SHAPING THE FUTURE OF DENTAL EDUCATION:

THE IMPACT OF NEW TECHNOLOGICAL AND SCIENTIFIC DISCOVERIES ON TRADITIONAL DENTAL EDUCATION

May 8, 2017, 14:00-17:00
Moderators: Lynn Johnson (USA), Abigail Tucker (UK)
Workshop rapporteurs: Irina Dragan (USA), Domenico Dalessandri (Italy)
Session Chair: Damien Walmsley (UK)
What continent are you from?
Connect to WiFi to answer.
Impact of New Technologies

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DISCLOSURES

Lynn Johnson, PhD is the chair of the Advisory Board for the Collaboration 4 Health IT. ICE Health Systems is a Collaboration member.

Lynn Johnson is participating in a research study with FollowApp.Care.
OUTLINE

Review participants’ expectations
Updates in academic environment
Patient care
Telehealth: between academia and private practice
Lessons learned
Conclusions: global perspective
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Global Representation
“I think we need to embrace New Technologies because current students learn in a different way.”

“I have an interest in using technology in facilitating learning - not just of students in the university, but also of general dental practitioners in a less formal manner.”
Literature Review

Ranked #1

2

Ranked #2

8
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The Level of Using **New Technologies** in the **Dental Academic Environment**: Systematic Review And Meta-Analysis

Dragan I, Bassir SH, Nevius A, Bensreti H, Karimbux N.
The majority of schools report using software to:
- manage admissions process
- curriculum analysis
- delivery of curriculum content
- manage student clinics and faculty practices.
Potential of information technology (IT) in dental education.

"IT will always remain exciting, as it is always changing and the users, whether dental students, educators or patients are like chameleons adapting to the ever-changing landscape."

- assist in the education
- competence development

“IT will always remain exciting, as it is always changing and the users, whether dental students, educators or patients are like chameleons adapting to the ever-changing landscape.”
Variations of teaching, diagnostic and treatment technological applications among seven dental curricula

Antonellou E. et. al, 2017
Gamification: A Tool to Enhance Knowledge Application and Lifelong Learning
Michelle Robinson DMD, MA\textsuperscript{1} and James Willig MD\textsuperscript{2}
University of Alabama at Birmingham Schools of Dentistry\textsuperscript{1} and Medicine\textsuperscript{2}

**AIM**
The volume of information required for students to learn can be overwhelming. In order to be able to apply new knowledge into practice, students must be familiar with a platform of facts that may be challenging to learn and retain. This work examines gamification as an innovative pedagogical technique to engage students in learning.

**RESULTS**
Implementation was simplified by a calendar feature allowing test questions to be scheduled for delivery. Scoring was set up ahead of time, permitting points to be assigned for correct answers and pre-determined milestones. Customized badges were motivating in keeping students engaged. Areas of strength and weaknesses were able to be identified. Participation rate was 100%.

**CONCLUSIONS**
The gamification format was well-received in this educational setting. It provided a novel method of interaction with material and shows promise as a means of improving test scores and retention of knowledge needed to facilitate research and clinical practice.\textsuperscript{1}

**METHODS**
An online game called Kolonia ("continuous improvement") was developed to aid student and resident learning. Periodontology residents participated in the game to assist them with preparation for a national in-service exam that assesses their learning over time in the program. The game allowed for both individual and team participation. Four online questions representing different Periodontology topics were given each weekday. Beneficial game features and participation were observed.

How does the game work?
- Instructed students to teams
- Instructed post questions and references in Kolonia software
- Students log into service using their ID and password
- Students answer questions and can receive feedback with answer results

**REFERENCES**
Gamification as a tool for enhancing graduate medical education.

**ACKNOWLEDGEMENTS**
This work was supported by the University of Alabama at Birmingham. Kolonia project made possible with assistance from the Kolonia clinical team.

James Willig MD, School of Medicine
Cathy Reche PhD, School of Nursing
Nancy Wingo PhD, School of Nursing
Preclinical Technologies in Dental Academic Institutions

Simulation Models

Haptic Technology

Virtual Patients

Dark Room to Augmented Reality: Technological Rise of Oral Radiology
Ali Z Syed; Ahmed Abdelkarim; Scott Lozanoff

Abstract
Radiology has continuously evolved in combination with advances in imaging technology integrated with the gelatin silver photographic process introduced over 150 years ago. Current advances in imaging technology include the introduction of holographic display within the context of an augmented or mixed reality (AR) environment. The introduction of this technology to dental radiology may enable the radiologist to achieve improved diagnostic understanding and interpretation of complex clinical scenarios. The purpose of this study is to implement AR display for the observation of virtual models with involvement of the interests associated with the patient. For illustrative purposes animated videos depicting viewed virtual teeth were manually rendered using AR technology.

Aim
Pre-service dentists and medical education has taken place in a traditional, faculty-instructed lecture format in the dental field, fostering distance learning with virtual procedures for simulation. It is required not only to provide the students with the fundamental understanding of the subject but also to develop their critical thinking skills for future practice. The use of AR technology, visual objects are transported onto a real environment to create a fundamental user interface. The aim of this study is to assess the AR technology as a tool to aid the students in understanding the fundamental aspects of dental radiology.

Methods
The imaging pipeline shown in Fig. 1: CBCT images were obtained and subjected to image analysis utilizing 3D software (3DReshaper.com). Specific features were viewed in raw and height images and registered (Fig. 2). Data were processed into a 3D model (Fig. 3), transferred to MeshLab, cleaned up, and triangulated, and based on the respective angle of view, the 3D models were exported to the unity software for rendering using the virtual environment. In the use of AR technology, the image is enhanced using holographic display, which allows the user to interact with the virtual objects in the real world.

Results
Understanding complex dental procedures continues to remain a challenge for dental professionals as they communicate with their patients. Microsoft HoloLens technology enables the placement of holograms, or virtual images that exist from the interaction of light beams, within the physical environment facilitating user interaction. HoloLens allows sounds, captures interaction, and recognizes gestures in spatially map the world around the user in real time. HoloLens provides multiple opportunities for users to interact with concepts before a screen. This is the first proof-of-concept study demonstrating the usefulness of holographic display within the context of dental radiology.

Conclusions
Future efforts will include introducing HoloLens technology to the dental students at the University of Hawaii at Manoa using several courses including Introduction to Radiology. Radiology will be an important component of the dental education process.

References
3. International Medical League, ILC. 2013:10.1007/978-3-319-07473-2.

Acknowledgments
Both authors acknowledge the help of the University of Hawaii at Manoa extension technical staff in the development of this technology.
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Patient Care
Technologies in Dental Academic Institutions

- CAD CAM
  - Indirect Restorations & Dentures
- Digital Radiography/CBCT
  - 3D Printer
- Rotary Endodontics
- Caries Detection
- Digital Orthodontics
- Lasers
  - Soft and Hard Tissues

“Is dentistry responding to technology or is technology driving dentistry?”

Paul Trombly, DMD, MS, DAPM
video courtesy of Dr. Yeganegi (Canada)
ELECTRONIC HEALTH RECORD (EHR)

School responsibilities:

- Servers
- Data Centers
- Backups
- Security
- System administrators
- Network
- Legal

School responsibilities:

- Legal
- Network
ELECTRONIC HEALTH RECORD (EHR)

Integration with other Cloud/Web Systems
ELECTRONIC HEALTH RECORD (EHR)

Patient Portal

- Web
- Mobile device
2020: LEARNING HEALTH SYSTEM

- Automatically gather data
- Systems analyze data
- Clinician decides action
- Patient receives information
- Treatment provided
2020: LEARNING HEALTH SYSTEM

vitalconnect  physiQ  PPA PLATFORM  PPA ANALYTICS  Epic
TELEHEALTH TECHNOLOGIES
Innovation Through Collaboration - An Overview of the University of the Pacific, Arthur A. Dugoni School of Dentistry Virtual Dental Home Program

Paul E. Subar, DDS, EdD, FACP, Associate Professor of Dental Practice, Director of Special Care
Alan W. Budenz, MS, DDS, MBA, Professor, Dept. of Biomedical Sciences and Vice Chair, Dept. of Dental Practice

Abstract:

Long-term increasing and health disparities in the U.S. population led to the implementation of the Virtual Dental Home (VDH) to improve access to dental care, especially for those with limited access. This program provides a remote delivery of dental care services to patients who may not have access to traditional dental care settings. The Virtual Dental Home Model incorporates telehealth technologies, including digital exams, virtual consultations, and real-time communication between dental professionals and patients.

Introduction:

The Virtual Dental Home (VDH) is a model for delivering dental care services remotely to patients who may not have access to traditional dental care settings. The VDH model includes the following components:

1. **Remote Consultation**
   - Patients can consult with a dentist or dental hygienist remotely through telehealth technologies.
   - Consultations can be scheduled at a convenient time and location for the patient.

2. **Remote Treatment**
   - Patients can receive treatments such as fillings, extractions, and other procedures remotely.
   - Treatments can be scheduled at a convenient time and location for the patient.

3. **Remote Monitoring**
   - Patients can monitor their oral health conditions remotely through telehealth technologies.
   - Monitoring can be scheduled at a convenient time and location for the patient.

4. **Remote Education**
   - Patients can receive education on oral health care remotely through telehealth technologies.
   - Education can be scheduled at a convenient time and location for the patient.

5. **Remote Communication**
   - Patients can communicate with their dental care providers remotely through telehealth technologies.
   - Communication can be scheduled at a convenient time and location for the patient.

The VDH Model is designed to improve access to dental care services for patients who may not have access to traditional dental care settings. The VDH Model is a cost-effective and efficient way to deliver dental care services to a large number of patients.

Virtual Dental Home Model:

- **Remote Consultation**
- **Remote Treatment**
- **Remote Monitoring**
- **Remote Education**
- **Remote Communication**

The VDH Model is designed to improve access to dental care services for patients who may not have access to traditional dental care settings. The VDH Model is a cost-effective and efficient way to deliver dental care services to a large number of patients.
Telehealth and Clinical Mentoring Through a Collaborative Cloud Health Record

Mark Gennis, PhD, ICF Health Systems, Canada; Lynn Johnson, PhD, University of Michigan, School of Dentistry, USA

AIM
Health professionals in remote locations struggle to serve patients, as well as to improve their skills. The Collaborative for Health IT, consisting of three US dental schools (Michigan, Pittsburgh and North Carolina), The University of Sydney (Australia), University of Oxford (UK) and ICE Health Services (Canada) is addressing these issues through expanding a cloud-based electronic health record (EHR), while incorporating both telehealth and clinical mentoring functions.

GOALS
Our vision is to use technology to rapidly advance health, education and research.

In doing so, we are committed to addressing the following problems as priorities for dental education and the dental profession:

1. Continuity, innovation and cutting-edge technology.
2. Develop a state-of-the-art system that is continuously updated with patient information.
3. Improve access to patient information so that the needs of dental researchers are met.
4. Increase security through continuous external audits.
5. Ensure interoperability with other systems.
6. Create a system of governance that encourages the schools to develop the future dental profession.
7. Keep EHR costs at a level that allows the schools to focus their resources on their missions.

COLLABORATION
Collaboration members work together to guide the development of their EHR. Innovative applications are now being explored. These include Telehealth, Data Warehousing and Clinical Mentoring.

METHODS
- Connect clinicians to clients, remote dental patients, and other resources via cloud-based technology.
- Convenient access to patient information through an online portal.
- Panoramic and cone beam images can provide the record for emergency and consultations.

Security is ensured through standards set by Internet2, a partner of ICE, and continuous external audits. ICE is now in process of seeking SOC 2 Type 1 Certification.
**Aim**
Evaluate the effectiveness of mobile monitoring post-dental treatment for early detection of complications and to assist in dental education. Identify and treat complications earlier, reducing patient suffering and in-office visits and facilitating faculty evaluations.

**Methods**
Patients enrolled in the graduate prosthodontics program received text messages with surveys tailored to specific dental procedures using HIPAA compliant patient monitoring solution. On-time notifications alerted users to monitor patients. Monthly reports allowed close tracking of patient treatment outcomes and satisfaction.

**Objectives**
1. Early detection of complications.
2. Patient treatment name monitoring.
4. Reduction of unnecessary office visits.
5. Reduce costs to facility as well as patients.
6. Determine if the mobile application is user friendly.

**Monthly Report**
- Reports are generated for student and faculty.
- Data includes:
  - Early detection
  - Number of procedures
  - Classification
  - Success rate
- Comparison:
- Reports are useful for learning and clinical practice.

**Results**
Patient post-detection was 84%. An algorithm has been created to identify post-treatment complications in order to improve faculty evaluations and student learning. Clinically relevant information guided clinical decision making.

**Conclusion**
This was the first time the mobile monitoring service was applied in an educational institution. This service allowed a reliable and secure collection of patient post-treatment outcomes in a timely fashion. This patient outcome tracking system created learning opportunities for students and facilitated faculty evaluations.
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LESSONS LEARNED

• Set clear and realistic goals
• Have an end date
• Support for faculty must be provided; include it in a priori cost analysis
• Find a non-IT champion
• Buy before build; it's cheaper
• Don’t start if you won’t be able to finish
• Communicate, communicate, communicate
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GLOBAL PERSPECTIVE

Internet availability

• 2002: 3% of world’s population
• 2017: 50% of world’s population

Open Access: Free & unlimited access to materials

• Reward faculty for placing teaching materials in open access forums
• Rationalize the copyright process to encourage open access
• IFDEA: Was a leader in collecting quality content and making it available worldwide
Review participants’ expectations

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Patient care
Thank you!

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GROUP GROUND RULES

• Listen to understand
• Respect each other’s thinking
• Stay open to new ideas
• One speaker at a time
• Everyone participates; no one dominates
• Ask “What is possible?”
10-YEAR PROSPECTIVE ACTIVITY

1. Break into groups: Each group has a Recorder and Reporter

2. Answer the following questions: **In 2027, what technologies will be used routinely in dental education and patient care?**

   - Didactic Education Technologies
   - Pre-clinical Education Technologies
   - Patient Care Technologies
   - Telehealth
10-YEAR PROSPECTIVE ACTIVITY

3. Determine the top **2** technologies that are most likely to be used in each technology area.
   
   • Didactic Education Technologies
   • Pre-clinical Education Technologies
   • Patient Care Technologies
   • Telehealth

4. Why are these **2** technologies important?
Thank you!
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