

ORIGINAL

Direct instruction and inquiry-based method in teaching endodontics among preclinical dentistry students

Instrucción directa y método basado en la indagación en la enseñanza de la endodoncia entre los estudiantes de odontología preclínica

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Abstract

Background: As part of the education and training of preclinical students in endodontics, traditional lectures on the content are normally delivered, and laboratory exercises on extracted tooth specimens are carried out. Innovative methods to improve the effectiveness and quality of teaching dental students have been proposed, such as inquiry-based teaching. This study aimed to compare the effectiveness of direct instruction and inquiry-based teaching on the performance in root canal treatment exercises of preclinical students.

Methods: A total of 49 students enrolled in the preclinical course in Endodontics during the first semester of 2016-2017 in a Dentistry school in the Philippines agreed to participate in the study. The students were first exposed to direct instruction then followed by inquiry-based teaching. The performance of the students in their root canal treatment exercise in both methods was recorded. The performance of the students using the two methods was compared using the t-test.

Results: Based on the students' scores in the exercise after direct teaching, a greater percentage failed, while after the inquiry-based method, their scores showed that the percentage of students who passed has markedly increased. There is a significant difference in the students' performance using direct teaching only and their performance after the inquiry-based teaching at 0.05 level of significance.

Conclusion: Therefore, inquiry-based teaching is effective in improving the preclinical students' performance in endodontics.

Keywords: Direct instruction, inquiry-based teaching, performance, root canal treatment exercise.

Resumen

Antecedentes: Como parte de la educación y la formación de los estudiantes preclínicos de endodoncia, normalmente se imparten conferencias tradicionales sobre el contenido y se realizan ejercicios de laboratorio con especímenes de dientes extraídos. Se han propuesto métodos innovadores para mejorar la eficacia y la calidad de la enseñanza de los estudiantes de odontología, como la enseñanza basada en la indagación. El objetivo de este estudio es comparar la eficacia de la instrucción directa y la enseñanza basada en la indagación sobre el rendimiento en los ejercicios de tratamiento del conducto radicular de los estudiantes preclínicos.

Métodos: Un total de 49 estudiantes matriculados en el curso preclínico de Endodoncia durante el primer semestre de 2016-2017 en una escuela de Odontología en Filipinas aceptaron participar en el estudio. Los estudiantes fueron expuestos primero a la instrucción directa y luego a la enseñanza basada en la indagación. Se registró el rendimiento de los estudiantes en su ejercicio de tratamiento de conductos en ambos métodos. Se comparó el rendimiento de los estudiantes con los dos métodos mediante la prueba t.

Resultados: Según las puntuaciones de los estudiantes en el ejercicio después de la enseñanza directa, un mayor porcentaje fracasó, mientras que después del método basado en la indagación, sus puntuaciones mostraron que el porcentaje de estudiantes que aprobaron ha aumentado notablemente. Existe una diferencia significativa en el rendimiento de los estudiantes utilizando sólo la enseñanza directa y su rendimiento después de la enseñanza basada en la indagación a un nivel de significación de 0,05.

Conclusión: Por lo tanto, la enseñanza basada en la indagación es eficaz para mejorar el rendimiento de los estudiantes preclínicos de endodoncia.

Palabras clave: Enseñanza directa, enseñanza basada en la indagación, rendimiento, ejercicio de tratamiento de conductos.

Introduction

Endodontic treatment is performed in a major portion of dental emergencies worldwide, and there is an increasing need to educate and train dental students in this specialty, such that they are prepared to perform better and predict treatment outcomes¹. The emphasis on inquiry-based teaching is especially important in laboratory courses, as these are the courses in which students apply the process of science². Over the past decade, repeated calls have been made to incorporate more active teaching and learning in undergraduate biology courses³.

The twenty-first century's onset and its challenges require developing a learning community where accomplished teachers make sure that both teachers and students meet today's challenges. In this regard, Arends and Kilcher⁴ stressed that a true learning community had been created for teachers and for their students, one that helps them meet the many and varied challenges of teaching in twenty-first-century schools.

Teaching practices in the twenty-first century are guided by several learning theories, the most popular of constructivism. This theory stresses that the students/learners reconstruct their conceptions in active, meaningful experiences. Thus, teaching is student-centered in the constructivist viewpoint⁵.

The direct instruction model is straightforward. It is designed to promote mastery of skills (procedural knowledge) and factual knowledge (declarative knowledge)⁶.

Direct instruction aims at accomplishing two major learner outcomes: mastery of well-structured knowledge and acquisition of varied skills⁷.

Teacher use of direct instruction, particularly the lecture method, comprises many classroom time in traditional classrooms. However, the primary criticism of direct instruction is that it is teacher-centered and emphasizes teacher-talk⁸.

Subject areas in dental education embody scientific concepts and skills. As a result, dental science instruction has become highly constructive, such that it has shifted from an emphasis on acquiring content knowledge to constructing scientific understanding. This has led to applying constructivist teaching and learning strategies such as the discovery approach, inquiry approach, integrative teaching, and cooperative learning. In this current study, the researchers applied an inquiry-based approach as a type of student-initiated model.

Inquiry-based teaching is a constructivist model conceived to help students understand how phenomena work and the processes used to investigate these phenomena⁹.

Inquiry-based teaching requires a high degree of interaction among the learner, the teacher, the materials, the content, and the environment. The most crucial aspect of the inquiry teaching model is that it allows both student and teacher to become persistent seekers, askers, interrogators, questioners, and ponderers¹⁰.

The instructional learner outcomes of inquiry-based teaching are as follows: acquire an understanding of the focus problem; develop thinking skills that underlie scientific reasoning; develop dispositions and commitment to scientific processes; and develop metacognitive skills and learner autonomy¹¹.

Overall, the inquiry-based model promotes an inquisitive and investigative mindset among the learners. Moreover, since the inquiry-based model is student-centered, it promotes active learning on the part of the students.

In this study, two teaching models are compared as regards effectiveness: direct instruction and inquiry-based teaching.

There are studies conducted to measure the performance of preclinical dental students in performing root canal treatment exercises. These studies utilized other methods of instruction.

According to Friedlander and Anderson¹², the teaching of advanced endodontic courses at the predoctoral level is common, but it cannot be easy to assess teaching effectiveness. Advanced modules placed later in the dental curriculum provide the opportunity to introduce a new topic, revisit and reinforce concepts learned previously, and instill the notion of lifelong learning. At any level, the introduction of new techniques to novices must be based on recognition of their prior knowledge and experience and their need for explicit direction, stepwise instruction, and comprehensive feedback. Assessment of students' performance should provide insights into what they know and can do and steer them towards desired outcomes. In addition, assessment can provide valuable feedback on teaching effectiveness.

A module was piloted for inclusion in the University of Otago (New Zealand) fourth-year dental curriculum¹³. This involved the use of tapered hand and rotary nickel-titanium files for root canal preparation and was taught through a didactic program (lectures and problem-based learning seminars) and a series of preclinical hands-on sessions. Findings from formative and summative assessments and student, peer, and self-evaluation indicated that the module's objectives were met and that it was effective in both providing students with the basic skills for using this type of instrumentation and increasing their understanding and enthusiasm for endodontics.

In a previous study, endodontics students had access to simulated models, and endodontic emergency care

practice also included feedback sessions after each clinical session. It was found that the intervention gave significantly improved their grades, which support the implementation and further evaluation of similar interventions in other areas of teaching and learning dentistry subjects¹⁴.

This study's major purpose was to determine the comparative effectiveness of direct instruction and inquiry-based teaching on the learning performance of preclinical dental students in root canal treatment exercises.

Specifically, this study aimed to determine the following:

1. The performance of the preclinical dental students in root canal treatment exercise after direct instruction;
2. The performance of the preclinical dental students in root canal treatment exercise after inquiry-based teaching; and
3. The comparison of the performance of the preclinical dental students in root canal treatment exercise in the two methods of teaching and if the difference is significant.

Materials and methods

This experimental study involved a single group exposed to two methods of teaching. A total of 49 students enrolled in the preclinical course in Endodontics during the first semester of 2016-2017 agreed to participate in the study. Ethical issues were thrashed out, and the study's purpose was explained to the participants, including the nature of their participation. The students were first exposed to direct instruction then followed by inquiry-based teaching. The exercise was done on extracted tooth specimens which were checked and approved by the instructor. The root canal exercise involved the sequence of steps from access preparation, determination of working length, biomechanical preparation, and obturation. The performance level of the students in their root canal treatment exercise in the two methods of teaching was recorded. In addition, the performance of the students using the two methods was compared using the t-test.

Results and discussion

The mean score of the students in the root canal exercise after being exposed to the direct instruction method is 93.35 out of the highest possible score of 135. Based on a passing score for this exercise which is 94.50, the mean score of the students is considered as failed. Considering the number of students who passed, only 48.98% of the students got scores within and above the passing mark. Although almost half of the students passed, this result can be explained by observing that direct instruction emphasizes more on teacher talk¹⁵. Hence the students were not actively involved.

The preclinical students had a mean score of 113.39 in their exercise after being exposed to inquiry-based teaching. This means that the students passed the exercise. Also, the number of students who passed the exercise comprised 95.92%, showing a marked increase in the passing rate. The students' higher scores using inquiry-based teaching show that a student-centered approach can help improve students' performance in a laboratory course¹⁶. The t-test result shows that the computed value is greater than the tabular value at alpha .05 level of significance ($12.22 > 2.021$), which fails to accept the null hypothesis. There is a significant difference between the mean scores of the students in the two methods ($p < .05$). Therefore, the preclinical students performed better after being exposed to the inquiry-based method. Similar results were found in a previous study where students' grades in endodontics improved after an intervention using simulation and feedback sessions¹⁷.

Conclusions

The preclinical students performed better in the endodontics exercise after being exposed to the inquiry-based method than their performance in the direct instruction method. The marked improvement in their scores shows that a student-centered method that leads to active student involvement helps students learn better in a laboratory course such as endodontics. The difference between the two methods was found to be significant therefore, based on the findings of this study, the inquiry-based method is more effective in teaching endodontics compared to direct instruction. Therefore, the inquiry-based method is appropriate for laboratory courses in the dental curriculum and other fields.

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