Solutions to Preclinical Teaching Challenges in the first year of the Dental Curriculum

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BACKGROUND

Dental school, by the nature of the material taught, may be overwhelming for a newcomer. Overnight, a student who previously excelled in theory and didactic classes is confronted with the challenges of performing manual skills which he has never encountered previously, in a very minute scale. Acquiring new manual skills and dexterity, which will lay the groundwork for a solid foundation, depends on the teaching methods used from the very first day of dental school. Skills acquisition, along with conceptualization and mastery, relate directly to the teaching tools used to transfer knowledge and information from teacher to student. This is especially true in dentistry where the concepts of tooth preparation involve visualization in three dimensions.

CHALLENGES

As with any new skill, the optimal learning set up for a beginner dental student would be to have his instructor available at anytime during his cavity preparation. Without the traditional teaching setup, the beginner student may encounter the following issues:

1. A student cannot get ongoing feedback from the instructor during his drilling session especially during the sensitive initiation period of manual skills acquisition.
2. The message is delivered as a package of information (wall angle of 90 degrees, floor depth of 2.3mm, outline shape, etc) which may confuse the student about where to start and which direction to take.
3. The student relies on instructor feedback and availability and may not readily develop skills of self-assessment and critical thinking, which are the backbone of the clinical judgment.
4. Cavity preparation principles involve an understanding and a visualization of the 3 geometric planes (MO, BL, and OPG). These may be difficult for the student to conceptualize using 2 D materials.
5. Students in traditional lab settings often evaluate their work with instructors after completing a portion of their work instead of during the process. Clinically unacceptable errors may be encountered more frequently after they are made rather than being prevented beforehand.

SUMMARY

Visualization and Correction of Hand Piece Positioning

Ongoing Process Analysis

METHODS & RESULTS

• Thirty students were divided into 1 of 3 groups:
  • Blue Group - traditional lab instruction.
  • Red Group - traditional lab instruction and augmented reality simulator (AR).
  • Green group - augmented reality simulator only.

• Students learning with AR acquired skills faster than students receiving traditional lab instruction only.
• Learning was optimized in the group of students with access to both AR and an instructor.
• The long-term retention of skills with high quality performance was observed in the 2 AR groups.
• The motivation to practice and perform was more apparent in the two groups with AR training compared to the group without.

SOLUTIONS

1. Enabling students to receive ongoing feedback of their preparation at any moment of the procedure at the time they need it the most optimizes learning potential.
2. Real-time 3D visualization during the preparation process allows the student to develop a mental image of the intended outcome.
3. Focusing on developing and mastering skills individually guides the students through the entire process.
4. Enabling the student to practice skills acquisition with self-assessment prepares the students for clinical challenges by developing critical thinking skills.
5. Assessment of ongoing process and not outcome is enabled by real-time feedback.