

Faculty Innovator Grant 2011
Center for Learning Technologies

Final Report Form

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Project Title: (10 words or less)	Modeling and Simulation to Improve Dental and Periodontal Identification in Dental Hygiene Students

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1. Describe the specific teaching and learning issues being addressed by the proposal.

Historically, dental hygiene students struggle with correctly identifying, verbalizing and recording specific dental restorative and periodontal conditions. Prior to providing oral health care to patients in the Old Dominion University Dental Hygiene Care Facility, dental hygiene students must demonstrate proficiency in all areas of patient oral health assessment, treatment and evaluation. Pre-clinical laboratory sessions include students partnering together to practice oral diagnostic and assessment skills. However, the typical dental hygiene students who enter the program are young adults and have few restorations or periodontal diseases, limiting practical experience in critical skills necessary for successful assessment of oral health conditions with future patients.

Dental restorative substances that require accurate identification include amalgams, composites, precious/semiprecious metals, porcelain crowns and bridges, sealants and anomalies. Periodontal conditions that necessitate precise detection are gingival/periodontal defects, recession, mobility, furcation and attachment loss. Although these concepts are reviewed didactically using photographs and written descriptions, students continue to have difficulty comprehending two-dimensional models.

2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

None

3. Describe the development activities involved addressing the learning or teaching issue.

Using the existing head-and-neck-simulator, eight simulated-mouth-models were available for faculty to randomly interchange. These models demonstrated varying dental and periodontal conditions. Since no dental models of this type were available, stock models were modified by faculty to reflect typical restorative clinical findings.

Eleven stock interchangeable simulated mouth models were customized to reflect oral restorative findings; five simulated mouth models exhibited periodontal conditions and six simulated mouth models exhibited no periodontal conditions. Each simulated mouth model contained custom restorative materials reflective of what a typical dental hygiene patient may have present. Two-dimensional images were obtained by photographing dentition of three typical dental hygiene patients with various restorative and periodontal conditions.

Students were randomly assigned to the Simulator Group (SG) or the Didactic Group (control). Students in the SG utilized a randomly selected custom simulated mouth model for 3 sessions of 15 minutes each to practice identification, verbalization and documentation of dental and periodontal conditions. Students in the control group

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viewed different two-dimensional images for 3 sessions of 15 minutes each to also practice identification, verbalization and documentation of dental and periodontal conditions. Findings for both groups were recorded using standard dental and periodontal charting methods. Dental/periodontal charts were graded by dental hygiene faculty.

4. Describe the learning outcomes attained by the project.

This modeling and simulation tool enhanced the students' ability to accurately identify certain dental materials and conditions

5. Describe unexpected outcomes, if any.

Students from both groups were able to complete the dental charting portion of the assignment within the allotted 15-minute time. Neither group; however, was able to complete the periodontal assessment portion. Some students in the SG completed a portion of the gingival margin identification but no students completed the periodontal probing, attachment calculations or other components of the periodontal assessment. Students in the control group were unable to record any periodontal information due to the obvious limitations of two-dimensional media.

6. Describe the impact of the completed project on your colleagues, department, college, or community.

Educators within the disciplines of both dental and dental hygiene curriculum will be able to use the findings of this study to improve assessment skills of students. The supporting data which proves the effectiveness of the simulated technology demonstrates the need for educators to consider and adopt this new technology as a safe, efficient, and effective teaching methodology. Simulation of the oral cavity enhanced the pedagogical transfer of didactic clinical assessment and evaluation skills into a realistic scenario. The framework used in this study was Donald Kirkpatrick's theoretical basis for a progressive teaching strategy. This structured training methodology offers a four-level evaluation for judging simulated training programs. The following four components were present in this strategy: 1: *Reaction*; 2: *Learning*; 3: *Behavior*; 4: *Results*. This investigation will help the College of Health Sciences and Gene W. Hirschfeld School of Dental Hygiene by contributing to the body of knowledge promoting Modeling and Simulation in the health sciences. Hence, justification of Modeling and Simulation equipment purchasing may be easier for both entities. The Hampton Roads community will benefit from this study by having students more prepared and familiar with simulated scenarios as graduates entering the workforce.

7. Describe how the project can be a model, template, or prototype for use by other instructors.

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Using modeling and simulation has shown to be an effective method to transfer knowledge from instructor to student when compared to traditional teaching methods. Simulators provide integration of psychomotor skill training with problem-based learning, such as didactic instruction. This leads to improved performance when compared to isolated classroom delivered, problem-based learning. Using the customized simulated mouth models will provide a low-cost opportunity for student dental hygienists to repetitively practice individual skills. In addition, this allows for immediate instructor feedback and the opportunity for students to become confident and proficient in critical skills necessary for successful assessment of oral conditions.

8. Describe the technology used to help address the issues described in the proposal.

Currently, one head and neck simulator is available no variability in the dental or periodontal conditions of the removable dentition. Extra removable typodonts were purchased and customized to reflect more accurate findings. Although budgetary restraints prevented the purchase of semi-precious and precious metal restorations, the amalgams, composites and sealants that were placed on each of the typodonts proved to be successful in assisting students gain skills in restoration identification.

9. Describe products, if any, that are a result of the project.

The products which are the result of this investigation are the simulated mouth models specifically created for this study. Each simulated mouth model reflected patient scenario periodontal and restorative findings as created by the research author. By demonstrating the effectiveness of this simulation technology, future simulation products may be created and adopted in the same manner by other researchers and institutions. Having the financial support from the FIG (Faculty Innovator Grant) provided an opportunity to create scenario models, provide support data for the introduction of Modeling and Simulation in dental healthcare, and inspire future studies.

10. Describe the future plans for this project, if any.

This modeling and simulation exercise will be implemented into the junior year dental hygiene pre-clinical laboratory course to assist students in accurately identifying dental restorations and periodontal conditions prior to actual patient care. Using this type of simulation tool in conjunction with traditional learning modalities will allow students to revisit certain oral conditions presented in the classroom setting.

In addition, our department is investigating the feasibility of acquiring space for multiple simulators to allow for several students to benefit from simulation technology.

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11. Attach a financial report with updated Budget Plan Matrix.

Final Budget Matrix

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
Standard Typodont Mouth Models	6	1329	1329	0
Periodontal Typodont Mouth Models	5	1563	1563	0