Does student reflection on case studies help make their learning visible?

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The Problem

Radiation Biology (BIO 433) is taken by radiation therapy and nuclear medical technician students. The course focuses on fairly technical aspects of the properties of radiation, how it impacts with living tissues, and potential side effects on whole organisms. The radiation doses these students will be using to treat cancer are just below a lethal dose, and there is a significant risk of serious side effects on patients even if used properly.

One concern in the course is that we focus on the effects of radiation on molecules and cells, and that the students may not connect this with the fact that these cells are part of a patient's body. The doses of radiation being delivered, especially in radiation therapy, can cause serious damage.

Goals of the project:

1. Use a case study to help students to apply their knowledge of how radiation affects living organisms to a realistic case.

2. Develop enhanced empathy for their patients to improve the care of their patients and the students attention to detail when providing therapy.

3. Reflect on their progress and development as a health care provider.

Evidence of Student Learning & Methods of Analysis

- The same case study was given the first day of class and the second to last day of class.
- The results were scored by a rubric, but not shared with the students or counted as a graded assignment.
- On the last day of class, both copies were returned to the students without any instructor comments.
- The students were then allowed to compare and reflect on their two sets of answers and comment on any changes both independently and in a group.

Radiation Biology Case Study

When your grandmother was 60 she was treated for breast cancer with radiation and chemotherapy. The therapy was successful, and she was in remission. At age 65 she began to have pain in her neck, trouble swallowing and her voice became hoarse. Her doctors suspected thyroid cancer. (Technical details on the treatment appear here, followed by technical questions).

Two months later 10 mls of a solution containing 185 MBq of ^{18}F-deoxyglucose (^{18}F-DG) was injected into your grandmother's vein followed by a PET scan 45 minutes later to look for metastasis. (Technical details on the treatment appear here, followed by technical questions).

A few days after receiving the ^{131}I radiotherapy, your grandmother shows symptoms of dry mouth, swelling in her neck and nausea. Following the external beam therapy she shows fatigue and loss of appetite that improves 2 weeks after the treatment is over. She shows no further occurrence of thyroid cancer, and appears to be in complete remission. Three years later at the age of 68 your grandmother develops cardiomyopathy. She dies two years later of heart failure at the age of 70. (Technical and personal questions followed).

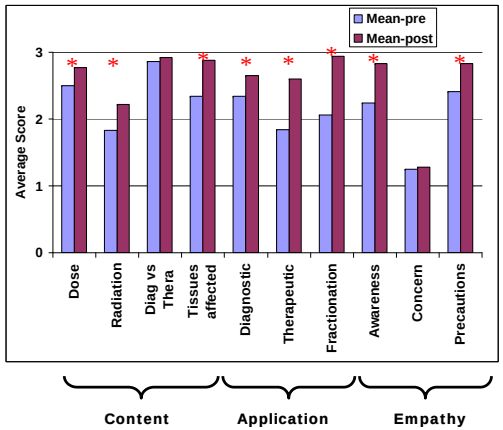

Figure 1. Comparison of pre and post survey scores. Questions were grouped by subject. An asterix represents a statistically significant difference by ANOVA.

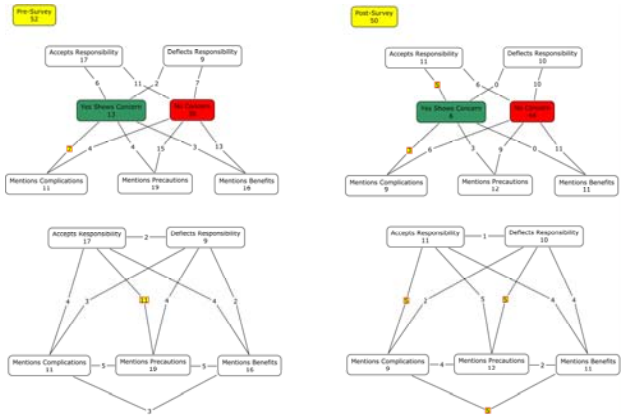

Figure 2. Concept maps generated from Grounded Theory analysis of a question related to student empathy for the patient. Written responses were coded and analyzed by a Spearman rank order correlation. Numbers within the boxes represent total numbers of students. Numbers on the lines represent the numbers giving both responses, a red box indicates a significant correlation.

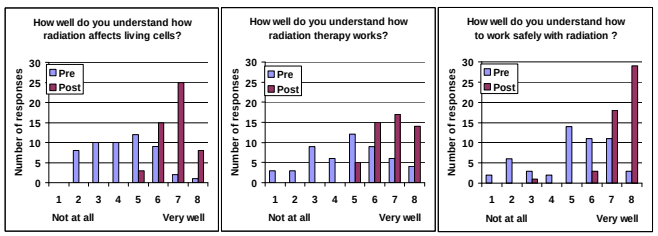

Figure 3. Results from pre and post course surveys. Questions are at the top of each graph.

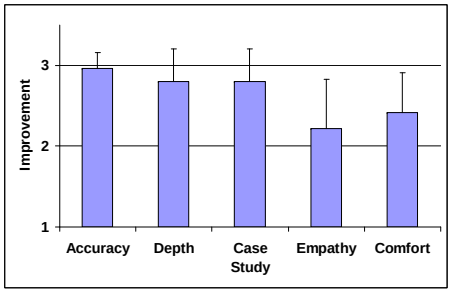

Figure 4. Results from students' own personal reflection on their pre and post course surveys. 1=decline, 2=no change, 3=improvement between pre and post surveys. Accuracy and Depth were related to technical answers, Case Study was ability to apply knowledge, Empathy was for patient and side effects, Comfort in working with radiation.

Conclusions

• Students showed a statistically significant improvement in scores in all areas measured with the exception of diagnostic vs. therapuetic uses of radiation and concern about exposing others to radiation. The initial score for the first question was very high, so there wasn't much room for improvement. The question on concern had the lowest average of all questions, and did not change after the course (Figure 1).

• Analysis of student written responses to their concern about exposing others to radiation using Grounded Theory revealed that the numbers of students expressing concern dropped in half after the course. Students expressing concern were more likely to mention personal responsibility in what happened to a patient, and mention complications. In contrast, those indicating no concern were more likely to use phrases that deflected responsibility to other team members or rules and regulations, or to mention the benefits to the patient (Figure 2).

• There was an overall positive trend in student confidence on understanding the theory behind radiation biology and their ability to work safely with radiation (Figure 3).

• In reflecting on the areas in which the students felt they improved the most in their pre and post surveys, they reported the most improvement in technical aspects of the course such as the importance of dose fractionation and function of certain isotopes. The students reported improvement the least often on questions dealing with concerns about side effects faced by the patient (Figure 4).

Overall students seem to focus more on the technical aspects of the course rather than how the treatments affect an individual.

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