The Use of 3D Printing in Dental Implant Education

Stuart J. Froum, DDS, Sang-Choon Cho, DDS, Peter Michael Loomer, BSc, DDS, PhD, MRCD, Aikaterini Georgantza, DDS, Takanori Suzuki, DDS, PhD, Yung Cheng Paul Yu, DDS
Rapid prototyping techniques for complex three-dimensional model fabrication were introduced more than a decade ago; however they were not widely applied in the field of dentistry because of their prohibitive cost. A survey to evaluate the use of three-dimensional models was completed by the 12 post-graduate students in the Department of Periodontology and Implant Dentistry at New York University College of Dentistry implant program. It was concluded that all aspects of implant training were improved using three-dimensional models. These models can be accurately and rapidly produced, based on Cone Beam Computed Tomography datasets and with the help of various rapid prototyping techniques. Using these models in implant dentistry training appears to be highly beneficial for demonstrating complex anatomical situations, instructing students and treatment planning. Based on these findings and the students’ experiences it is recommended that educators use these models in periodontal and prosthetic training in specialty programs as well as for undergraduate teaching.

**EDUCATIONAL OBJECTIVES**

The overall objective of this article is to discuss the basic principles and applications of three-dimensional printing for educational use in implant dentistry, and to review the integration and experience of this technology in a 2-year post-graduate implant training program. After completing this article, the reader will be able to:

1. Review the history and use of 3D models and techniques to create these;
2. List and describe advantages of 3D versus 2D models in implant dentistry;
3. Describe the use of 3D models for implant treatment planning and pre-operative practice; and,
4. Review the results of the student survey and implications for dental education.

**ABOUT THE AUTHORS**

Stuart J. Froum, DDS is a Diplomate of the American Board of Periodontology. He earned his dental doctorate from New York University College of Dentistry after graduating with a BA from Brooklyn College. Dr. Froum then completed a general dentistry internship at Brooklyn Veterans Administration Hospital and a periodontal residency at New York Veterans Administration Hospital and New York University Dental Center.

Currently, Dr. Froum is a Clinical Professor and Director of Clinical Research in the Department of Periodontics and Implant Dentistry at New York University Dental Center. He is also a Diplomate of the International College of Implantology.

Dr. Froum is the past President of the American Academy of Periodontology (2013-2014), past President of the Northeastern Society of Periodontics (1995-1996) and sits on the editorial review boards of Middle East Journal of Oral and Maxillofacial Surgery, the International Journal of Periodontics and Implant Dentistry and Journal of Periodontology. He is the recipient of The 2016 AAP Master Clinician Award. He also received the AAP Gies Award and the NESP Hirschfeld Award. Dr. Froum is the Editor and an Author of several books on periodontics and implantology.
The Use of 3D Printing in Dental Implant Education

Sang-Choon Cho, DDS is a Clinical Assistant Professor and Director of the Advanced Program for International Dentists in Implant Dentistry and Co-director of Clinical Research in the Department of Periodontology and Implant Dentistry at New York University College of Dentistry. He currently holds a position as an ICOI Ambassador and recognized as a Diplomate of ICOI. Dr. Cho graduated from the College of Dentistry at Kyungpook National University, Korea, and received his Bachelors of Dental Science in 1984. Dr. Cho continued his clinical practice in South Korea, until coming to the United States in 1995 to further his studies. He then received an Advanced Implantology Certificate from the New York University, where he has been teaching hands-on implant surgery and restorative courses since 1997. In 2003, Dr. Cho received his Doctorate in Dental Surgery, from New York University.

Dr. Cho is part of the Editorial Board for Journal of Periodontal and Implant Science; he is a Member of the Academy of Osseointegration (AO), Greater New York Academy of Prosthodontics (GNYAP) and OKU. He is a Chairman of the Implant Dentistry Research & Education Foundation Scientific Advisory Board. He received the Outstanding Teacher Award in 2013. Dr. Cho has published over 30 articles in peer review journals and wrote chapters in four textbooks. He delivers timely scientific presentations and continually publishes articles in prestigious dental journal. In addition to teaching and lecturing, Dr. Cho maintains a private practice in New York City, specializing in Implantology and Dental Aesthetics.

Peter Michael Loomer, BSc, DDS, PhD, MRCD is the Chairman and Clinical Professor of the Department of Periodontology and Implant Dentistry at New York University College of Dentistry (NYUCD) and the Director of Oral Health for Global Health Sciences, NYU College of Global Public Health. He is a graduate of the University of Toronto, where he obtained all of his academic and clinical specialty training. He is a Diplomate of the American Board of Periodontology, member of the Royal College of Dentists of Canada and a Fellow of the New York Academy of Medicine and the OKU Dental Honors Society. He serves as Associate Editor for the Journal Biomed Central Oral Health, and as a reviewer for many other peer-reviewed journals. Over the last 25 years, Professor Loomer has studied bone and microbial aspects of periodontal diseases. His research has a strong focus on global oral health, concentrating on improving oral health of underserved populations in Africa and India. Professor Loomer is the recipient of the Medical Research Council of Canada Medical Sciences Fellowship, the AAP Young Investigator Fellowship Award, Oral-B Dr. Robert Hutson Award for Dental Education, AAP Outstanding Educator Award, Pierre Fauchard Society Faculty Award, and New York Academy of Medicine Fellowship.

Aikaterini Georgantza, DDS obtained her dental degree from the Aristotle University of Thessaloniki School of Dentistry in 2007. She graduated from the Advanced Program in Implant Dentistry for International Dentists at NYU in 2015. She is currently a resident of the Periodontology Post Graduate Program at NYUCD.

Takanori Suzuki, DDS, PhD graduated from the Nippon Dental University College of Life Dentistry in Tokyo, Japan. He received his DDS degree there in 2000, a doctorate of operative dentistry in 2004, and then worked in the department of operative dentistry as an assistant professor from 2004 to 2008. He completed a one-year Advanced Program for International Dentists in Comprehensive Dentistry at NYUCD in 2009, the two-year Advanced Program for International Dentists in Implant dentistry in 2011 and a clinical fellowship in Implant dentistry in 2012. He is currently a Clinical Assistant Professor in the Ashman Department of Periodontology and Implant Dentistry at NYUCD.

Yung Cheng Paul Yu, DDS graduated from Dental School in 1997 at Universita’ Sapienza in Rome, before training in Advanced Orthodontic and Gnatology at Ospedale Nuovo Regina Margherita in Rome and later completing his Advanced Implant Dentistry training at NYU. Dr. Yu lectures nationally and internationally and has published in several peer reviewed journals. Dr. Yu is currently a full time faculty member in the Ashman Department of Periodontology and Implant Dentistry at NYUCD.
Introduction

Numerous clinical reports have demonstrated the benefits of digital technology in the diagnosis, treatment and fabrication of implant-supported dental prostheses. Digital diagnostic impressions, virtual planning, computer-guided implant surgery and custom abutments, fabricated using Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM), can be used to plan and complete implant placement and implant-supported dental prostheses.

Recent advances in computed tomography (CT) technology have improved visualization of bone morphology when compared to standard two-dimensional (2D) radiographs. Use of this planning software has the potential to increase the predictability of implant treatment while avoiding unwanted complications. Techniques have also been developed using new software and hardware to accurately represent data in three-dimensional (3D) format on a 2D screen. Given the visualization provided by sophisticated software packages, the fabrication of physical models may seem unnecessary; however, the display of 3D morphology on a 2D screen does not provide the surgeon with a complete representation of the patient’s anatomy (Fig. 1). Using 2D visualization, surgeons must learn to interpret the information in order to mentally reconstruct the 3D geometry. The utilization of 3D physical models is a significant advancement, whereby 3D information is seen in an accurate duplication of the patient’s anatomy (Fig. 2).

Rapid prototyping (RP) refers to the fabrication of 3D physical models directly from a CAD model. 3D printing was introduced more than a decade ago, but was not widely applied in the field of dentistry at the time as early 3D printers were highly complex and expensive, suitable only for the largest manufacturers that could afford to pay several hundred thousand dollars for them. However, a series of advances, and cost reduction, has enabled the use of 3D printing in mainstream dentistry. Moreover, by providing visual and tactile information and documentation of the patient’s anatomy, 3D printing has enormous potential in changing the overall
process of teaching, treatment planning, and successful placement and restoration in implant dentistry. Computer-directed RP techniques in dental education have begun to become more available. To date, however, there are few publications regarding the various uses of 3D models in combination with traditional training methods in the fields of restorative dentistry and oral and maxillofacial surgery.11-14

Experience with the use of 3D Printed Models in the New York University College of Dentistry (NYUCD) Implant Program

Since 2012, 3D printed models have been successfully integrated and used in educating and training students in the International Implantology Program at NYUCD.

RP technologies and 3D model fabrication in dentistry

A physical model was manufactured using data from Cone Beam Computed Tomography (CBCT) and Magnetic Resonance Imaging (MRI).15-17 Methods employed to fabricate a physical prototype fall into two categories: subtractive and additive. The subtractive technique employs conventional numerically controlled (NC) machining, generally milling, and the shape of the model is created from a block of polyurethane or other foam. However, this method has limitations – complex geometries are difficult to program, and reproduction of anatomical undercuts is almost impossible. In addition, the quality of milled models is limited because polyurethane foam is brittle, soft, cannot be sterilized, and significant excess material waste is generated. On the other hand, RP models are created by the additive technique and can include undercuts, voids and complex internal geometries such as neurovascular canals and sinuses. These models can also be translucent, allowing the internal anatomy to be easily seen. Therefore, additive methods are advantageous in fabricating physical models with anatomical details. In addition they are cost-effective, as the materials used are in powder or liquid forms, and then hardened by external power sources before being layered into the final model. The most common additive technologies in dentistry are Selective Laser Sintering, Fused Deposition Modeling, Multi-Jet Modeling and Stereolithography.8

Prior to 3D printing, highly complex data had to be pre-processed to provide a format that a RP system could recognize. The current process for data utilization is divided into the following steps: 1. Data acquisition; 2. Image processing; and, 3. Model fabrication. The digital imaging and communications in medicine (DICOM)-based CBCT data can now quickly be exported into the standard tessellation language format used in RP.11 This has greatly facilitated the printing of 3D models derived from radiographic images. As part of the workflow following acquisition of CBCT scan data, CT slices are created as 2D layers during the printing process and these layers are then assembled into a solid mass. The result is the easy production of CBCT data-based, tactile models for educational purposes. The 3D models serve as identical physical representations of the patient’s oral anatomy derived from CT data sets. By accurately simulating the hard tissue, they provide both visual and tactile information and documentation for visualization, diagnostic, therapeutic and educational purposes.

Use of 3D Models in Dental Implant Education

The use of 3D models (Formlab Inc., Somerville, MA) in the NYUCD dental implant education program can be divided into 4 major areas:

1. Patient education and informed consent
2. Student visualization of anatomical structures related to implant dentistry
3. Treatment planning and pre-operative practicing
4. Evaluation of prosthetic options using provisionalals created to simulate the final prostheses

1. Patient education and informed consent

3D models help patients understand the treatment plan prior to signing an informed consent form and allow them to feel more comfortable about the proposed treatment. For many patients, observing the procedure on a 3D model decreases fear of the unknown and allows them to “see” the procedure in a non-threatening way (Figs. 3,4).

2. Dental implant education to teach anatomical structures

Unlike traditional models (Fig. 5), 3D models can replicate
the exact maxillary and mandibular anatomy, which allows the student to view the external and internal structures that will be encountered during surgical intervention, thereby aiding treatment planning (Fig. 2, page 3). The most common maxillary anatomical landmarks that are significant in implant dentistry are: the sinus floor and sinus anatomy including the septa, the posterior superior alveolar artery, the greater palatine foramen and the incisive canal (IC). In the mandible, they are: the pathway of the inferior alveolar nerve (IAN) and the mental foramen.

3. Utilizing 3D models for treatment planning and pre-operative practice

3D models have been used to assist students in developing a pre-surgical treatment plan for routine and complex procedures, including selection of the surgical technique and materials, and simulation of the planned surgical procedure. The benefits of planning and practicing implant procedures on these models with the implant faculty instructors are numerous (Fig. 5):

• Students encounter the exact bone anatomy that they will find under the soft tissue at the time of the actual surgery and can rehearse the procedure, correct any errors during the rehearsal, and become familiar with the proper technique (Figs. 6,7, page 6).
• If simultaneous bone augmentation will be required at the time of implant placement, the student can be prepared with the materials and techniques needed. The actual surgical procedure may then require less time, with accuracy improved and the student becoming more confident.
The Use of 3D Printing in Dental Implant Education

- Improved communication and trust, not only between the student and the Faculty/Instructor but also between the student and patient.
- Accurate selection of the required materials, e.g., in the case of ridge augmentation, using a 3D model, enables the student and faculty to visualize the defect, measure it and consequently select the appropriate materials. The type of implant and material can be accurately selected, and in some cases membrane barriers can be specifically contoured, prior to surgery.
- Lastly, second-year students are able to practice advanced and more complex procedures hands-on with 3D models, e.g., immediate implant placement and immediate provisionalization, implant placement lateral to the IAN, ridge split techniques and sinus augmentation procedures.

Figure 6. 3D model used for surgical simulation prior to actual surgery

Figure 7. Implant placed on 3D model according to ideal mesio-distal and bucco-lingual dimensions with resulting fenestration, lateral and occlusal view. Surgical “practice” increases successful placement during the actual surgery and demonstrates implant position placement changes to avoid fenestration.

Figure 8. Modified implant position with no resulting fenestration.
with or without simultaneous implant placement. This planning is aided by individually prefabricated 3D guides that allow accurate window design on the models and are then used on the patient, thereby increasing accuracy while reducing surgical time (Fig. 8).

The innovative application of 3D technology has helped in optimizing treatment outcomes, and in reducing operating time and intra-operative complications.  

4. Utilizing 3D models for prostheses and for implant maintenance education

RP techniques are becoming more attractive in dental prosthodontics and can be used to design, develop and manufacture dental prostheses such as provisional restorations, copings, crowns, and fixed partial dentures. Prosthetic applications can be reviewed using 3D models, with particular focus on fabrication of the wax pattern of the actual prostheses, surgical templates, custom trays, bite registration jigs, provisional restorations and night guards (Fig. 5, page 5). Data is acquired using 3D scanning devices and CAD for the prosthesis. Unlike with traditional methods, dental prostheses can now be fabricated layer by layer directly from a computer model, without part-specific tooling or human intervention. Labor costs are substantially reduced and better dental restorations can be delivered in less time. In addition, the models can be used to demonstrate maintenance of the implant-restoration complex to patients.

To evaluate experiences and opinions regarding the use of 3D models in their training, a 12-question visual analog scale (VAS) survey with a scale from 1 to 10 (1: of little help, 10: very helpful) was completed anonymously by each first- and second-year post-graduate student (n=12). These two classes of students had been exposed to the 3D printing models to a different extent. First-year students had limited or no experi-

| Table 1. Survey questions asked regarding 3D printing models |
|------------------|-------------------------------------------------|
| Item  | Question: The use of 3D printing models improved the following procedures or understanding. |
| 1     | Rapport with the patient                       |
| 2     | Obtaining informed consent from the patient regarding their treatment plan |
| 3     | Treatment planning skills                      |
| 4     | Knowledge of the patient’s anatomy             |
| 5     | Ordering of materials                          |
| 6     | Understanding the surgical procedure           |
| 7     | Practicing the surgical procedure and becoming more proficient with the 3D models |
| 8     | Decreased time of the surgery                 |
| 9     | Smoother post-op course                        |
| 10    | Planning and placing of provisional restorations with the use of 3D models |
| 11    | Planning of auxiliary restorations with the use of 3D models |
| 12    | Planning and final production of the implant supported restoration with the use of 3D models |

Note: Results were quantified on a scale of 1 to 10.
ence restoring implant-supported prostheses in general and with the help of 3D models in particular. Therefore, only the students who had experience with the 3D models in planning and placing provisional, auxiliary and final restorations were asked to answer questions 10, 11 and 12 in the survey. Survey questions are shown in Table 1.

Results

In the students’ opinion, all aspects of implant training – from planning to knowledge of the patient’s surgical anatomy to production of the provisional and final restorations – were improved using 3D models. Patient understanding of the procedures, and confidence in giving informed consent, were also improved as evidenced by ratings in the 8-9 range. The areas rated as providing the least improvement were “decreased time of the procedure” and “smooth post-operative course,” although improvements were still reported (scores >7.0) (Table 2).

Discussion

RP technologies were originally developed in the 1980s to build a prototype of a new product based on a computed file, and have been a very valuable method over the last decade. This technique is widely used in product design in other industries, especially in the automobile industry and in engineering.8 The successful use of RP technology for clinical applications in dentistry has been documented in the literature.12,13 In addition, as CT slice thickness is reduced, 3D model resolution will continue to improve. For a single model the printing process takes up to 1-2 hours depending on the layer thickness used. The benefit of this process is that one group of 20 mandibles can be finished in 5-10 hours. With the help of various RP techniques, 3D model fabrication can be completed accurately and rapidly.

RP techniques are now regarded as a promising option for dental prosthesis production and have been a valuable addition to implant training at NYUCD. However, few studies have addressed its use as a teaching resource and none for dental implant education. With reference to the dental literature, this is the first time applications of 3D printing have specifically been used for educational and didactic purposes in implant dentistry.

The use of 3D models in the education of implant dentistry appears to be highly beneficial to demonstrate complex anatomical situations, for instructing students and for treatment planning. The survey results demonstrated that students believe that 3D models improved the educational experience in treatment planning, patient anatomy, practice in implant placement as well as the fabrication of provisional and final implant-supported restorations. Based on these findings, it would follow that educators can use 3D models in periodontal and prosthetic training in various specialty programs and undergraduate teaching. Surgical education with models, using data from cone beam computed tomography (CBCT) patients, provides a method of teaching and has a long tradition in conservative operative dentistry.

In conclusion, generating 3D models based on CBCT datasets has promising potential for implant education, for understanding, planning and surgical practice. Mass
production of these models also makes it feasible to use 3D models in all implant-training programs. Further teaching options and uses of the 3D printer may be revealed in the future, and their applicability in various education settings remains to be determined in future studies.

References
9. The History of 3D Printing: redOrbit Press – A publication of Science Matters Media LLC.

Webliography
1. Rapid prototyping technology was originally developed in the ________________.
   a. 1970s  
   b. 1980s  
   c. 1990s  
   d. 2000s

2. 3D printed models were not widely used in the field of dentistry until recently as ________________.
   a. they were highly complex  
   b. their cost was prohibitive  
   c. only large manufacturers could accommodate their large size  
   d. a and b

3. Displaying 3D morphology on a 2D screen provides the surgeon with ________________ representation of the patient’s anatomy.
   a. a high resolution  
   b. a complete  
   c. an incomplete  
   d. a and b

4. Using the subtractive technique to create physical prototypes, one limitation is that ________________.
   a. reproduction of anatomical undercuts is almost impossible  
   b. the relatively poor quality of milled models  
   c. polyurethane foam is brittle, soft, cannot be sterilized  
   d. all of the above

5. Prior to 3D printing, highly complex data had to be pre-processed to provide a format that a RP system could recognize.
   a. True  
   b. False

6. The additive method to create physical prototypes results in ________________.
   a. translucent models whereby the internal anatomy can be observed  
   b. models that can include undercuts, voids and complex internal geometries  
   c. cost-effective models  
   d. all of the above

7. By accurately simulating the hard tissue, 3D models provide ________________.
   a. visual information  
   b. tactile information  
   c. documentation for visualization, diagnostic, therapeutic and educational purposes  
   d. all of the above

8. For many patients, observing the procedure on a 3D model ________________.
   a. decreases visualization of the procedure  
   b. decreases fear of the unknown  
   c. increases resistance to the proposed treatment  
   d. decreases compliance

9. The ________________ is/are one of the most common maxillary anatomical landmarks that is/are significant in implant dentistry.
   a. the sinus floor and sinus anatomy  
   b. the posterior superior alveolar artery  
   c. the greater palatine foramen and the incisive canal  
   d. all of the above

10. The pathway of the inferior alveolar nerve (IAN) and the mental foramen are significant landmarks for implant dentistry.
    a. True  
    b. False
CEQuiz

11. When using 3D models, the student can _______________.
   a. remove any possibility of implant failure
   b. accurately treatment plan and practice the procedure ahead of the patient visit
   c. avoid patients being noncompliant with maintenance
   d. all of the above

12. Using 3D models helps _______________.
   a. to improve team communication and trust
   b. with accurate selection of the required materials
   c. to improve accuracy and may reduce treatment time
   d. all of the above

13. Implant students are able to practice _______________ using 3D models.
   a. Immediate implant placement and immediate provisionalization
   b. implant placement lateral to the IAN
   c. sinus augmentation procedures
   d. all of the above

14. RP techniques are becoming more attractive and can be used to design, develop and manufacture _______________.
   a. dental prostheses
   b. bone grafts
   c. temporary anchorage devices
   d. luting cements

15. According to the responses of the students at the NYU Implant Program, the biggest improvement in their educational experience by incorporating the use of 3D models was _______________.
   a. knowledge of the patient’s anatomy
   b. treatment planning skills
   c. practicing the surgical procedure and becoming more proficient
   d. Planning and placing of provisional restorations

16. RP techniques can be used to design, develop and manufacture dental prostheses.
   a. True
   b. False

17. On the 1 – 10 scale used in the survey, the average score students gave when asked to rank how much 3D printing models helped in the planning and placement of provisional restorations was _______________.
   a. 8
   b. 8.4
   c. 9
   d. 9.5

18. According to the student survey responses, the area providing the least improvement with incorporating the use of 3D models was _______________.
   a. patient understanding of the procedures
   b. treatment planning skills
   c. decreased time of the procedure
   d. confidence in treating the patient

19. Using 3D scanning devices and CAD for the prosthesis, _______________.
   a. dental prostheses can now be fabricated layer by layer directly from a computer model
   b. labor costs are substantially reduced
   c. the models can be used to demonstrate implant maintenance to patients
   d. all of the above

20. Generating 3D models based on CBCT datasets has promising potential for implant education, for understanding, planning and surgical practice.
   a. True
   b. False
**CE ANSWER FORM**

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clarity of objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Usefulness of content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Benefit to your clinical practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Usefulness of the references</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Quality of written presentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Quality of illustrations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Clarity of quiz questions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Relevance of quiz questions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Rate your overall satisfaction with this course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Did this lesson achieve its educational objectives?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>11. Are there any other topics you would like to see presented in the future?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EDUCATIONAL OBJECTIVES**

1. Review the history and use of 3D models and techniques to create these;
2. List and describe advantages of 3D versus 2D models in implant dentistry;
3. Describe the use of 3D models for implant treatment planning and pre-operative practice; and
4. Review the results of the student survey and implications for dental education.

**COURSE EVALUATION**

Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

- Clarity of objectives
- Usefulness of content
- Benefit to your clinical practice
- Usefulness of the references
- Quality of written presentation
- Quality of illustrations
- Clarity of quiz questions
- Relevance of quiz questions
- Rate your overall satisfaction with this course
- Did this lesson achieve its educational objectives?
- Are there any other topics you would like to see presented in the future?

**COURSE SUBMISSION:**

1. Read the entire course.
2. Complete this entire answer sheet in either pen or pencil.
3. Mark only one answer for each question.
4. Mail answer form or fax to 732-303-0555.

For immediate results:

1. Read the entire course.
2. Go to www.dentallearning.net/3DP-ce.
3. Log in to your account or register to create an account.
4. Complete course and submit for grading to receive your CE verification certificate.

A score of 70% will earn your credits.

**AGD Codes: 690, 691, 697**

**QUIZ ANSWERS**

Fill in the circle of the appropriate answer that corresponds to the question on previous pages.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D
11. A B C D
12. A B C D
13. A B C D
14. A B C D
15. A B C D
16. A B C D
17. A B C D
18. A B C D
19. A B C D
20. A B C D

**Price:** $29  **CE Credits:** 2

Save time and the environment by taking this course online.

If you have any questions, please email Dental Learning at questions@dentallearning.net or call 888-724-5230.