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# Knowledge of dental undergraduate students about digital photography and impact of training on the subject

Glória Beatriz do Nascimento Andrade[1]
0009-0003-6347-6866

Quemuel Pereira da Silva[1]
0000-0002-0093-6322

Maria Vitória Dantas Oliveira[1]
0000-0001-7663-3793

Luana Angélica Aires Rodrigues Jordão[1]
0000-0003-3636-129X

Paulo Rogério Ferreti Bonan[1]
0000-0002-4449-4343

[1]Universidade Federal da Paraíba(UFPB), João Pessoa, Paraíba, Brasil.

Correspondence:
Glória Beatriz do Nascimento Andrade
E-mail: gloria.beatriz@academico.ufpb.br

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**Abstract** The present study aimed to evaluate and compare the knowledge of Dentistry students regarding photography in the diagnostic process of oral lesions, before and after participating in audiovisual training on the subject. Data collection was carried out through two questionnaires, answered before and after the presentation of a training video on the topic. The questionnaires were developed by the researchers based on information obtained from the literature. The training video was created by the researchers using the Animaker® platform. The data were organized in an electronic spreadsheet and later exported to the statistical software JAMOVI®. Of the 63 participants, 44 (71.4%) were female, with a mean age of 24.9 years, and most of them (n=37, 60.3%) were in the 7th semester. Most students (n=38, 61.9%) do not usually photograph the cases they attend, and those who did used their mobile phones. The majority of participants (n=44, 71.4%) had never received guidance on how to take photographs. The average number of correct answers in the pre-video questionnaire was 1.83±1.21, while in the post-video questionnaire the average was 4.16±1.23. It is concluded that the training contributed to an increase in students' knowledge regarding the subject.
**Descriptors:** Education, Dental. Photography, Dental. Oral Medicine. Diagnosis, Oral.

**Conocimiento de los estudiantes de odontología sobre fotografía digital y impacto de la capacitación en el tema**
**Resumen** El presente estudio tuvo como objetivo evaluar y comparar el conocimiento de los estudiantes de Odontología sobre la fotografía en el proceso diagnóstico de lesiones bucales, antes y después de participar en una capacitación audiovisual sobre el tema. La recolección de datos se realizó mediante dos cuestionarios, respondidos antes y después de la presentación de un video de capacitación sobre el tema. Los cuestionarios fueron elaborados por los investigadores con base en información obtenida de la literatura. El video de capacitación fue creado por los investigadores utilizando la plataforma Animaker®. Los datos fueron organizados en una hoja de cálculo electrónica y posteriormente exportados al software estadístico JAMOVI®. De los 63 participantes, 44 (71,4%) eran mujeres, con una edad media de 24,9 años, y la mayoría (n=37, 60,3%) cursaba el séptimo semestre. La mayoría de los estudiantes (n=38, 61,9%) no suele fotografiar los casos que atiende, y quienes lo hacían utilizaban el teléfono móvil. La mayoría de los participantes (n=44, 71,4%) nunca había recibido orientación sobre cómo tomar fotografías. El promedio de respuestas correctas en el cuestionario previo al video fue de 1,83±1,21, mientras que en el posterior al video fue de 4,16±1,23. Se concluye que la capacitación contribuyó al aumento del conocimiento de los estudiantes respecto al tema.
**Descriptores:** Educación en Odontología. Fotografía Dental. Medicina Oral. Diagnóstico Bucal.

**Conhecimento de graduandos de Odontologia sobre fotografia digital e impacto de capacitação sobre o tema**
**Resumo** O presente estudo teve a finalidade de avaliar e comparar o conhecimento de estudantes de Odontologia sobre a fotografia no processo diagnóstico de lesões bucais, antes e após participarem de capacitação audiovisual sobre o tema. A coleta de dados foi feita por meio de dois questionários, respondidos antes e após a exibição de um vídeo de capacitação sobre o assunto. Os questionários foram elaborados pelos pesquisadores, de acordo com informações obtidas na literatura. O vídeo de capacitação foi construído pelos pesquisadores na plataforma Animaker®. Os dados

foram organizados em planilha eletrônica e posteriormente exportados para o *software* de estatística JAMOVI®. Dos 63 participantes 44 (71,4%) eram do sexo feminino, com média de idade de 24,9 anos e a maioria (n=37, 60,3%) era do 7º período. A maioria dos alunos (n=38, 61,9%) não costumam fotografar os casos que atendem e os que fotografavam utilizavam o celular. A maioria dos participantes (44, 71,4%) nunca tinha recebido orientação de como fotografar. A média de acertos no questionário pré-vídeo foi de 1,83±1,21, enquanto no pós-vídeo a média foi de 4,16 ±1,23. Conclui-se que a capacitação contribuiu com o aumento do conhecimento dos discentes em relação ao tema.
**Descritores:** Educação em Odontologia. Fotografia Dentária. Medicina Bucal. Diagnóstico Bucal.

## INTRODUCTION

In Dentistry, photography was initially introduced mainly in Orthodontics, with the purpose of recording and comparing the beginning, progression, and outcome of treatments, as well as clarifying cases for study in the absence of the patient. However, with the advancement and spread of digital photography, photographic documentation has become popular in other dental specialties as well[1].

In addition to being used for case monitoring, photographs can also serve educational purposes, act as legal records of treatments, document patients, and facilitate communication among dentists[2].

Images taken in the clinic are also important tools that aid in diagnosis in Dentistry, as they can depict lesions at a larger scale than their actual size, thus improving visibility for the dentist and communication among the different specialties involved in oral diagnosis[1].

Therefore, capturing high-quality images is extremely important in clinical practice. However, achieving this requires knowledge, and many dentists do not have access to materials that provide information on how to take such photographs or do not consider them necessary[3].

Among the reasons why many professionals do not use this tool in clinical practice are the lack of opportunities, educational materials, and encouragement during undergraduate studies, highlighting how little this topic is discussed in universities. It is a subject more frequently addressed in postgraduate courses, although still not comprehensively or with sufficient emphasis on its importance in everyday professional practice. Furthermore, there is little incentive for the development of didactic content on how to obtain quality images[3].

Considering this context and the scarcity of didactic material on the topic, the present study aimed to develop a video on how to take photographs to assist in the diagnostic process, and to evaluate and compare the knowledge of Dentistry students regarding photography in oral diagnosis, before and after participating in audiovisual training using the developed material.

## METHODS

This study is a descriptive, cross-sectional, and observational investigation with a quantitative and statistical approach. The research project was approved by the Research Ethics Committee under protocol number CAAE 57405322.5.0000.5188.

The sample consisted of 63 students enrolled in the Dentistry program at the Federal University of Paraíba (UFPB), Paraíba, Brazil, from the 5th to the 10th academic semester.

Data collection was carried out using two questionnaires adapted from Rocha et al. (2016)[4]. The first questionnaire, administered prior to the viewing of an educational video on photography applied to Dentistry, contained a total of 18 questions. In addition to technical aspects, it included general questions about the participants and their experience with photography in clinical practice at the university (Figure 1). The second questionnaire (Figure 2), completed after viewing the video, consisted of 12 questions focused on the subject matter and general patient information.

Participants completed the questionnaires either remotely or in person. In the remote format, participants received a Google Forms link to the first questionnaire, followed by access to the instructional video, and then the second questionnaire. In the in-person format, participants received a printed version of the first questionnaire, watched the video projected by the researchers, and subsequently completed the second printed questionnaire.

The instructional material was developed based on the current literature on the topic, and the video was created by the researchers using the Animaker® platform.

The collected data were entered into an Excel spreadsheet (Microsoft Office 2017 for Windows) and later exported to the JAMOVI® statistical software. The Kolmogorov-Smirnov test was applied to assess the normality of the data distribution. Upon confirmation of normality, Student's t-test was used for statistical analysis.

**Dear participant, please answer the questions below according to your knowledge:**

1. Initials of your full name:
2. Gender: ( ) Female ( ) Male
3. Age (in years):
4. Which semester are you currently attending? ( ) 5th ( ) 6th ( ) 7th ( ) 8th ( ) 9th ( ) 10th
5. Do you usually photograph the clinical cases you attend? ( ) Yes ( ) No ( ) Not applicable
6. If you answered yes to the previous question, what device do you use to take the photos? ( ) Digital camera ( ) Mobile phone ( ) Other:
7. During the documentation of clinical cases, who takes the photos of the lesions? ( ) Myself ( ) My clinical partner ( ) The professor ( ) Not applicable
8. Have you ever received guidance on how to take good dental photographs? ( ) Yes ( ) No
9. If yes, how did you receive this guidance? ( ) Through mandatory courses in the Dentistry curriculum ( ) Through elective courses in the Dentistry program ( ) Through internet research ( ) Through continuing education courses ( ) At congresses ( ) From Regional or Federal Dental Council bulletins ( ) In scientific journals or magazines
10. For what purposes do you believe digital photography is used in Dentistry? (Check all that apply) ( ) To complement the patient's clinical record ( ) As evidence in legal cases ( ) Before any procedure ( ) For evaluating and improving work techniques ( ) For describing lesion color, shape, texture, and size ( ) For patient follow-up ( ) As teaching material ( ) For research purposes ( ) For communication with dental laboratories ( ) Marketing ( ) Other:
11. What light source(s) do you believe are appropriate for dental photography? ( ) Ambient light ( ) Operatory light ( ) Camera or phone flash ( ) External flash ( ) Flashlight ( ) Other:
12. What is the correct sequence to follow when taking clinical photographs? ( ) Extraoral photos – intraoral fotos ( ) Intraoral photos – extraoral fotos ( ) The sequence is irrelevant
13. What do you consider the correct distance for extraoral photographs? ( ) Between 50–60 cm ( ) Between 60–70 cm ( ) Between 90–100 cm ( ) Between 150–300 cm ( ) I don't know
14. What do you consider the correct distance for intraoral photographs? ( ) Between 10–20 cm ( ) Between 20–30 cm ( ) Between 30–40 cm ( ) Between 40–50 cm ( ) I don't know
15. To obtain a good photograph, it is necessary to use high resolution. Do you know how to adjust the resolution on the camera you use? ( ) Yes ( ) No
16. Which settings do you believe are related to image resolution? ( ) Photo size ( ) Color space ( ) Image quality ( ) White balance ( ) Focus ( ) Other:
17. Photographs should be taken: ( ) Before prophylaxis ( ) After prophylaxis ( ) It depends on what is to be photographed
18. Which factors do you consider important in photography for diagnosis? ( ) Photograph only the lesion ( ) Clean the lens before photographing ( ) Apply anesthetic before photographing ( ) Adjust the focus ( ) Use zoom to get closer ( ) Use a single-colored background behind the patient ( ) Stabilize the patient ( ) Photograph the face ( ) Other:

**Dear participant, please answer the following questions according to your knowledge and the video you have just watched.**

1. Initials of your full name:
2. Gender: ( ) Female ( ) Male
3. Age (in years):
4. Which semester are you currently attending? ( ) 5th ( ) 6th ( ) 7th ( ) 8th ( ) 9th ( ) 10th
5. Which light source(s) do you believe are appropriate for dental photography?

   ( ) Ambient light ( ) Operatory light ( ) Camera or phone flash ( ) External flash ( ) Flashlight( ) Other:
6. For what purposes do you believe digital photography is used in Dentistry? (Check all that apply) ( ) To complement the patient's clinical record ( ) As legal evidence in case of a dispute ( ) Before any procedure ( ) To evaluate and improve work techniques ( ) To describe the color, shape, texture, and size of lesions ( ) For patient follow-up ( ) As teaching material ( ) For research purposes ( ) For communication with dental laboratories ( ) Marketing ( ) Other:
7. What is the correct protocol regarding the sequence of photographic records?

   ( ) Extraoral photos – intraoral photos ( ) Intraoral photos – extraoral photos ( ) The sequence is irrelevant
8. What do you consider the correct distance for intraoral photographs?

   ( ) Between 10–20 cm ( ) Between 20–30 cm ( ) Between 30–40 cm ( ) Between 40–50 cm ( ) I don't know
9. To obtain a good photograph, it is necessary to use high resolution. Do you know how to adjust the resolution on the camera you use? ( ) Yes ( ) No
10. Which settings do you believe are related to camera resolution?

    ( ) Photo size ( ) Color space ( ) Image quality ( ) White balance ( ) Focus ( ) Other:
11. When should dental photographs be taken?( ) Before prophylaxis( ) After prophylaxis

    ( ) It depends on what is to be photographed
12. Which factors do you consider important in photography for diagnostic purposes?

    ( ) Photograph only the lesion ( ) Clean the camera lens before photographing

    ( ) Apply anesthetic before photographing ( ) Adjust focus ( ) Use zoom to get closer

    ( ) Use a solid-colored background behind the patient ( ) Stabilize the patient ( ) Photograph the face ( ) Other:

Thank you for your participation!

**Figure 2**. Post-video questionnaire.

## RESULTS

Among the 63 participants, 44 (71.4%) were female and 19 (28.6%) were male. The mean age was 24.9 ± 3.58 years. Of the total, 37 students (60.3%) were in the 7th semester, 12 (20.6%) in the 9th semester, 8 (12.7%) in the 5th semester, 3 (4.8%) in the 6th semester, and 1 (1.6%) in the 10th semester.

Among the participating students, 38 (61.9%) reported that they did not usually photograph the clinical cases they attend. Of the 24 students (38.1%) who did take photographs, 52 (83.3%) used a mobile phone, while 10 (16.7%) used a digital camera.

Most participants (n = 44; 71.4%) had never received guidance on how to take clinical photographs. Among the 19 participants (28.6%) who had received some form of instruction, 45 (72.2%) reported receiving this information

through comments made during mandatory coursework, 6 (11.1%) at scientific congresses, 6 (11.1%) through online sources, and 3 (5.6%) through university extension projects.

The Kolmogorov–Smirnov test confirmed the normal distribution of the data. A paired Student's t-test was used to compare the mean number of correct responses on the pre- and post-video questionnaires.

Considering only the questions related to knowledge of photography, the mean number of correct answers in the pre-video questionnaire was 1.83 ± 1.21, while in the post-video questionnaire it increased to 4.16 ± 1.23 (Figure 3), indicating a statistically significant difference ($p < 0.001$) in performance after the training session.

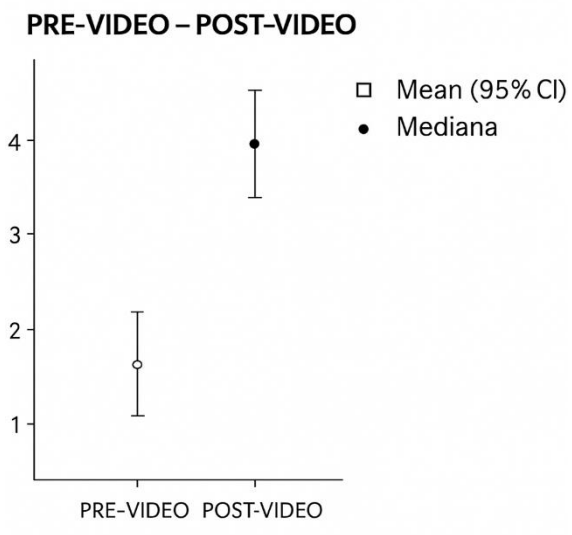


**Figure 3**. Average scores on the pre- and post-video questionnaires. Paired samples t-test.

## DISCUSSION

In recent years, photography has gained a prominent role in Dentistry and has improved, in many aspects, the daily clinical practice of dental surgeons, as it can be applied in various contexts, such as monitoring the progression of clinical cases, enhancing the visualization of lesions, for educational purposes, and even as evidence in legal proceedings.

Although the importance of photography has been evident for some years now, the topic is still rarely addressed intentionally during undergraduate studies. A finding from the present study that supports this is the fact that 71% of the students who participated in the research had never received any instruction on how to take quality photographs in dental practice.

Considering that dental photography is a skill that can be acquired through theoretical knowledge and practical application, addressing this topic during undergraduate education is essential, since training in this area can produce positive outcomes. One finding from our study that demonstrated this was the increase in average scores on the questionnaires before and after watching the instructional video on how to take proper photographs, rising from 1.83 in the pre-video questionnaire to 4.16 in the post-video one. These results reinforce the idea that training is effective in achieving its objectives.

Another factor contributing to the rising importance of photography in Dentistry is the growth of teledentistry, which involves providing dental services when distance is a critical factor and which became more prominent following the COVID-19 pandemic in 2020. In remote settings, the existence of images is essential for communication among dental professionals and even for aiding in diagnosis.

Studies such as that by Fonseca et al. (2021), which involved sending photographs taken with a smartphone camera and a brief clinical history of the patients to three evaluators via email—who then responded with further questions and requests for additional exams if necessary in order to formulate diagnostic hypotheses—demonstrate this well. These hypotheses were compared to a gold standard using the Kappa test. The authors found a similarity in 76% of the cases,

and the Kappa coefficients indicated high agreement (k = 0.817–0.903), highlighting that good photographs are effective and important tools in aiding the diagnosis of oral lesions.

Based on the above, it is understood that well-captured photographs of appropriate quality serve not only as a means of case documentation but also as a tool for remote communication between dental professionals and for assisting in the diagnosis of patients in remote areas with limited access to specialists. This reinforces the importance of discussing techniques for capturing high-quality images of the oral cavity, since with the proper knowledge, it is possible to take good images even with smartphones, which are accessible devices that dentists are already familiar with.

Images have the power to transcend language barriers, thus enabling better analysis of the condition under evaluation. Therefore, understanding and applying proper photography techniques is essential in clinical practice. Images can be captured using smartphones, which are more affordable than photographic cameras but, when used correctly, are capable of producing photographs as effective as those taken with digital cameras.

However, one barrier encountered is the lack of scientific standardization in the methods for taking appropriate photographs. The absence of scientific techniques to guide dentists in this task becomes a challenge in acquiring high-quality and standardized images. Thus, it is clear that studies linking photography and Dentistry are both scarce and necessary to establish standardized techniques that provide reliable images.

Descriptive studies have some limitations, such as not establishing cause-and-effect relationships, dependence on the quality of the questionnaire, and the risk of bias in participants' responses. This study is no exception. Among its limitations, we can highlight that the second questionnaire was applied immediately after the training video, which may have caused confusion and bias in the responses. Another limitation is that participation was not uniform across all academic periods, and the study was conducted at a single institution, resulting in a limited and non-uniform sample.

## CONCLUSION

The training contributed to an increase in students' knowledge on the topic; however, the data reinforce the need to incorporate content on this subject into the curricular structure of dental programs.

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