



The Use of Personal Narrative in Classroom Case Study Analysis to Improve Long-term Knowledge Retention and Cultivate Professional Qualities in Allied Health Students

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This study evaluated the use of two different case study formats (clinically-oriented cases versus personally-oriented cases) to determine which was most effective in promoting long-term retention of clinically significant microbiology concepts, developing patient empathy, improving comprehension of patient compliance problems, and facilitating student understanding of transcultural health care concerns. The analysis was conducted in multiple sections of three different introductory microbiology classes targeting specific cohorts: nursing students, pharmacy students and other allied health students (pre-med, pre-PA, CLS, etc.). Retention of course content was determined by evaluation of multiple-choice and short answer examinations at least three weeks after completing case studies. Evaluation of patient empathy, understanding of patient compliance issues and transcultural health care concerns were determined via student surveys. The results of the study indicated that personalized cases significantly improved long-term retention of course content. In addition, student responses indicated that personalized case studies were more effective in developing patient empathy and aiding students in understanding issues patients have with complying with treatment recommendations. Finally, personalized case studies were effective tools for introducing students to the challenges of transcultural health care.

INTRODUCTION

A dilemma faced by most microbiology educators is the desire to convey a large volume of factual information to their students in a limited time frame. The pedagogical technique most frequently employed to accomplish this daunting objective is the standard classroom lecture supported by assigned readings and, perhaps, a posted set of on-line PowerPoint notes. Unfortunately, numerous studies analyzing effective teaching strategies indicate these passive tools are among the least valuable, especially when long-term knowledge retention is evaluated (2). The classic “cone of experience” proposed by Dale (3) reveals reading, lecturing and visual review, respectively, as the three teaching methods least likely to result in knowledge retention two weeks following the lesson. Clearly, better instructional protocols are essential, particularly since the microbiology lecture concepts imparted to students in the allied health disciplines are crucial for the safety and well-being of both themselves and their future patients.

While hands-on performance such as activities that occur in the microbiology laboratory is the best active learning practice (3), it is probably unrealistic for coverage of all relevant microbiology topics. Many microbiology courses take advantage of the next best thing by providing simulated experiences in the form of lecture-related wet lab activities.

Unfortunately, with the recent economic down turn, an increasing number of institutions have eliminated microbiology laboratories to reduce costs. Educators dedicated to enhancing student long-term learning outcomes must be particularly creative in their application of other learning techniques. While many highly effective experiential learning applications exist (4), knowledge retention is maximized when multiple active learning features are simultaneously utilized (1). Most closely associated with successful knowledge retention are the actions of discussing, presenting and simulating an essential concept (3). Therefore, we proposed that the incorporation of engaging, true and medically relevant case studies into the standard curriculum would be an effective active learning application for microbiology students. In addition, case studies can be designed to simulate the role of a medical professional by requiring students to evaluate patient histories, increasing the relevance of the activity to a student preparing for a career in health care.

While case study analysis is a superior active learning technique that encourages students to synthesize and integrate content for practical application (5, 6), we observed a significant pedagogical flaw linked to the standard case format. The necessary background material is often condensed and formalized into a terse, technical presentation. While an impersonal, clinical delivery of relevant facts is an efficient communication mechanism, it hardly simulates the experiences a future health care provider will encounter when acquiring a patient history. Clinically presented cases spoon-feed information and deny students the opportunity to develop the sleuthing skills a practitioner needs to assess pertinent details for diagnosis and treatment. By selectively providing extensive technical data in this

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unrealistic clinically-oriented format, students are encouraged to make biased decisions while analyzing an infectious disease case. Therefore, we modified the use of microbiology case studies to maintain their value as tools that result in critical thinking and knowledge retention, while providing a more realistic context for preparing future health care professionals. This personalized format presents material as a story about the patient as well as information regarding their family circumstances, personal characteristics, appropriate ethnic information and individual motivations. Interwoven in this text are relevant clinical data and laboratory analyses. In this way, students are exposed to medical scenarios that more accurately simulate true patient/care provider interactions. We also included cases that introduced students to transcultural health care issues. Students at our university encounter minimal diversity on campus and within the surrounding rural communities. Therefore, we desired to increase cultural sensitivity so they would more effectively care for their future patients with varying ethnicities. Cases were utilized to introduce our students to health care problems related to different cultural backgrounds.

The purpose of this study was to evaluate the use of two different case study formats (clinically-oriented cases versus personally-oriented cases) to determine which was most effective in promoting long-term retention of clinically significant microbiology concepts, developing patient empathy, improving comprehension of patient compliance problems, and facilitating student understanding of transcultural health care concerns. The analysis was conducted in multiple sections of three different introductory microbiology classes targeting specific cohorts: nursing students, pharmacy students, and other allied health students (pre-med, pre-PA, CLS, etc.). Retention of course content was determined by evaluation of multiple-choice, short answer and essay examinations. Evaluation of patient empathy, understanding of patient compliance issues and transcultural health care concerns were determined by student surveys. The results of the study indicated that personalized cases were more effective learning tools for all parameters studied.

METHOD

Student cohorts

Annually, three distinct groups of ONU students receive microbiology instruction. The Microbiology for Allied Health Sciences course is specifically designed for sophomore level students enrolled in ONU's Bachelor of Science in Nursing (BSN) program. Prior to taking their microbiology requirement, these students have completed the following courses as part of their major and general education programs: Introductory Biology, Introductory Chemistry, Anatomy and Physiology, Writing I and II, Speech, Western Civilization, and a Non-western Cultures class. The lecture-based class averages 25 students and lacks a laboratory component. The Introduction to Microbiology course caters to students majoring in environmental studies, biology, forensic science,

and all pre-professional students (pre-med, clinical laboratory science, etc.). These students usually have junior status and have already completed at least one year of biology, one year of chemistry, one year of mathematics, and the bulk of their general education requirements, including a Non-western Cultures course. In this course, students attend four lectures/week plus a three-hour laboratory which is divided into a two-hour session on the first day to initiate experimentation and a one-hour session on the subsequent day to read results. In addition to performing laboratory exercises to complement lecture material, a required group research project is an integral part of their laboratory experience. The lecture usually has 30 or more students in attendance but laboratory sections are capped at 16 for safety purposes. The Introduction to Medical Microbiology course primarily serves the students in ONU's College of Pharmacy. These high-achieving students receive four weekly lectures but no laboratory experience. Since this course is populated with third-year students, they have all completed at least one year of biology, one year of general chemistry, one year of organic chemistry, Calculus, Statistics, Physics, Writing I and II, Great Works, Speech, Western Civilization and a Non-western Cultures course. Because of its clientele, this microbiology course emphasizes treatment and is generally composed of 60 students who have extremely strong academic credentials.

Team structure

Since enhanced knowledge retention is associated with interactive activities, we require students to work on case study analysis in teams. Students were divided into groups of four to work collaboratively on the assigned case studies. Cooperative learning groups were formed by the instructor rather than letting the students self-select. Although the grouping appears random to the students, each cohort has four members determined by their past academic performance. A team consists of a high academic achieving student (GPA = 3.5 or higher), a low academic achieving student (GPA = 2.99 or lower), and two moderate academic achieving students (GPA = 3.00–3.49). This prevents teams from forming that are academically unbalanced and would be unable to complete their projects without a large amount of instructor assistance. The student with the highest past academic performance was assigned the role of group leader. Generally, these students demonstrate superior intelligence, self-discipline and strong organizational skills which they can use to promote the successful outcome of their group.

Case assignments

Because case study analysis is a significant component of the curricula in the microbiology courses at ONU and the majority of our students are strongly motivated to achieve high grades, we introduce this new learning tool with a practice case. All groups were assigned the same case study, which was drafted in the personal format. Students were

instructed to read the case and work together to thoroughly answer the associated questions. They were encouraged to use their text books, classroom notes, and on-line sources, but were required to cite all references. Each group turned in one set of answers and references for review. Their work was critiqued and the feedback included extensive comments and suggestions so students were well aware of the expected quality of work for all future cases assigned.

All subsequently assigned case studies were graded and students were informed that this material would be covered, along with lecture information, on their examinations. With each assignment, students analyzed the same case material and answered the same questions regarding disease etiology, transmission, pathogenesis, clinical features, diagnosis, treatment and prevention. For their first graded case, half of the groups were assigned a scenario written in a standard clinical format while the others were assigned the case written in the personal format. Answers and references were graded and reviewed, and all group members received the same grade for the assignment. Once the students had received feedback from the first case analysis, a second case was assigned to the class. Again, all students analyzed the same case material and answered the same questions. Groups assigned the clinical format for their first cases were provided with a personal version for the second exercise, and vice versa. Alternating case assignments were made throughout the remainder of the term such that these exercises complemented lecture information. Additionally, to provide exposure to health care issues relating to various ethnic groups, two cases were specifically assigned focusing on transcultural patient care. As before, case format was alternated so each group would analyze a transcultural scenario with both clinical and personal narratives.

At the end of the term, students were required to provide confidential feedback describing the group dynamic and the proportion of work performed by each member. When group members consistently indicated a peer had not contributed appropriately to the overall product, the instructor modified the group grade by subtracting points from the score of the noncontributing student and adding them to the scores of the other team members.

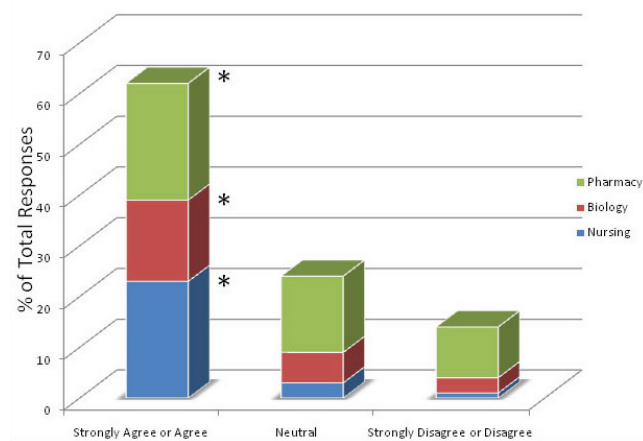
Assessment method

A student’s short- and long- term retention of case content was assessed through an analysis of performance on their case study evaluation plus a series of test questions, which included multiple-choice, “fill-in-the-blank”, and short essay formats. The first examination was administered one to two weeks after content presentation and followed up on the final exam six to eight weeks later, depending upon students’ course schedule. Additionally, student opinions regarding case format were evaluated using a questionnaire. This assessment instrument focused on the student’s perception of the ability of case format to improve content retention, hone critical thinking skills, understand patient compliance issues, develop patient empathy and understand transcultural health

care issues. Additionally, it provided information regarding student ethnicity and travel experience.

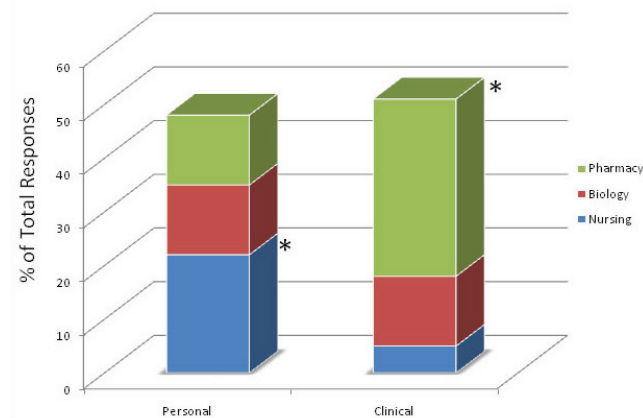
RESULTS

Collectively, students strongly preferred (65% to 18%) the personalized format for case study analysis (Fig. 1) with approximately seven times as many students identifying the addition of personal narrative as essential or helpful for improving their understanding of the case content. It is interesting to note, however, that a significant difference in format predilection correlates with the student’s future allied health profession. Overall, nursing students indicate the most pronounced preference for the personally formatted narrative, while pre-professional and pharmacy students demonstrated either no preference or partiality for the clinical version, respectively (Fig. 2). Regardless of major, students overwhelmingly indicated enhanced development of their critical thinking skills (Fig. 3) and ability to recall case content when personal



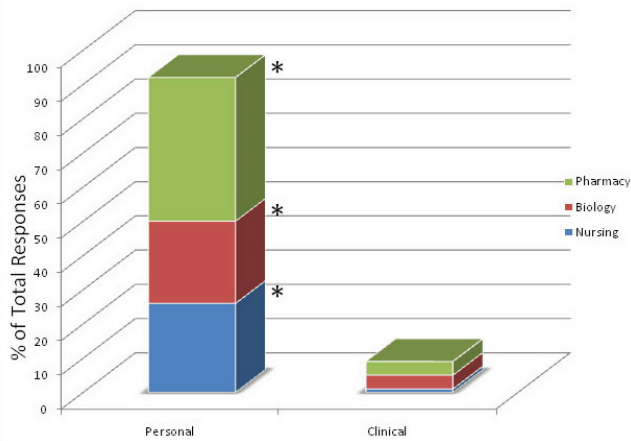
* indicates p < 0.05; N = 93

FIGURE 1. Student response to case study format survey: “I found the additional narrative information of the personal format helpful.”



* indicates p < 0.05; N = 25, 24 and 42 for pharmacy, biology and nursing students, respectively

FIGURE 2. Student response to case study format survey: “I preferred reading cases written in the _____ format.”



* indicates $p < 0.05$; N = 84

FIGURE 3. Student response to case study format survey: “Which case format was more effective at developing critical thinking skills?”

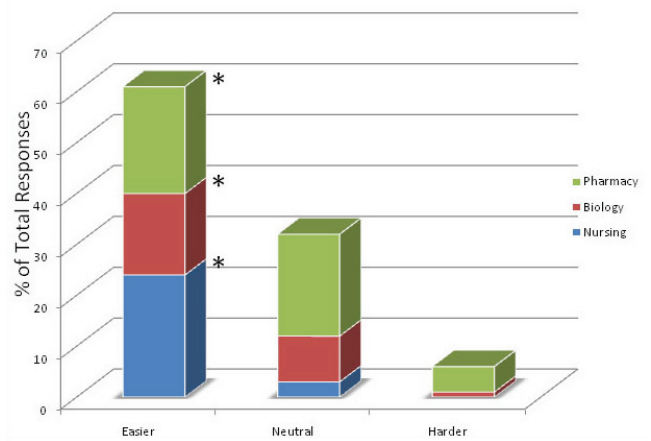
narratives were employed (Fig. 4). These student perceptions correlated with markedly improved performance on case questions and examinations regardless of the type of questions administered. However, the use of multiple-choice questions to assess long-term learning yielded the most pronounced results (90% correct with personal format versus 42% correct when using clinical format) (Fig. 5).

The real-world approach simulated in personally formatted case studies also resulted in all student cohorts reporting improved understanding of the impact of patient compliance on successful clinical outcomes (Fig. 6). Additionally, all student groups indicated a superior ability to empathize with their patients as a result of format presentation (Fig. 7). Thus, these data suggest that case study analysis in the microbiology classroom leads to the cultivation of multiple professional skills required by health care providers in addition to helping build a solid knowledge base.

An examination of our class demographics revealed a two-fold greater enrollment of female students. An even more lop-sided ethnic composition characterized our courses; the student body is dominated by Caucasian (90%) pupils, with only 8% Hispanic and 3% African American representation. Analysis of the travel experiences for our students was also notably limited, indicating few opportunities for exposure to cultural diversity. For these reasons, our students were assigned two cases for review which focused on microbial infections impacting patients of varied ethnic backgrounds. Students reported the additional narrative provided in these personal case formats added to their understanding of trans-cultural health care issues (Fig. 8).

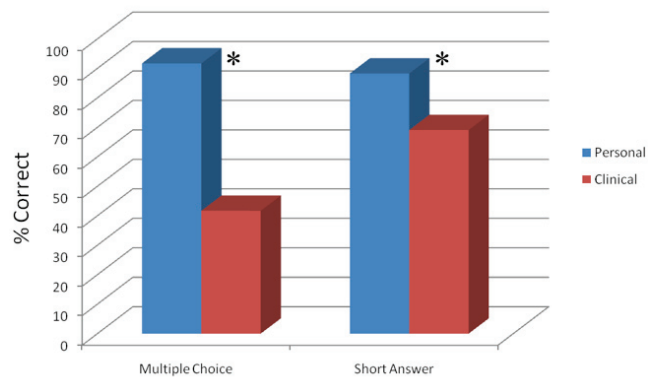
DISCUSSION

For most allied health students, it is important to understand that solutions to the problems of infectious disease require more than just recognizing a list of clinical signs and symptoms and interpreting laboratory tests. Background information about a patient’s lifestyle, attitudes, personal habits



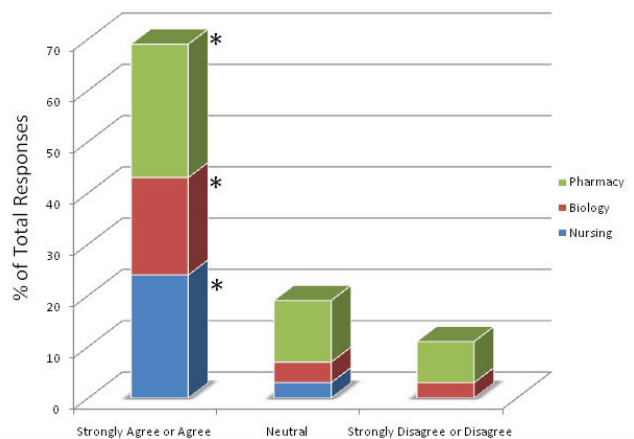
* indicates $p < 0.05$; N = 91

FIGURE 4. Student response to case study format survey: “The personal presentation of the patient’s history made it _____ to remember the relevant factual information for an extended period.”



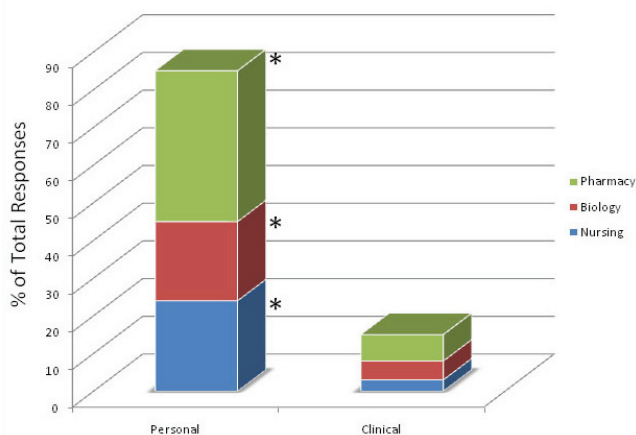
* indicates differences were significant at the 0.05 level. Values \pm 95% confidence interval were $92\% \pm 7\%$ and $42\% \pm 13\%$ for responses to multiple-choice questions with N = 327; $88\% \pm 5\%$ and $69\% \pm 7\%$ for short answer questions with N = 294

FIGURE 5. Evaluation of content retention by students at least three weeks after completing case studies.



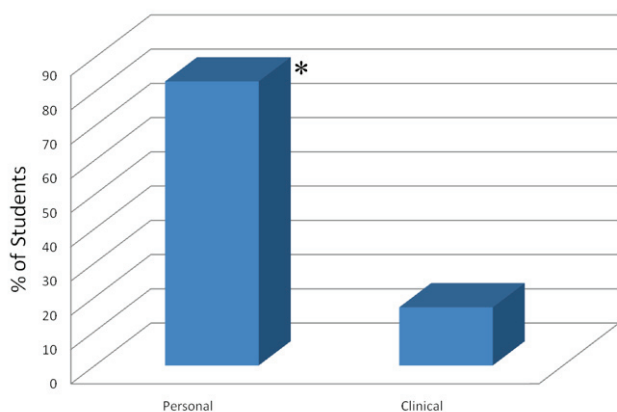
* indicates $p < 0.05$; N = 90

FIGURE 6. Student response to case study format survey: “The personal presentation of the patient’s history better helped me understand patient compliance issues.”



* indicates $p < 0.05$; N = 91

FIGURE 7. Student response to case study format survey: "The _____ format made it easier for me to empathize with the patient."



* indicates $p < 0.05$; N = 77

FIGURE 8. Student response to case study format survey: "The _____ format was more effective at increasing understanding of medical care for patients with differing ethnicity."

and cultural heritage provides key clues that are often not included in more typical undergraduate microbiology cases. For these reasons, our students preferred analyzing case studies written with a personal narrative which realistically provides these insights. An interesting correlation is noted between the extent of patient contact anticipated in a student's future medical profession, the rigor of their curriculum and their preference for a given case format. Nursing students have chosen a career that requires an extensive, hands-on patient care component which is consistent with their strong preference for the personal case format. Although they have a full curriculum, the nursing students take less basic science than the other cohorts examined in this study and potentially have more schedule flexibility. Conversely, pharmacy students will have significantly less hands-on patient interaction in their profession but possess the most rigorous science curriculum of the three cohorts. We believe their significant preference for the brief, clinically-based case format may be linked to

the profession's reduced direct patient relationships and/or concern about managing their limited time. Students in the pre-professional cohort will eventually have an intermediate level of patient contact and, at this stage of their matriculation, they also have an intermediate level of science background or curricular rigor. Consequently, it was not surprising to find no overall case format preference for this cohort.

The more accurate depiction of how students will encounter future patients represented by personal case formatting has the added benefits of helping them better retain relevant microbiological facts for extended periods. Our data show this additional information facilitates long-term retention of the key concepts emphasized in the case. Students tested using "fill-in-the-blank" or short essay questions performed significantly better on examinations than their peers if they analyzed a case presenting the relevant material in the personal format (87% versus 65%). An even greater success rate for knowledge retained was measured for students answering multiple-choice questions regarding concepts from cases formatted with personal narrative (90% versus 42%). This finding is particularly noteworthy, as most of our students will be required to take multiple-choice standardized examinations (Major Field Test, MCAT, GRE, nursing or pharmacy state boards) in order to complete their medically-based training. Students clearly recognize the value of case format in nurturing their critical thinking and concept application skills as they almost unanimously report the personal version to be more helpful to their professional development than the standard clinical design. Closely tied to these results is the student perception, supported by test scores, that the personal case format indeed promotes lasting retention of crucial information.

Personal case formatting represents a more accurate depiction of how students will encounter future patients in a health care setting and, clearly, this extra information aids their long-term knowledge recall. This real-world approach has several added benefits in that it also helps students better empathize with their patients, and facilitates an understanding of the impact of patient compliance on clinical outcome. By cultivating these less tangible but highly valuable professional skills as undergraduates, we believe our students will ultimately become more effective care providers. They will have increased ability to connect with patients, identify with their concerns, recognize potential treatment pitfalls, and implement therapeutic protocols.

Finally, because the composition of the study body at ONU lacks extensive cultural diversity, our students have relatively little experience interacting with people of different ethnic backgrounds. This situation appears to be further compounded by their general lack of international travel experience. Since the majority of the students enrolled in our courses plan to embark on careers as health care providers which will expose them to patients of diverse cultural traditions, we sought to enhance their ability to successfully connect with these future patients by introducing them to transcultural health care issues through personally formatted

case studies. Two case studies with a transcultural focus were assigned for student analysis. Upon completion of the task, students strongly indicated superior understanding of the role of heritage in approaching patient care. The additional information provided in the personal case format served to acquaint students with cultural customs that influence whether a patient of a specific ethnicity will practice traditional therapies, seek professional medical attention, and/or comply with prescribed treatments. Since the majority of our students will ultimately work in metropolitan areas supporting diverse ethnic communities, enhancing their appreciation of the role cultural traditions play in medical care will benefit their future patients.

In conclusion, this study demonstrates that the case study format has a significant impact on student ability to retain factual information for extended periods. Regardless of the question type employed, students using personal case studies for analysis scored significantly higher than peers analyzing cases written in the clinical perspective. Additionally, all student cohorts analyzed in this study report improved critical thinking skills, genuine patient empathy, a significant understanding of how noncompliance can negatively affect therapeutic outcomes, and enhanced appreciation of transcultural medical issues due to learning with the personal format. Therefore, we conclude the realistic presentation offered by personal format case studies in a general microbiology

class may help to better prepare students for careers in the health care arena.

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