentalpain.com website, student-required laptop computers in the clinic, and every operatory with Internet access. This is of critical importance considering that local anesthesia is performed on most patients, is the rate-limiting step in the provision of care, and is most important for comfortable dentistry. Having immediate access to local anesthesia instruction on varied techniques and local anesthetics is valuable for a number of reasons. For many students there is a long period of time between taking the anesthesia technique course and performing the different injections on their patients. Also, the treatment needs of the patient at an appointment may vary from what the student expects. The website includes overview charts and step-wise visuals on thirteen injection techniques (inferior alveolar, buccal, lingual, mylohyoid, incisive, Gow-Gates, Akinosi-Vazirani, intraligamentary, intraosseous, anterior superior alveolar, posterior superior alveolar, nasopalatine, and anterior palatine), instructions on overcoming difficulties in local anesthesia, and a chart of the local anesthetics available in the United States including dosage, vasoconstrictors, duration, and selection factors. Besides having the instructional material available for the students at all clinic operatories, it is available anywhere students have access to the Internet. This is especially true of the Arthur A. Dugoni School of Dentistry where nearly every area of the school has Internet access ports and several areas have wireless Internet access. The educational material accessible at each operatory may be one of the minor factors contributing to record clinic revenues during the last two years. Having immediate instructional material on local anesthesia at each operatory improves the knowledge and skills of the student and enhances patient care.

### **T4. Computer-Based Interactive Learning Tool and Its Utilization in the Dental School Curriculum**

Robert G. Holmes, Medical College of Georgia; John S. Blalock, Medical College of Georgia

For the past two years, we have incorporated Classroom Performance System (CPS) in our curriculum to increase student interaction in the teaching process. We initially incorporated CPS in our freshman Dental Anatomy and Occlusion course, but have since expanded its use to aid our students in preparing for the National Board examinations. We use various questions submitted from instructors and from previously released board examinations to help us determine the student's deficiencies. CPS provides each student with a wireless remote answering device and allows the instructor to tabulate responses instantly on a computer via an attached infrared sensor. The CPS software can be used singly or in tandem with programs such as Microsoft PowerPoint. At any time during class, a lecturer can quiz all of the students in unison and determine if key concepts are being understood. After analyzing the students' feedback, the lecturer can modify instruction as necessary to more effectively

utilize class time. Conversely, students can monitor their own progress in relation to their classmates without embarrassment. The feedback from the CPS is almost instantaneous, which is of great benefit in an accelerated review course format. In addition to lectures, CPS can be used to administer quizzes and record the students' results in a password-protected grade book. These grades can be exported to Microsoft Excel if desired. CPS can generate several different reports to analyze results of an individual student or the class as a whole. Student feedback on the system has been overwhelmingly positive. Student interaction has increased greatly. Students appreciate the anonymity of their individual responses. Feedback to the lecturer has been very informative regarding the effectiveness of instruction.

*Table-top demonstration also available in the Expo.*

### T5. A Collaborative, Open Source Web-Based Literature Database

Michael Bleed, University of Michigan; Lynn Johnson, University of Michigan; Steve Aquilino, University of Iowa

The Literature Summaries Internet database is a collaborative project between the University of Iowa and the University of Michigan that contains peer-reviewed summaries and critiques of published literature written by graduate students in their literature review classes. It improves upon a system originally developed at Iowa and reflects the enhancements indicated by a thorough formative evaluation. The summaries are written and entered by graduate students and reviewed for quality by faculty. There are four user types: 1) students who write the summary; 2) faculty who review each summary after notification via email; 3) support staff who perform administrative functions; and 4) public browsers of the faculty-approved summaries. A secure login is required to add/edit reviews. Students can save draft copies before they are ready to submit for approval. Reviews are categorized by institution, discipline, course, and topic. A public user can either browse by topic or use an indexed database for fast, full content, multiple word searching. Faculty have the ability to archive old summaries that are no longer part of the course reading list. A formative evaluation of the original design suggested the following improvements: no HTML knowledge required to enter a summary, Boolean searches, ability to include visuals, a Level of Evidence qualifier for each summary, and a spell checker. A top-to-bottom open source architecture is used for this project, making it easily and freely portable to other systems. Technologies involved are Linux, Apache, PHP, and PostgreSQL. This project is supported by NIH and NIDCR Grant No. DE-15607.

### T6. The Cognitive Influence on Interactive Multimedia Design: Towards the Development of a Computer-Based Instruction in Removable Partial Dentures

Ranier M. Adarve, University of Minnesota; Igor Pesun, University of Minnesota

Developing effective materials in any medium that facilitate learning requires an understanding and appreciation of the principles underlying how people learn. In the development of a computer-based instruction (CBI), one should be thinking about the principles of learning and assessing whether the software reflects and is compatible with them. At the University of Minnesota School of Dentistry, a computer-based instructional software entitled "A Review of Basic Concepts and Principles in Removable Partial Denture" is being designed and developed to serve as an adjunct to Removable Partial Denture course instruction. The multimedia design of the software is primarily guided by several principles central to cognitive psychology such as those relating to perception and attention, encoding of information, memory, comprehension, active learning, transfer of

learning, and metacognition. The applied principles are compatible, support the learning process, and furthermore, foster the psychological events necessary in effective learning. These principles include the following: 1) multimedia principle—the effective use of text and graphics to present instructional content rather than decorative; 2) contiguity principle—placement of the explanatory text adjacent to the graphic they describe; 3) modality principle—effective use of audio narration to explain onscreen graphics or animation; 4) redundancy principle—avoiding the use of audio narration and redundant text; 5) coherence principle—avoidance of the use of graphics and video clips that are related but not essential to the knowledge and skills to be learned; 6) personalization principle—instructional content presented in conversational language; 7) the design for practice opportunities that supports selecting, integrating, and retrieval of knowledge learned; and finally, 8) the use of a learning or pedagogical agent as an onscreen coach that serve a valid instructional purpose. These principles of designing CBI are based on scientifically valid research studies and experimental evidence concerning features that promote best learning. The current direction of the project is to evaluate learning outcomes and to set guidelines and protocols in developing CBIs for dental education.

*Table-top demonstration also available in the Expo.*

## Clinical Technology

### C1. Electronic Simulation: The Visualized Treatment Plan

James Day, Northern Arizona University; Lou Shuman, Invisalign

ClinCheck is a three-dimensional virtual representation of a doctor's prescribed treatment plan and reflects the stages of treatment from which Aligners are manufactured. ClinCheck provides viewing and navigation tools to enable better treatment planning and better clinical decisions. ClinCheck review is the clinician's opportunity to carefully consider the treatment goal and a complete treatment plan and communicate any modifications necessary to achieve excellent treatment outcomes. The movements portrayed in the ClinCheck file will be present in the Aligner design. In instances in which the ClinCheck does not match/represent the treatment plan, additional instructions should be provided to clarify and request modifications to ClinCheck to ensure that all movements are reflected appropriately. Visualization of treatment objectives in a simulated orthodontic movement informs planning and execution of excellent clinical treatment outcomes and sharing treatment options through informed consent

*Table-top demonstration also available in the Expo.*

### C2. Paperless Clinical Record at One Year: Student/Resident/Faculty and Staff Reviews

Mark S. Wolff, Stony Brook University; Michael McEnerney, Stony Brook University; Susan Schlusler, Stony Brook University; Carol Sloane, Stony Brook University

Extensive planning goes into the implementation of any new clinical policy. The implementation of a computerized patient record requires considerable planning and preparation, yet few institutions feel that their preparations covered all areas. In August 2003 the School of Dental Medicine at Stony Brook University introduced a totally paperless clinical record throughout the dental care center. The training of staff, students, and faculty occurred over two months. The complete implementation of the software within the clinical facility occurred in a single day. Eleven months after the implementation, the graduating senior class and graduating advanced

training residents were surveyed about their attitudes regarding the training, implementation, and software. Nearly one year after implementation, the faculty staff and remaining students were surveyed about the training, implementation, and software. The review of student, resident, staff, and faculty evaluations revealed many distinct differences in the experience. Universally students, residents, and staff state that they would never want to go back to the paper record (25:1). Faculty were less convinced about the computerized paperless record, with many showing various levels of comfort with the new system. Nearly 15 percent of faculty were happier with the paper record. Faculty expressed that the new system represented more work for them. Staff believed that the computerized system greatly reduced their workload and improved their productivity. Staff believed that the training was adequate, students were split as to the adequacy of training, and the faculty felt that more training was necessary. This presentation will review the process of training and implementation used at Stony Brook and then review the results of this user evaluation survey. The needs for training differ between students, staff and faculty prior to the implementation of a computerized record. It may be impossible to satisfy the needs of all groups.

### C3. The Integration of Digital Imaging to Support In-Patient Processing at the UTHSCSA Dental School

Gary F. Guest, University of Texas Health Science Center at San Antonio; S. Brent Dove, University of Texas Health Science Center at San Antonio

The University of Texas Health Science Center at San Antonio Dental School has initiated a patient screening process utilizing digital imaging to support data capture in a problem-based record. The purpose of this project is to improve the efficiency of patient in-processing to the outpatient dental clinic. The goals are to reduce the time required for the process, decrease the manpower to support the activity, and improve the communication of the patient information to individuals making decisions on patient assignment and acceptance. The rationale for using digital imaging technology as a component of the patient selection process is that “a picture is worth a thousand words” or in this case a thousand data elements. The process involves initial registration of the patient candidate followed by an initial assessment by a faculty member. Five digital intra-oral photographs and a digital panoramic radiographic image are acquired for each potential patient. This portion of the data collection process requires approximately ten minutes. Once the images are acquired, the basic demographic and clinical information are entered into a searchable database along with the six digital images. Subsequently, the image information and data collection screen are displayed for review by a faculty member. The final assessment of the patient’s dental problems are made primarily from these digital images. After initial implementation, the faculty and staff utilizing this system have noticed an increased satisfaction with the patient selection process. In addition, a reduction in faculty manpower has resulted from this project. Preliminary data indicate an increase in the number of patients processed per clinic session and a larger total potential patient pool. In the future, a long-term assessment will be made of the process including satisfaction surveys of users, analysis of the number of patients processed, validity of clinical data, and overall quality of patient selection. The project has demonstrated the use of digital images to effectively support in-processing and selection of potential patients for a dental school.

*Table-top demonstration also available in the Expo.*

### C4. Chairside Computer Use in Clinical Dentistry

Pedro L. Hernandez, University of Pittsburgh; Thankam Thyvalikath, University of Pittsburgh; Miguel Torres-Urquidy,

University of Pittsburgh; Heiko Spallek, University of Pittsburgh; Titus Schleyer, University of Pittsburgh

More than 89 percent of all dentists use computers for administrative functions, yet only 25 percent of general dentists in the United States use computers at chairside. To date, computer use at chairside has not been formally studied. We have conducted a telephone survey with a random sample of 302 dentists who use computers at chairside in order to determine the hardware and software infrastructure, storage and data entry patterns for patient information, and perceptions about the practice management system in use and clinical computing. As of August 2004, we have completed eighty-four interviews. Our preliminary results show that dentists who use computers at chairside are on average forty-eight years old, 85 percent of them are male, more than half have taken computer courses, and only 10 percent feel uncomfortable with computers. The majority of patient information is entered by dental assistants and hygienists. However, dentists typically record treatment plans, progress notes, and digital images. Information with a strong administrative connotation, such as appointments and treatment plans, is most often stored on the computer. Images and hard/soft tissue charts are stored less often on the computer, and other clinical information, such as the medical and dental history, and progress notes, least often. Only 1 percent of the practices studied were completely paperless. Advantages of computers at chairside included fast, organized, and easy access to patient information, patient education, and improved workflow. Barriers for chairside computer use were lack of space, the steep learning curve for staff, infection control, the time required to enter data, cost, and cumbersome user interfaces. While 90 percent of the offices had Internet access, only 22 percent of dentists found it to be very essential for clinical purposes or accessed it at chairside. In addition to establishing a baseline measure of clinical computer use among general dentists, this study showed that despite rising computerization, much patient information is still stored on paper. The number of truly paperless practices is still very small. Final results of this study will be presented at the meeting.

### C5. Mapping Snodent to Clinical Conditions

Franklin M. Din, Columbia University; Satishchandra Pai, Columbia University; John L. Zimmerman, Columbia University

The functionality of electronic medical records has increased with the increasing use of the various terminology coding standards, such as Snomed, Loinc, etc. Until recently, dentistry has been limited to CDT codes, which are inadequate to describe diagnostic information. Snodent, modeled after Snomed, is an attempt to rectify this problem. It is a systematized nomenclature of dentistry, which contains dental diagnoses, signs, symptoms, and complaints. While there are many questions that must be investigated before Snodent can be generally adopted by the dental profession, the objective of this study is limited to the question, “Does Snodent actually map to a clinician’s diagnostic findings?” Our approach is to allow free text entry into a clinical form and then have the user select the best available Snodent description. The results are evaluated to determine closeness of the match between the Snodent description and terminology and the actual clinical data entered for the given field. This should measure the utility of Snodent with actual clinical practices. To help achieve this, we created a user-friendly tool that queries the Snodent database to produce a reduced subset of Snodent terms. This avoids the need to use the entire dataset. Further, each subset can be saved as a separate list to be used in a clinical application. In our specific trial, we used only codes related to endodontics and achieved significant reductions (from 6,491 items to 1 to 79 items depending on the endodontic term used for parsing). No knowledge of query generation is needed to use this tool.

*Table-top demonstration also available in the Expo.*

### **C6. Methods to Facilitate HIPAA Compliance**

Alesha R. Adamson, Oregon Health & Science University

Dental schools are generally entities within a university or health science center. Schools often must comply not only with federal, state, and local regulations, but also with additional policies and procedures imposed by the university. This will likely be the case with the HIPAA Security Rule. To confound the issue, the security rule point of contact within the school may be someone with no functional experience in deploying IT controls let alone recognizing the need for them, while the informatics team may not have a sound sense of policy or security best practice. For schools intending to hold themselves to reasonable levels of compliance, or better, waiting for the university to implement all controls for all areas is not sufficient. Responsible parties must be proactive in identifying special areas and types of data and classifying the staff into different types of users. At the same time, there can be significant consequences for a school that is overzealous in its adoption of the security rule and misaligns their efforts with those of the university. A strategy to facilitate compliance will be presented, including: 1) developing the "Team of Two" to provide administrative and technical expertise, resources, and the leverage necessary to bootstrap compliance; 2) outlining resources and publications that are available to help guide educators and administrators in the process of developing in-house policies that apply more specifically to the school or program while upholding the security rule and the university's policy; 3) demonstrating a mechanism for finding deficiencies in the existing collection of in-house policies using an audit crosswalk of pre-existing policies and HIPAA codes, and 4) discussing a mechanism to ensure policies are disseminated to new employees, returning faculty, visiting dentists, and anyone else that may not have been available on the day the policy was released. Schools should utilize a prescribed, yet simple, process to ensure compliance with the HIPAA security rule.

### **PDA's and Tablet PC's**

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#### **P1. The Use of PDAs and PowerPoint Presentations in Patient Education and Treatment**

Ryan C. Thomas, New York University; Elise S. Eisenberg, New York University

Hand-held devices (PDAs) are being purchased in record numbers to enhance dental education and clinical experiences. Many colleagues, practicing dentists, and our students have gone beyond basic uses of these devices (tracking appointments, contacts, and items to do) and are using these powerful tools to look up drug information at the point of care, track patient treatment, and use it to show patients treatment alternatives and before and after images. PowerPoint presentations have been placed onto PDAs of third-year predoctoral students. These PowerPoint presentations contain five common oral pathology/oral lesions. Each presentation contains patient and practitioner information, images, treatment modalities, and drug information. Students were asked to complete monthly surveys to determine the functionality and utilization of the presentations in patient treatment. Preliminary results show the presentations have a positive influence on student understanding and presentation to patients and patient understanding of oral pathology and oral lesions. PDA technology and the programs that run on them have continued to advance at a rapid pace. PowerPoint presentations provide a new and innovative way to disseminate information to students and patients and provide clear and concise information to assist with treatment decisions.

*Table-top demonstration also available in the Expo.*

#### **P2. Utilization of a Hand-Held Device (PDA) to Track Orthodontic Procedures**

Long G. Luu, New York University; Olivier F. Nicolay, New York University; Elise S. Eisenberg, New York University

Hand-held devices (PDAs) are being purchased in record numbers to enhance dental education & clinical experiences. Many colleagues, practicing dentists, and our students have gone beyond basic uses of these devices (tracking appointments, contacts, and items to do) and are using these powerful tools to look up drug information at the point of care, track patient treatment, and use it to show patients treatment alternatives and before and after images. Databases to track orthodontic procedures have been created using a Palm OS program called HandBase. PDAs and this program were distributed to Orthodontic faculty and Orthodontic PGY2 students to track a variety of treatment information. Faculty have the ability to comment on procedures as well as search for patient treatment status. Faculty can also review procedures in progress/completed by students and can determine future patient assignments. Faculty and students were asked to complete a survey every month to assess their use of the database and a variety of other issues. Preliminary results have shown benefits in the deployment of this technology for Orthodontics as well as other clinical areas. PDA technology and the programs that run on them have continued to advance at a rapid pace. This presentation will demonstrate the utilization of a database for tracking of Orthodontic patients and procedures and results of surveys used to determine faculty and student satisfaction with this technology.

*Table-top demonstration also available in the Expo.*

#### **P3. Use of a PDA Device for Chairside Patient Education in Restorative Dentistry**

Howard E. Strassler, University of Maryland; D.H. Hoffacker, University of Maryland

Patients when presented with a treatment plan can have many questions concerning not only the treatment proposed but also the expected treatment outcomes. The range of restorative treatments in any given treatment plan when explained to a patient can not only be overwhelming and confusing, but also be potentially misunderstood. Dental students are developing their presentation skills and in many cases have done few if any of the treatments being presented. To meet the challenge, a series of patient education programs have been developed using a personal digital assistant (PDA) on either a Palm or Pocket PC platform as a presentation tool to demonstrate to a patient images of treatment and treatment outcomes. Dental students are already using Palm and Pocket PC PDAs to track appointments and store names and addresses of their patients. Proprietary software and over fifty unique PowerPoint presentations for patient education in restorative dentistry have been developed. These include routine operative dentistry procedures, esthetic treatments including bleaching, direct bonding, and porcelain veneers, routine and complex prosthodontic treatments, and implants. These programs have been provided to third- and fourth-year dental students with recommendations for software to use with these programs on their PDA. Once these programs have been loaded to their PDAs, they can demonstrate the patient education programs for patient viewing at chairside. Those students currently using the programs have provided positive feedback. Additional patient treatments are being added. This program presents a novel and unique application of a PDA providing the student with the ability to demonstrate patient education in varied restorative treatments.

### **P4. Dental Hygiene Hand-Held Electronic Evaluation System (DHEVA)**

Eunice M. Edgington, University of Alberta

The acquisition of dental hygiene preclinical and clinical skills is an intricate teaching-learning process that requires intense attention to detail, constant hands-on instruction, and observation and ongoing evaluation. The process of clinical evaluation is labor-intensive, demanding time and energy recording and documenting student progress, grades, and records on complex evaluation forms. The development of a handheld computer program application for the PALM enables chairside paperless evaluation of the dental hygiene clinical process. It provides competency-based evaluation criteria for each procedure including patient-centered care and critical thinking. Other features include pop-up lists, definitions, and tooth and surface maps for detailed reporting. The data collected is transferred automatically to a central computerized data evaluation program and a detailed grade report can be generated. This palm evaluation system is portable, user-friendly, and expedient. It will provide diagnostic data on the student's progress as well as a detailed progress report of all aspects of the student's performance. Students can track their progress by viewing their individual records but do not have the access to change data. Instructors can use the reports to calibrate their evaluation performance. This system will enable instructors to focus on teaching and feedback rather than grading at chairside. This system is designed to increase teaching and learning by enabling more efficient use of time chairside, increase the quality and quantity of documentation and feedback, increase objectivity and consistency of the grading process, and provide more comprehensive diagnostic and remedial student profiles.

### **P5. Electronic Chairside Evaluation: A Valuable Tool for Monitoring Clinical Competence**

Kathi R. Shepherd, University of Detroit Mercy; Kathleen Neveu, University of Detroit Mercy; Mert Aksu, University of Detroit Mercy; Charles Laird, University of Detroit Mercy; Aman Dada, University of Detroit Mercy

A key to graduating competent clinicians is a successful clinical performance monitoring system. Electronic evaluation programs have been noted as being a valuable tool in monitoring student competency. The purpose of this presentation is to demonstrate a custom-designed software program currently utilized for dental hygiene care evaluation. This software manages qualitative and quantitative data for each student utilizing an AS400 midrange computer and tablet PC platforms. It provides real-time, online chairside evaluation of students resulting in elimination of data entry costs and time lags between rendered care, data entry, and generation of reports. The program serves as a mechanism for tracking student progress in completed procedures, patient classification data, and clinical competency level. Both students and faculty access online data to identify areas of strengths and weaknesses enhancing individualized performance. Detailed outcomes reports are analyzed during annual dental hygiene program reviews to assess achievement of program goals and competencies. Tablet PC technology including computing power, screen size, and electromagnetic sensitivity as well as other features such as mobility, security, and compatibility with infection control requirements will be discussed. Results thus far include improved data accuracy, increased data management efficiency, and the opportunity for students to receive cumulative feedback in a more timely manner. A future objective of the system is to utilize data to assess faculty calibration of clinical evaluation procedures. Use of an electronic evaluation program is highly beneficial in monitoring student clinical competence.

*Table-top demonstration also available in the Expo.*

### **P6. One-Year Retrospective Look at an Implementation Plan for the Tablet PC**

Mert N. Aksu, University of Detroit Mercy; Maher Salam, University of Detroit Mercy

As dental schools continue making investments in technology to access chairside features of clinical information software packages, there are many decisions being made in selecting a particular hardware platform. Factors considered include operating system, economics, processor speed, wireless versus hard-wired PC, etc. In addition, any plan to implement a chairside clinical operating system must include a plan for replacement, maintenance, and long-term obsolescence. Over the past eighteen months, the introduction of the Tablet PC platform has increased the number of options available to dental schools looking for a hardware solution to chairside computing needs. This program will be a one-year retrospective look at an implementation plan for the Tablet PC. This program will assess the validity of various selection criteria, and will look at challenges faced during the post-implementation period. Experiences using the hardware throughout the curriculum will also be discussed. The program will review the implementation plan for the inclusion of Tablet PC hardware into an existing hard-wired system with a one-year retrospective look into the implementation of the Tablet PC technology into an existing dental school information system. The benefits of the Tablet PC platform—including an electromagnetic digitizer stylus/screen, increasingly faster processor speeds now reaching 1.3 GHz, transportability, infection control simplicity, long battery life, wireless capability, and application in the classroom and simulation laboratory—will be discussed. A progressive program for training faculty and students will be discussed as well as examples of integrating the hardware for use in web-based courseware. Outcomes of a user satisfaction assessment among different user groups will be discussed. The characteristics of the Tablet PC are suitable for use as a device for the electronic patient record and electronic student evaluation.

*Table-top demonstration also available in the Expo.*

## **Expo-Only**

### **1. An Alternative to the Use of Interactive Television in the Delivery of Oral Radiography**

Daniel Alford, Northern Virginia Community College

The use of distance technology to deliver courses in dental hygiene has been effective in increasing the number of candidates that successfully enter the profession and therefore increasing access to health care for the general population. The effective traditional use of interactive television when delivering these courses is limited by the necessity of not only facility use, but also the large initial outlay of funds for equipment and the continued funding of maintenance and staff. Exploring alternative methods of distance course delivery ensures that educators keep abreast of emerging technology while exploring methods of delivery that may be more in keeping with the mission of community colleges to increase access to education while addressing access to health care with increased enrollment of candidates for licensure. Objectives for the project include the following: design and implement a course in oral radiography for dental hygiene students utilizing online synchronous technology (Centra); identify potential obstacles for students and instructors who want to use this software; assess the attitudes of students, instructors, and administrators toward this type of delivery; and evaluate the effectiveness of this online course when compared to the same course delivered by interactive television. This project

currently is in the design stage with implementation to begin in the spring 2005 semester.

### **2. Transfer of a Dental Instrument Management Design Across Information Platforms**

Sandy Allen, University of Maryland

The development of a comprehensive Dental Instrument Management system started with a complete yet simple design shown to be platform independent. This demonstration presents the design, its implementation with a legacy system, and second implementation with the clinic information system, axiUm, developed by Exan Academic Software Inc. The technical significance of a good design is in its ability to be transferred across platforms while still meeting the requirements of the users. This design at the University of Maryland achieved these goals, and an opportunity exists for this design to be used by other dental schools. Key features include minimal intervention by the provider, documentation of instrument movement, and clear, concise directions to instrument management personnel. The original design was based on an innovative combination of simple data structures, data-driven processes, use of bar codes, and bar code readers, matched with practical manual processes. Both design implementations have been successful in processing more than 1,200 dental instrument cassettes and 2,000 handpieces to approximately 350 providers who treat in excess of 450 patients each day. The evaluation of both implementations to the same design was demonstrated by the efficiency of operations apparent on the very first day of implementation and by the minimal amount of user retraining required for the second implementation. The definition of each workflow area for processing instruments remained the same; the users were only retrained to the new information layout. Additionally, no hardware changes were required in the workstation or bar code readers, outside of that needed to support the new clinic information system.

### **2. Head and Neck Anatomy for Health Professionals on CD-ROM Unit III: Muscles**

Christine Blue, University of Minnesota

Virtually every aspect of the practice of clinical dentistry and clinical dental hygiene is dependent upon a solid knowledge of head and neck anatomy. The static nature of this course content makes it ideal for translation to computer-based instruction (CBI). The third unit in the Head and Neck CD-ROM series entitled "Muscles" allows students to study the material at their own pace and choose where and when they want to study. The self-instructional unit on muscles is highly interactive, so students become more involved in the learning process as opposed to taking notes in lecture. Anatomical landmarks come alive as students view them three-dimensionally instead of in a textbook. Terms are pronounced by a human voice to help students build their vocabularies. A self-evaluation section allows students to test their understanding of the material. Immediate feedback is given as well as a review option. Adding a computer-based learning option in the Head and Neck Anatomy course improves the ability to accommodate learning style variations. Students may review the material throughout the curriculum as needed. Faculty may use the CBI unit on muscles to replace a lecture or serve as a mechanism for subject enhancement, subject review, or remediation. Research has shown that CBI is either more effective or at least equally effective as other methods of education while promoting favorable attitudes in students. Students' enjoyment and desire to use CBI may influence the student's level of motivation towards learning head and neck anatomy.

### **3. Managing On-Demand Video and Other Digital Assets at the University of Michigan School of Dentistry**

Daniel Bruell, University of Michigan

The DAMS project, in its second year at the University of Michigan School of Dentistry, has developed a practical means of archiving and delivering rich and diverse media. Archiving assets (ingesting) must begin with a digital file; content that was produced in analog form must first be digitized. Digitizing assets at sufficiently high resolutions and data rates is crucial to enable a wide variety of delivery options to support users at various connection speeds. A high-resolution, high-data rate digital file is regarded as the "prime digital" source; once ingested into DAMS, lower resolution derivatives are generated and stored on dedicated servers. Searching for archived content becomes more complex when the asset is time-based media (audio/video). With a DAMS, as rich media is ingested, voice to text software analyzes the asset and generates a searchable file that becomes part of the metadata for that asset. The power of this system is realized when the results of a search yield all occurrences in a video of the search criteria. Displayed in a "storyboard" view, direct access to the relevant video clip is possible. Results of searches can be saved and shared; collections of video clips can be assembled and downloaded. Another major component of the DAMS is Digital Rights Management (DRM); through user-defined Access Control Lists (ACLs), users have control over the accessibility and management of their assets.

### **4. Demonstration of Clinical Procedures Using Super-Mini Video Camera Mounted from the Operator's View**

Daniel Chan, Medical College of Georgia

Computers, video imaging, digitized radiology, and electronic data transmission are becoming an integral part of dental education and dental practice. The authors will present the instrumentation and set-up of a super-mini video camera to demonstrate clinical procedures from the operator's view. The current capabilities and limitations of video imaging using a super-mini video camera will also be discussed. The super-mini video system is put together with a headlight illumination system and a miniature color CCTV camera. This system can be used with two power sources: a wall plug in transformer or a small lightweight rechargeable battery. Minor low-cost alteration was made to control the aperture and the amount of light reaching the sensor. Such alteration is essential for chairside dental procedures. The video output can be connected directly to a video monitor or recorded. The recorded images can then be edited using video editing software. Such a system is less than one tenth of the cost of a comparable commercially available system. The proposed system provides the opportunity for others to see exactly what you see while performing a procedure. The operator can share this image with the patient or use the system to educate students and colleagues. This system is unique in the sense that it can deliver the operator's view that was previously unavailable to anyone but you.

### **5. Instructional Multimedia Design for Teaching Pulpotomy Treatment**

Jung-Wei Chen, University of Texas Health Science Center at Houston

Dentistry requires not only memorizing, decision making, and problem solving, but also high levels of sensory-motor ability, which may require multiple educational strategies. Pulpotomy, a pediatric dentistry pulp treatment, is difficult for students to learn for several reasons: 1) the treatment is three-dimensional and dynamic, 2) it is

difficult and inconvenient to demonstrate because it needs to be performed on the real patient, and 3) students at this level lack clinical experience. Four different kinds of multimedia method—animation, video, PowerPoint presentation, and static text—are tested and compared in this project. All multimedia contents will be uploaded to a website and available to sixty-four second-year dental students. The Pulpotomy treatment content was divided into sections to help the students understand the procedure and control the learning pace by themselves. Achievement of both cognitive and clinical skills objectives will be assessed. Cognitive measures will be assessed with written equivalent-forms and pre- and posttests. The project will evaluate and compare, between and within groups, not only the total pre- and posttest scores, but scores assessing achievement of the four objectives at both high and low cognitive skill levels. These comparisons will evaluate which methods will more effectively teach dental students the pulpotomy treatment, both overall and for each cognitive skill level. To measure clinical skills, all students together will perform the pulpotomy treatment on typodont teeth with pulp chamber in the dental undergraduate lab. All data will be analyzed using the SPSS, particularly using the GLM and MANOVA at level of significance  $p=0.05$ .

### 6. Implementing a Paperless Patient Record System

James George, University of North Carolina

Modules have been added to the University of North Carolina School of Dentistry's electronic patient record system (EPR) for the Health History, Clinical Exam, Periodontal Chart, and Progress Notes. Combined with already existing modules for Patient Registration, Digital Radiographs, Treatment Planning, and Treatment Updates, the additional modules will replace all provider entries in the patient's paper chart. Initially, the paper chart will be retained until an electronic document repository can be created to store consent forms, correspondence, and old records. The new modules were introduced in the predoctoral and graduate clinics at the start of the fall 2004 semester and will be implemented in the school's dental faculty practice later in the fall semester. The EPR is accessed using laptops placed in the operatories or using the students' personally owned laptops. Signature pads are available in the operatories equipped with laptops or checked out at the student dispensary for use with the students' laptops. The signature pads are used for obtaining patient signatures on health histories and treatment plans, and providers and instructors authenticate records by entering their login and password. Some innovative features in the EPR include the following: 1) a student evaluation system that tracks each treatment step and treatment plan, 2) a clinical-progress report that gives students and administrators an up-to-date snapshot of planned, in-progress, and completed procedures, and 3) pending-signatures modules enabling instructors, providers, and administrators to track missing signatures. Plans are being formulated to evaluate the new modules using a web-based survey of students' and instructors' opinions.

### 7. Helping the Smoking Patient to Quit

Wilda Guzman, University of Puerto Rico

Three DVD instructional modules in the Spanish language have been prepared for use in the University of Puerto Rico School of Dentistry course "Tobacco Control Interventions for Patients in the Dental Office" and continuing education courses for health professionals in Puerto Rico. They will be demonstrated in this presentation.

### 8. The Application of Tactical Feedback Within the Tooth Atlas Learning Protocols

Eric Herbranson, University of the Pacific

This demonstration will show the use of haptic feedback technology that allows the viewer to "feel" the complex models contained within the *Tooth Atlas*. The *Tooth Atlas* has been designed to allow viewer-controlled interactivity with three-dimensional computer models. It is understood that these types of protocols allow more efficient and accurate understanding of the complex anatomy of human dentition. This project will add tactical feedback to the interactive stereo viewing protocols.

### 9. Virtual Geriatric Patient: New Tool to Enhance Teaching and Assessment

Jadwiga Hjerstedt, Marquette University

A shortage of dental school faculty and a documented need to integrate geriatrics and geriatric dentistry content into an already-crowded curriculum required new teaching and evaluation resources. This CD-ROM set was designed to meet these challenges and is intended for faculty use. The CDs are easy to navigate, interactive, and build upon a real geriatric patient case. The key features of the Virtual Patient CD-ROM for teaching and assessment contain a media file library with a variety of images (e.g., radiographs, lab findings), PDF documents (text files), and short video clips of patient interactions with physicians, dentists, other allied health professionals, and family members. The required software to access the media files is included for downloading. Materials are organized for access by discipline/specialty, disease/topic, and comprehensive listing. Any of the media files can be inserted into presentations and demonstrations and can be used to facilitate seminar or rounds discussions. The CD set provides directions for inserting the media text and image files. The content for evaluating competencies can be navigated by four main links: topics, competencies, evaluation form, or comprehensive listing. There is an instructor guide with directions for assessment tool administration, a printable question sheet to measure targeted competencies, video clips with short vignettes addressing a particular competency, and a scoring key for faculty.

### 10. 3DCeph: A Versatile and Integrated 3D Cephalometric and Craniofacial Diagnostic System

Budi Kusnoto, University of Illinois at Chicago

3DCeph is an economical and reliable method for measuring human facial skeletal structures by means of 3D computer modeling. The automatic computerized landmark alignment module of 3DCeph™ enables the software to improve precision in locating any cephalometric landmarks and thus improve the overall accuracy of the 3D computer modeling.

### 11. Dental Program Students Treating Patients Who Use Tobacco: Using a Website to Customize Treatment

Jill Loewen, University of Detroit Mercy

Dental professionals have been strongly advised to take a more active role in providing tobacco prevention and treatment services to patients. Research has shown that most patients now expect their oral health care professionals to inquire about their tobacco usage. Lack of role preparedness has been cited as an obstacle to this service. Severe limitations of time exist with the ability to incorporate tobacco education throughout the curriculum, although many courses can be identified as appropriate for presentation of tobacco use-related

material. With the limitations of time to introduce this information and develop skill, the use of a website can be the vehicle toward more effectiveness with an existing tobacco program. Materials can be accessed as “redi-references” and “scripts” in the patient clinic, by students on demand, so treatment can be customized. This information can be provided in the form of information sheets and treatment guides. Students have expressed the desire to obtain this experience. Student skill is limited and lacks appropriate preparation to 1) help motivate a patient to schedule a counseling service and 2) be more effective in customizing treatment for patients to enhance success rates in patient quit attempts. The use of the website in the dental clinic presents an opportunity to more effectively serve students, so that they are more competent to treat patients; serve faculty, so that they can provide enhanced guidance to students; and benchmark best practices to share with other dental schools, encouraging them to develop these programs.

### **12. DCMS-OrthoTxWiz: Diagnosis, Treatment, and Clinic Management System for Orthodontics and Dental Education**

Yunqing Pan, University of Illinois at Chicago

This application intends to give orthodontics residents an easier, more efficient and more comprehensive way to understand treatment procedures and prepare treatment writeups. It facilitates auditing orthodontic education training by improving performance, efficiency, and accuracy in delivering standardized orthodontics treatment writeups.

### **13. Interactive Dental Anatomy e-Courseware**

Anthony Parisek, University of the Pacific

The Interactive Dental Anatomy (IDA) software is an intuitive, self-paced learning environment that ties dental anatomy lecture and laboratory course content together and provides direct access to third-party resources such as Brown and Herbranson’s *3-D Tooth Atlas*. Use of IDA increases students’ efficiency in learning tooth morphology by eliminating the need for students to attend lectures where they rarely engage in active learning. IDA increases faculty efficiency by eliminating lecture preparation time year after year, allowing instructors to spend more time with students in the laboratory and discussing clinical applications. Course materials are presented consistently and thoroughly year after year. IDA delivers lecture and laboratory course content by means of animated, color presentations supplemented with annotations and clinical applications. It gives students on-demand access to course materials that they can study on their laptops any time, as many times as they like. By increasing teaching efficiency for both students and faculty, more time can be spent working on laboratory projects and exploring the clinical applications of dental anatomy. IDA provides an active learning environment for students that is more comprehensive in its presentation than traditional lectures and provides access to new learning resources. We will survey students after the dental anatomy course to determine their level of satisfaction with IDA. Students’ performance on NDBE Part I will be compared with former classes. The students will take a follow-up survey after one year of clinical experiences to determine how IDA contributed to their clinical preparedness. IDA was introduced in July 2004 to 143 first-year dental students at the University of the Pacific’s Arthur A. Dugoni School of Dentistry. It has been well received by the class and has had few technical difficulties. No students have expressed concern navigating or understanding the software. Scores on quizzes have been comparable to prior years. We are currently developing course content to be used by the students for the remainder of this academic year. We expect IDA to be complete by January 2005.

### **14. Computer- and Internet-Delivered Multimedia Training Modules**

Rebecca Poling, International Training Institute

The International Training Institute (ITI) is an independent educational provider that offers dynamic digital multimedia training for the dental and orthodontic professions. ITI utilizes the latest technology and computer programming available to deliver its unique and comprehensive educational training via CD-ROM and the Internet. The ITI Training System helps professionals quickly learn new clinical skills easily from any place at any time. Through the use of a unique interface, concepts are taught using animations, close-up video, professional narration, interactive quizzes, printable checklists and spreadsheet programs, a multimedia glossary, and online pretesting and post-testing for continuing education credit. Several modules are being offered for online delivery with broadband as a subscription to private individuals, university programs, and private enterprises.

### **15. A Haptics-Based, 3D, Virtual Reality Periodontal Training Simulator**

Arnold Steinberg, University of Illinois at Chicago

The addition of haptics to dental simulators is very important since it gives trainees the ability to feel what the instructor is feeling. Described is the current progress in the development of 3D, virtual reality (VR), haptic-based periodontal simulation program to facilitate student training and practice in periodontal probing. The haptic-driven simulation program allows the user to feel, interact with, and be guided by the 3D, VR image on a computer monitor. The haptic device employed is a Phantom (SensAble Technologies) using a Dell Xeon 530, 3 Ghz workstation. For programming, Ghost software (SensAble Technologies) was used initially and has been modified with our own program (PerioSim©). 3D model teeth used in this system were obtained from Viewpoint Corp. (Viewpoint Corporation, Digimation). Crystal Eyes Stereo shutter glasses along with Crystal Eyes Workstation (infrared emitter) from Stereographics Corp. (San Rafael, CA) were used for 3D viewing. By operating the Phantom device, an onscreen 3D, VR periodontal probe can be manipulated sensing contact with the root surface and the surrounding gingival tissues of the pocket or crevice. Training in probing of periodontal pockets or crevice, along with determining their depths, is greatly facilitated using this simulator. A control panel is available for fine control by an instructor for a variety of parameter such as gingival transparency, haptic fidelity, and creation of templates for 3D instrument orientation and movement. A VR periodontal explorer and scaler have also been developed. Alpha evaluation of this onscreen model has shown very good acceptance and usefulness. A next generation system currently being developed will have the ability to display the onscreen image as a 3D, VR display suspended in space above a desktop. This will allow the user to feel, immerse, and interact with the suspended in space object as if working on a real object. After having developed this model system, it is now necessary to perform validation studies to see if its use will aid in teaching and training tactile skills so critical for success in the practice of dentistry.

### **16. Dental Anatomy: A Three-Dimensional Approach Using CAD/CAM Software**

Deborah Szabo, University of Michigan

The pilot course will apply the CEREC 3D program (Sirona) to aid in the student’s visualization of dental anatomy and introduction to restorative dentistry. Students often have difficulty applying dental anatomy concepts learned through drawings, manuals, and form waxing to the fabrication of dental restorations. The CAD/CAM 3D

program presents teeth in three dimensions while allowing students to view and manipulate them in 360 degrees on the computer screen. The CAD/CAM 3D program also allows students to apply their knowledge of dental anatomy by virtually “waxing up” the tooth to alter contours, contacts, and occlusion. Students can then objectively self-evaluate their anatomical designs by comparing them to master designs entered by the instructor. The hypothesis being tested is that introducing the CAD/CAM 3D program to first- and second-year dental students will not only aid in their perception of dental anatomy but also enhance their ability to apply this knowledge to the fabrication of amalgam and composite restorations. The pilot program will be implemented in the 2004 fall term. Students will receive a pre-test on dental anatomy prior to beginning the course. Initial instruction will be focused on dental anatomy of posterior teeth and utilization of the CEREC 3D program. Students will complete exercises to create the desired anatomy, contours, and contacts. The second phase of the course will be to provide modified cavity preparations for the students to “virtually restore,” which will test their ability to apply dental anatomy knowledge. Students will receive a post-test following the course based on dental anatomy and restorative dentistry skills. They will also be surveyed on their attitudes and perceptions of the use of the CAD/CAM 3D program relative to conventional teaching aids currently used.

### **17. A Student-Developed Interactive Computer-Based Simulation Module**

Jeremy Wong,

This project is a continuation of a previous pilot project that was presented as a table-top demonstration at the 2003 ADEA TechnoFair. The pilot project was reviewed by senior students who overwhelmingly agreed that the module was an effective learning and teaching experience, but recommended incorporating clinical and diagnostic video material. The current project was initiated by students with the intent to create a new case simulation module that would include more interactive clinical and diagnostic video material. A module covering the subject “Scaling and Root Planing” was chosen. Three students participated in its development. A senior staff member provided a Scaling and Root Planing Objective Structured Clinical Examination (OSCE) Case. This consisted of a patient’s case history, along with four associated multiple-choice questions with five answer choices for each. A Pentium PC with NeoBook 5.0 software was

used. Students collected the necessary information using text and literature references along with relevant slides and videos from the faculty. The program is so developed that when a participant responds to each question, whether correctly or incorrectly answered, a detailed explanation along with literature references are given. As part of the explanation process, slides and technique vignettes complement the subject material. The module is currently available to students who are accessing it as part of their periodontal learning experience. Each student has been asked to complete a ten-question Likert scale survey assessing the module. The data is being assessed using qualitative analysis.

### **18. Using Technology to Support Community Oral Health Service Learning**

Karen Yoder, Indiana University

Seal Indiana is a statewide mobile dental sealant program that is operated by Indiana University School of Dentistry (IUSD). The program is supported, in part, by the Indiana State Department of Health and endorsed by the Indiana Dental Association. Seal Indiana targets low-income children in Title I schools, Head Start programs, and community health centers throughout Indiana. More than 5,000 Indiana children have been treated by IUSD faculty and students working with Seal Indiana since the program’s inception in March 2003. Three forms of technology are used to prepare and evaluate fourth-year dental students’ three-day required service-learning rotations with Seal Indiana. The first tool, Oncourse, is an online teaching and learning environment developed at Indiana University for use by IU faculty to complement in-class instruction as well as enable distance learning via the Internet. Oncourse and the Seal Indiana website are used for dental student pre- and post-rotation assignments, reflection, evaluation, and surveys of knowledge and attitudes. An intranet-based calendar conveys up-to-the minute information relevant to assignment location, transportation arrangements, and population to be served. Staff assignments, distance from Indianapolis, and expected functions are also listed on the intranet-based calendar, which is accessible to all students, faculty, and staff. Production of a DVD that will be used for student orientation and public information is in developmental stages and will be the fourth form of technology used to support service learning in community oral health.