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Monitoring project in Endodontics and the importance of institutional support: an experience report

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Abstract Monitoring is a complementary activity that offers pedagogical support and plays an essential role in training undergraduate students and the monitor himself and their initiation to teaching. The report aims to present the experiences of developing a monitoring program, with institutional support, in an endodontics discipline at a federal higher education institution. The teaching team prepared a work plan that contemplated different pedagogical, technical, and scientific activities to be developed by the monitors. The following results were achieved after four semesters: a) positive influence on the performance of 109 students with only three final averages lower than seven; b) technical and scientific improvement of the monitors with participation in a *workshop* on mechanized instrumentation in Endodontics; c) scientific development of the monitors with the production of didactic materials, scientific projects, participation and presentation of six papers in scientific events with three awards, publication of abstracts in annals and production of two-course completion papers; d) participation in institutional action to reduce dropout in the course; e) elaboration of a research project to evaluate the performance of monitors, structured through a questionnaire. It can be concluded that the development of a monitoring project inserted in the context of an academic support program, with the offer of scholarships, can generate significant interest in participation by students and that a variety of activities proposed in the work plan contributed in a relevant way to the teaching-learning process of the monitors and to the discipline.
Descriptors: Education, Dental. Students, Dental. Mentoring. Endodontics. Surveys and Questionnaires.

Proyecto de tutoría de Endodoncia y la importancia del apoyo institucional: un relato de experiencia

Resumen La tutoria es una actividad complementaria que ofrece apoyo pedagógico y juega un papel importante en la formación de los estudiantes de pregrado y del propio tutor, así como en su iniciación a la docencia. Este informe tiene como objetivo presentar las experiencias de desarrollo de un programa de tutoría, con apoyo institucional, en una disciplina de Endodoncia en una institución de educación superior federal. El equipo docente elaboró un plan de trabajo que abarcaba diferentes actividades pedagógicas, técnicas y científicas a desarrollar por los monitores. Después de cuatro semestres se lograron los siguientes resultados: a) influencia positiva en el desempeño de 109 estudiantes con sólo tres promedios finales inferiores a siete; b) perfeccionamiento técnico-científico de tutores con participación en un taller de instrumentación mecanizada en Endodoncia; c) desarrollo científico de los tutores con la producción de materiales didácticos, proyectos científicos, participación y presentación de seis trabajos en eventos científicos con tres premios, publicación de resúmenes en anales y producción de dos trabajos de conclusión de curso; d) participación en acciones institucionales para reducir el abandono de cursos; e) elaboración de un proyecto de investigación para evaluar el desempeño de los tutores estructurado a través de un cuestionario. Se puede concluir que el desarrollo de un proyecto de tutoría en el contexto de un programa de apoyo académico, con la oferta de becas, puede generar gran interés de participación por parte de los estudiantes y que una variedad de actividades propuestas en el plan de trabajo contribuyeron significativamente para el proceso de enseñanza y aprendizaje de los monitores y de la disciplina.

Descriptores: Educación en Odontología. Estudiantes de odontología. Tutoría.

Endodoncia. Encuestas y Cuestionarios.

Projeto de monitoria em Endodontia e a importância do suporte institucional: um relato de experiência

Resumo A monitoria é uma atividade complementar que oferece apoio pedagógico e exerce papel importante na formação dos alunos de graduação e do próprio monitor, bem como em sua iniciação à docência. O presente relato tem como objetivo apresentar as experiências do desenvolvimento de um programa de monitoria, com suporte institucional, em uma disciplina de Endodontia de uma instituição de ensino superior federal. A equipe docente elaborou um plano de trabalho contemplando diferentes atividades pedagógicas, técnicas e científicas a serem desenvolvidas pelos monitores. Os seguintes resultados foram alcançados após quatro semestres: a) influência positiva no desempenho de 109 alunos com apenas três médias finais inferiores a sete; b) aprimoramento técnico-científico dos monitores com participação em *workshop* de instrumentação mecanizada em Endodontia; c) desenvolvimento científico dos monitores com a produção de materiais didáticos, projetos científicos, participação e apresentação de seis trabalhos em eventos científicos com três premiações, publicações de resumos em anais e produção de dois trabalhos de conclusão de curso; d) participação em ação institucional para reduzir a evasão no curso; e) elaboração de projeto de pesquisa para avaliação do desempenho de monitores estruturada por meio de questionário. Pode-se concluir que o desenvolvimento de um projeto de monitoria inserido no contexto de um programa de apoio acadêmico, com oferta de bolsas, pode gerar grande interesse de participação pelos discentes e que uma variedade de atividades propostas no plano de trabalho contribuiu de forma relevante para o processo ensino-aprendizado dos monitores e para a disciplina.

Descritores: Educação em Odontologia. Estudantes de Odontologia. Tutoria. Endodontia. Inquéritos e Questionários.

INTRODUCTION

Monitoring is a pedagogical support activity that aims to solve undergraduate students' difficulties with the content they work on in the disciplines[1,2]. Although a complementary activity, it can substantially favor teaching[3] since it represents an essential link between highly qualified teachers and beginning students4. As the monitor has already experienced this learning environment, he/she knows the student's needs and limitations, which enables better assistance in learning new and complex information and contributes positively to the teaching and learning process[5-7].

This activity also significantly favors the training of the monitor himself, contributing with his intellectual and social knowledge[4,7], based on the development of activities with the professors and academics of the course[8-10]. Thus, it allows students to glimpse new horizons and academic perspectives and encourage their initiation into teaching[5,7,8,11]. The continuous construction process between teacher and monitor favors clarifying theoretical and technical doubts and improving knowledge related to the syllabus[9,10,12]. In addition, they instigate interest in teaching practice as a future professional activity since they allow the development of activities linked to teaching and research[5,7,8,13]. The assignment of different functions related to teaching to the monitor favors the development of communication and teaching skills[4,5], critical reflection, and fostering the commitment to the deepening of knowledge for better development of monitoring[7,10,14]. It should be emphasized that monitoring broadens the clinical practical experience in dentistry courses and contributes to developing the monitor's technical ability and excellent safety in clinical procedures before the conclusion of course [1]. Endodontic treatment requires several steps, so doubts about the material, the organization of the work environment through the assembly of clinical tables, the performance of radiographs, and the instrumentation, filling, and biosafety procedures may arise.

The Dentistry course at the Federal University of Espírito Santo (UFES) offers 30 spots per semester for mandatory disciplines, including Endodontics. The course provides students with laboratory training in Endodontics I during the fifth

semester, with a semester workload of 60 hours (including theoretical classes). Clinical learning in Endodontics II starts with a workload of 120 hours, 30 of which are dedicated to theoretical activities. Students will then provide care in intramural interdisciplinary clinical internships during the eighth, ninth, and tenth semesters, totaling 405 hours (including 60 hours of theoretical activities). It is important to note that practical classes for Endodontics I and II are divided to better support students. However, with only four professors in the area of Endodontics, they may be unable to meet all the demands of theoretical and practical classes.

Four professors who specialize in endodontics teach the Endodontics II discipline at UFES. During practical classes, three professors lead each shift. Over the years, volunteer monitors have also assisted the students. However, due to their other academic and paid commitments, the monitors could only contribute occasionally and offer limited assistance. Informal monitoring programs often assume that the monitor is already aware of their responsibilities, which can hinder the benefits of the activity in the teaching process. Therefore, careful planning is essential when implementing peer learning strategies. Institutional promotion of these strategies is also crucial to ensure that the monitors can fully develop their teaching activities and achieve desirable results. In order to encourage academic development, a teaching project began to provide paid incentives for students who monitor the Endodontics II discipline.

The teaching projects at UFES aim to improve the quality of undergraduate teaching and learning for both teachers and students. They are part of the Institutional Academic Support Projects (PIAA) under the Program for the Improvement and Development of Teaching (PRÓ-ENSINO) managed by the Dean of Undergraduate Studies (Prograd) at UFES. The PIAA projects support undergraduate students in promoting academic success and preventing retention, evasion, and dismissal from undergraduate courses.

This report is about the development of a monitoring program in Endodontics. This program aimed to implement teaching and learning strategies to improve the quality of education and prepare Dentistry students at UFES for teaching careers. The PIAA developed the program by notices in 2017 and 2018.

EXPERIENCE REPORT

The Endodontics II course comprises two hours of theoretical class and twelve hours of practical class per week. The practical classes are subdivided into two classes of approximately 15 students, each with a workload of 6 hours. These classes take place in an outpatient setting and aim to equip students with the necessary skills to perform endodontic treatment of uni- and bi-radicular teeth in pairs. The students are responsible for all clinical procedures related to diagnosing pulp and periradicular alterations and invasive and non-invasive clinical procedures for treatment. They undertake anamnesis, clinical examination, radiographs, caries removal, isolation of the operative field, coronary opening, chemical-mechanical preparation and filling of the canal, and temporary restoration of the treated teeth.

Each pair must plan the clinical case and develop the treatment following a checklist of procedures prepared and evaluated by the discipline. After completing each case, the student prepares a clinical report describing the endodontic treatment and presents it to the course. The course's final grade is an average of the theoretical evaluations and an average of the practical evaluations.

The course includes two summative theoretical evaluations per semester, covering the content taught in the course. The classes are divided into four groups to present seminars with themes related to the clinical cases developed during the semester. Practical evaluations are conducted at each practical class and evaluate different criteria such as quality of the work presented and performed by the student, organization of the clinical work table, material, application, attendance, punctuality, quality of radiographs, commitment, participation in classes, ethical relationship with professors, students, and patients. The reports of the clinical cases carried out by the pairs are also evaluated and used to calculate the practical average of the discipline.

To be approved for the course, the student must obtain a final grade equal to or higher than 7.0 (seven). If the student fails to meet this requirement, they must take a theoretical final exam covering all the content taught in the course. They

will only be considered approved if the arithmetic average between the final grade and the final exam equals or exceeds 5.0 (five).

The teaching team of the Endodontics II discipline of the Dentistry course at UFES submitted a teaching project to the PIAA Prograd-UFES 2016 notice to develop a monitoring program in the discipline. This program, designed for students of the Dentistry course, aims to encourage the selected monitor to participate and collaborate in the didactic activities of the discipline with the students under the constant supervision of the coordinating professor and collaborating professors. Furthermore, the activities developed by the monitor should motivate students in the initial periods and those intending to monitor the course study in the discipline to reduce dropout rates in the institution's Dentistry course.

The teaching team has established several goals for the discipline to enhance the teaching and learning process. These goals include improving the approval rate of all students without a final exam, enhancing the cognitive development and skills of the monitors in Endodontics, developing the cognitive and attitudinal skills of the teaching assistant, promoting scientific development among the monitors by presenting two panels at scientific events and producing two didactic materials for the discipline, assisting students who face academic difficulties, especially those who are already in study follow-up plans to avoid retention, evasion, or dismissal. Additionally, they aim to develop an action plan for incoming students to reduce retention, dropout, or dismissal. Lastly, they plan to create some didactic material for the discipline of Endodontics. To accomplish these goals, the teaching team has prepared a work plan of 20 hours per week for the monitors, detailing the various activities they need to carry out over 12 months.

The submitted project has been approved and awarded four academic scholarships. The institution offers these scholarships as financial aid exclusively for dentistry students at the same institution. In late 2017, Prograd UFES launched a new public notice (PIAA-2017), and the teaching team submitted a new teaching project. The project was approved, and three academic scholarships have been awarded to continue the monitoring program in the discipline throughout 2018. Consequently, the monitoring program will continue for a total of 24 months.

Selection of student-monitors

The first step of each project involved the teaching team creating a simplified selection process notice. Collegiate has widely disseminated this notice to students from the 7th to the 10th periods. It established the rules for participation and selection criteria for student monitors who belonged to the course's student body. In both processes, black, brown, and indigenous students (PPI) or those with a monthly family income of up to 1.5 minimum wages per capita were given priority, according to the current guidelines of the UFES Institutional Plan. In PIAA-2016, 16 students applied to compete for the four available vacancies; in PIAA-2017, 23 students applied for the three vacancies.

Work Plan

The monitors followed the Work Plan outlined in the approved Teaching Projects. Table 1 shows the types of activities and their respective workloads, which totaled 20 hours.

The training provided to the student monitors before the practical classes was crucial in ensuring responsible and ethical conduct within the discipline. The discussion between the teaching team and monitors helped establish a strong connection and fostered an open communication environment. It was encouraging to see the emphasis placed on cognitive development and theoretical classes for the monitors to help them become better role models for the students. The support provided by the monitors during clinical activities, including diagnosis of clinical cases and assistance in performing various procedures, was commendable. The constant supervision by the teaching team during these activities ensured the safety of the students and the patients. The presentation of clinical cases further promoted healthy debates and discussions among the team members, helping everyone learn from each other. The individual and group meetings provided opportunities for the monitors to seek guidance and support from the teaching team and work towards improving their performance. The structure of the promotes a positive learning experience for all involved.

Table 1. Workload distribution for each monitor's weekly activities.

ACTIVITY	WORKLOAD (hours per week)
a. Monitoring of clinical activities	06
b. Extra-class orientation of students	06
c. Individual meetings with the teaching team	03
d. Group meeting with teaching staff	03
e. Presentation of clinical cases	02

Results Achieved

Influence on the performance of students in the discipline

During the four academic semesters when the program was implemented (2017/1, 2017/2, 2018/1, and 2018/2), 109 students enrolled in the discipline. There was only one dropout due to personal health problems. Additionally, there were no failures in the discipline, and only three students received a final average lower than 7.0.

Technical-scientific improvement of the monitors

At PIAA 2017, the monitors were fortunate to attend a workshop on the mechanized instrumentation of root canals, a technique commonly used in endodontic treatment. However, due to its complexity and high cost, it was not covered in the Undergraduate Dentistry course at UFES. The workshop offered both theoretical and laboratory training to the monitors, which they applied in developing clinical cases during practical classes in the curricular disciplines of integrated clinics.

Scientific Production

The project's primary goal may not have been to educate, but the monitoring aspect proved to be a valuable opportunity for growth for those who participated. With the creation of didactic materials such as photos and videos, the course covered various Endodontic topics, including clinical table assembly, dental anatomy, operative field isolation, and coronary opening. The monitors went on to submit five scientific projects, which were all approved by the institution's Human Research Ethics Committee (CAAE 80480417.3.0000.5060; CAAE nº. 98735418.1.0000.5060; CAAE nº. 98743318.6.0000.5060; CAAE no. 68535617.8.0000.5060; CAAE nº. 61901916.8.0000.5060). Additionally, they presented six scientific papers at various events, earning three awards and publishing their work in event annals. The close relationship between teacher and student developed through monitoring sparked students' interest in incorporating the program's projects into their Final Paper.

Action to reduce student dropout

In the Dentistry program at UFES, some students in the beginning stages may become disheartened due to the extensive theoretical workload and limited practical experience. However, more experienced students can offer support by sharing their knowledge and personal experiences. In order to avoid a high dropout rate, the program created a PowerPoint® presentation titled "Experience Report of the Dentistry Program at UFES," which details the unique aspects of each stage of the program, including the challenges and triumphs faced by students. In 2017, the Collegiate of Dentistry utilized this presentation to welcome new students.

In the 2018/2 semester, two students who participated in a study follow-up program excelled in theoretical and practical assessments. One of them even voluntarily oversaw the laboratory discipline of Endodontics.

Elaboration of a Questionnaire for Performance Evaluation

Throughout the project, the teaching team realized the importance of evaluating the monitoring activities and identifying any possible oversights during the orientation of the monitors. After completing the practical activities, a questionnaire was devised and distributed to the discipline's students to ensure an unbiased assessment. The questionnaire focused on specific aspects of the monitor's knowledge and ability to provide assistance and guidance throughout each stage of the endodontic treatment. However, it does not evaluate individual monitors; it assesses all monitors' practical procedures and theoretical knowledge. The questionnaire has three parts: Part I - "Evaluation of Monitors in Theoretical and Practical Activities," which relates to each stage of endodontic treatment and assistance in theoretical activities. Part II - "Evaluation of Monitor Performance in Theoretical and Practical Activities" contains seven open-ended and closed-ended questions with four to seven answer options. Finally, Part III - "Effects of Monitoring on the Discipline and Student-Student," includes three closed-ended questions with two answer options. Part I consists of 25 closed-ended questions with three answer options.

A research project has been submitted to the Human Research Ethics Committee CCS-UFES, along with the Informed Consent Form (ICF), and it was ultimately approved. This project aimed to validate a questionnaire and administer it to students of a course after its completion. It also aimed to publish the results evaluating the impact of the monitoring activity on the teaching and learning process in clinical endodontics. Unfortunately, the approval process took longer than expected, which was outside the scope of the project's goal of applying it to students at the end of the practical activities. Furthermore, the discipline discontinued the monitoring program the following year, which could have significantly impacted participants' responses. Due to potential bias, the team decided to halt the research without validating or administering the questionnaire. Nevertheless, Figures 1, 2, and 3 feature the questionnaire developed, which can serve as a model in different teaching-learning contexts after necessary adjustments and validation. The application of this questionnaire may contribute to the teaching-research-extension triad in other institutions.

Assessment of the achieved results

The PIAA program mandated achievement reports at its conclusion. However, PROGRAD, the responsible institutional division, held meetings between approved project coordinators during the program to discuss potential implementation difficulties, partial results, and experiences gained. These meetings facilitated critical analysis of project progress and sharing of strategies for improving the teaching-learning process. Moreover, the work plan activities, including "presentation of clinical cases" and "group meetings," enabled continuous self-evaluation throughout the project. As a result, positive aspects were identified, and any flaws were corrected. However, the program did not include an evaluation of the monitors' performance by the students, which may have obscured any potential problems with the project or service provided by the monitors.

FINAL CONSIDERATIONS

The undergraduate degree in Dentistry requires the student to have theoretical knowledge complemented by laboratory and clinical practice. Theoretical knowledge without the student having the opportunity to put into practice the assimilated content makes it unfeasible since both complement each other. From this point of view, the reciprocal becomes true. Thus, academic monitoring programs in undergraduate courses in Dentistry are essential strategies in the teaching-learning process[3] since they consolidate the fusion between practice and theory and, at the same time, provide the undergraduate student participating in the project with autonomy, responsibility, and critical thinking, also favoring greater integration of the monitor-teacher-students triad[1, 6,7,9,10].

The large number of applicants who participated in the selection process for the projects presented proves the high student interest in developing monitoring and the importance of financial support by higher education institutions in the context of this complementary activity of great relevance for undergraduate students in Dentistry, whether they are monitors or not[1].

It is crucial to highlight that incorporating a monitoring project into an Academic Support Program has generated significant

interest among students while also professionalizing this activity within the discipline. As a result, the training of monitors has been implemented based on these projects, which aligns with other studies that emphasize the importance of peer teaching[3,10,18]. Moreover, the institution's efforts have had other benefits, such as reducing student retention and dropout rates.

QUESTIONNAIRE TO EVALUATE THE MONITORING ACTIVITY IN THE DISCIPLINE OF ENDODONTICS II

I - Evaluation of the monitors in theoretical and practical activities

1. Did the monitor guide and assist you correctly during the establishment of the diagnosis?
2. Did the monitor guide and assist you correctly in the preoperative procedures?
3. Did the monitor guide and assist you correctly during the anesthesia procedure?
4. Did the monitor guide and assist you correctly during the absolute isolation procedure?
5. Did the monitor guide and assist you correctly during the dressing and/or caries removal procedure?
6. Did the monitor guide and assist you correctly during the coronary opening procedure?
7. Did the monitor guide and assist you correctly during the periapical radiographs?
8. Did the monitor guide and assist you correctly during the processing of the periapical radiographs?
9. Did the monitor guide and assist you correctly in the instrumentation of the cervical and middle thirds with the Gates-Glidden reamers?
10. Did the monitor guide and assist you correctly in odontometry?
11. Did the monitor guide and assist you correctly during the instrumentation of the apical third with manual files?
12. Did the monitor guide and assist you correctly during patency?
13. Did the monitor guide and assist you correctly during the primary cone test?
14. Did the monitor guide and assist you correctly during lateral condensation?
15. Did the monitor guide and assist you correctly while using the McSpaden in the filling?
16. Did the monitor guide and assist you correctly during lateral condensation?
17. Did the monitor guide and assist you correctly in handling materials and medications?
18. Did the monitor guide and assist you correctly during the application of intracanal medication?
19. Did the monitor correctly guide and assist you in placing the temporary sealing of the coronary opening cavity?
20. Did the monitor guide and assist you correctly in filling out medical records and discipline forms?
21. Did the monitor guide and assist you correctly in removing the absolute isolation?
22. Did the monitor guide and assist you correctly in the irrigation/aspiration procedures?
23. Did the monitor guide and assist you correctly in the biosafety procedures?
24. Did the monitor guide and assist you correctly in preparing clinical case reports?
25. Did the monitor guide you correctly in assignments and exams of the discipline?

Figure 1. ""Part I" of the Questionnaire developed for the project. Each question has three options: (a) Yes, (b) No, or (c) I didn't request it.

II - Evaluation of the performance of the monitors in theoretical and practical activities
How do you evaluate the performance of the monitors?

1. Regarding assistance during practical activities
2. Regarding the clarification of doubts
3. Regarding the mastery of theoretical content
4. Regarding the mastery of the technique
5. Regarding the ethical stance
6. Regarding the relationship with students
7. What reason(s) made you not seek the help of the monitors?

( ) Lack of confidence in the monitor's knowledge

( ) Lack of confidence in the monitor's execution of the practical procedure

( ) Preference for the teacher's guidance in a given procedure

( ) Distance between the monitor and the student

( ) Distance between the student and the monitor

( ) The fact that the student did not deem it necessary to help

( ) Other: _____

Figure 2. "Part II" of the Questionnaire designed for the project comprises six questions, each with four multiple-choice options: (a) poor, (b) regular, (c) suitable, and (d) great.

III – Effects of monitoring on student discipline and performance

1. Did having monitors improve your performance at the Clinic?
2. Did the presence of monitors in Endodontics II impact your interest in monitoring this discipline?
3. Did the presence of monitors in Endodontics II spark your interest in monitoring other disciplines?

Figure 3. "Part III" of the Questionnaire designed for the project. In this section, each question has two multiple-choice answer options, namely (a) Yes and (b) No.

While the advantages of monitoring activities are well-established[1,3,5,7,9,10], it is essential to evaluate the impact of these activities from the perspective of the students involved[6]. This analysis helps to confirm the benefits and identify potential drawbacks, enabling teachers to address the needs of their students[5,9,16] better. Furthermore, the development of monitoring projects has led to new hypotheses for other teaching actions that could enhance the learning process. Although the "Questionnaire for the evaluation of monitoring activity in the discipline of Endodontics II" was not used for these projects, it could be validated and applied in similar teaching and learning contexts to contribute to this analysis.

The support system for the monitoring program differs from traditional programs as it prioritizes continuous self-evaluation through regular meetings between project coordinators and the implementation of the work plan. This approach enables teachers to identify and address flaws, enhancing the project's effectiveness.

The monitors are trained to assist with organizational procedures and can effectively communicate with students by using simple language and sharing their prior experiences[2,7]. By integrating monitors into the teaching staff, the activities outlined in the work plan contribute to personal satisfaction and a more substantial commitment to the discipline. This trusting relationship allows educators to delegate specific tasks, freeing them to focus on other critical aspects of the teaching and learning process[1,16]. Additionally, the didactic material produced by the monitors can be reused in future periods since it relates to content already taught in the discipline.

The project successfully boosted the scientific output of undergraduate students by inspiring them to participate in extracurricular activities that raised their profile in the academic sphere. This endeavor was established in collaboration with the monitor and helped reinforce the essential role of the university in promoting the teaching-research-extension triad in undergraduate courses, as outlined in the National Education Plan[19].

Overall, the Work Plan's diverse range of activities produced noteworthy technical, scientific, and pedagogical outcomes that positively impacted the teaching-learning process in Endodontics within the Dentistry course at UFES. When combined, these various factors significantly contributed to the project's success.

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