



Using Narratives to Teach Students Enrolled in Science and Medical Science Bachelor's Degree Programs

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Abstract

Introduction Narratives (as opposed to stories) can assess multiple facets of the same problem through the viewpoints of different characters.

Methods Narratives related to three cancer patients, from diagnosis to cure or death, were used to teach seven cancer-related themes in a Cancer Pathology course offered to third-year medical science and science (college) undergraduates.

Results The majority of students preferred narrative-based learning compared with traditional learning methods because they felt that it improved their learning experience and retention of information.

Conclusion Narrative-based learning may improve the learning experience of students by contextualizing complex concepts and highlighting real-world applications of knowledge.

Keywords Narrative-based learning · Pathology · Cancer · Undergraduate education · Medical science

Background

Narratives are powerful tools that can be gainfully employed in undergraduate education [1]. They are different from stories as the events do not have to be told from a “beginning” to the “end.” For example, a sequence of events in a narrative can be recounted from back to front (as a reflection) or as different versions re-told by multiple characters [2, 3]. The potential advantages of using narratives in teaching are as follows: learning content in relation to scenarios rather than as abstract concepts [4], ability to focus on important areas while appreciating the broad perspective of the topic, and learning in context [5, 6], thereby enhancing retention [7–10]. Teaching in this manner may also increase authenticity of information, which can improve students’ learning experience [2, 11].

This short communication discusses the design, evaluation, and impact of a series of narrative-based practical classes for Science/Medical Science undergraduate (college) students in an Australian university.

Activity

The narrative-based teaching activities discussed here are part of the PATH3206 Cancer Pathology course offered to third-year undergraduates in pursuit of a bachelor’s degree in Medical Science or Science in 2018 at UNSW Sydney [12]. This program is run jointly by the Faculties of Medicine and Science. The course content is taught using lectures, tutorials, practical classes and assignments with some overlap of topics between these methods. Virtual microscopy practical classes in previous iterations of this course were heavily focused on histology of different types of cancer. According to student feedback, they found histopathology of limited relevance to their future career aspirations. The newly re-designed practical classes (six classes, each of 2 hours duration) used fictional narratives focused on three patients to teach seven themes related to cancer: clinical presentations, histopathology of benign and malignant tumors, biostatistics, treatment options in

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cancer, screening, research ethics, and terminal events. We hypothesized that the skills obtained from these classes would have a broader appeal to many different career pathways (research, allied health, pharmaceuticals, medicine).

The three fictional patients (an expanded outline of all practical classes is shown in Table 1) had bowel cancer (presenting as anemia), breast cancer (presenting as a pathological fracture of hip due to metastasis), and lung cancer (presenting as a paraneoplastic syndrome) respectively. Each “patient” was assigned to one of three large groups of students (further subdivided in to “research groups” of no more than five students to complete small group activities related to their patient) who followed up the same patient in practical classes throughout the course. All students attended the practical classes as a single cohort, taught by the same lecturer at the same venue. During the class, students were given problems and tasks (e.g., making a diagnosis, calculating risk ratios, writing a histopathology report) on an online worksheet with the aid of macroscopic pathology specimens, data, and virtual microscopy slides. The teacher in each class discussed all three cases with the entire cohort after each of the group activities. All resources including lectures, practical notes, pictures, virtual microscopy slides, and tutorial notes were made available via Moodle, the Learning Management System for UNSW. Two online modules on biostatistics, designed specifically for this course, were made available as pre-class learning material [11].

At the end of the course, all students were invited to provide feedback regarding the practical classes via an anonymous online questionnaire. This queried whether students had experienced narrative-based teaching before and included four statements scored on a 6-point Likert scale with options ranging from “strongly agree (scored 6)” to “strongly disagree (scored 1).” The statements were as follows: (a) “narrative-based approach improved my learning,” (b) “I remember the content better as it was related to a story,” (c) “narrative-based classes are preferred to standard practical classes,” and (d) “despite learning about three patients only, the principles taught are applicable across multiple patients.” Students were also asked two yes/no questions as to whether narrative-based classes were better than traditional methods at linking multiple themes together and whether they were better at demonstrating the practical applications of knowledge. Finally, three open-ended questions were included, relating to the perceived strengths and weaknesses of this teaching method as well as suggestions for improvement. The feedback was summarized as totals and percentages. Statistical significances in responses between student groups were explored with the chi square test with statistical significance set at $p < 0.05$.

Results and Discussion

One hundred and five students completed the PATH3206 course in 2018 (of 107 enrolments) with over 80% attendance at the practical classes. Sixty-two students completed the online feedback questionnaire (response rate 59%). The quantitative feedback from students is summarized in Fig. 1 while the top recurring themes of qualitative feedback are summarized in Table 2. None of the respondents had experienced narrative-based learning previously. A clear majority of students (>90%) agreed that narrative-based learning improved their learning experience (Fig. 1). The majority maintained that narrative-based classes were better at linking multiple cancer-related themes together (68%, 42/62) and in demonstrating the practical applications of content taught (69.4%, 43/62), compared with traditional methods of teaching.

Analysis of open-ended items in the questionnaire revealed several themes. Many students indicated that a narrative made it easy to understand concepts as well as to see the connections between different topics. Students also found the classes to be engaging and interesting as they were curious about what would happen next to their patients. They also appreciated the sense of emotions and empathy these “real-life scenarios” injected to the technical details of each disease. Some were surprised by the multiple themes and learning opportunities a single case could provide, demonstrating better alignment with real-life applications. The weaknesses of the new method reported by students were categorized into two themes: issues specific to individual classes (content), such as unfamiliarity with some clinical investigations and difficulties in understanding biostatistics; and those related to the process and hence applicable to all classes (process) such as unequal attention to each case, limited number of cases discussed, and occasional repetition of information. When students were grouped according to the underlying theme of their comment (content vs. process) and cross-analyzed in relation to their answers to other questions, there were no statistically significant differences between groups. This suggests that both content and process were equally important to the learning experience.

The students also provided feedback on the entire course through *myExperience*—the UNSW University-wide institutional survey (response rate 73.3%, 77/105). The overall satisfaction with the course improved to 93.5% compared with 79.2% in the previous year (which did not have narrative-based practical classes). While this improvement cannot be attributed to practical classes alone, 24 students out of 57 (42%) that provided qualitative feedback mentioned the practical classes as one of the best features of the course.

Table 1 Outline of practical classes and the learning objectives for each class

Class	Theme	Narrative	Examples of learning activities
1. What is wrong with me?	Clinical diagnostics	Ted (60) presents with anemia and is diagnosed with a colonic carcinoma Emma (50) presents with a fragility fracture which eventually leads to a diagnosis of breast cancer with bone metastasis Andy (45) presents with a non-resolving cough and biochemical evidence of Cushing syndrome and is diagnosed with small cell carcinoma of lung	Use clinical histories, examination findings, and an interactive panel of investigations to reach a final diagnosis in each case Understand that symptoms in cancer can be due to (a) primary growth, (b) metastasis, and (c) paraneoplastic syndromes
2. Under the microscope	Histopathology	Students take the role of pathologists to diagnose the slides made from biopsies of Ted, Emma and Andy	Understand the difference between benign and malignant lesions using paired un-labeled virtual slides from the same organ with normal histology and neoplasms Determine the typing and grading of the malignancy of their “patient” using a virtual histology slide
3. Making sense of the numbers (This practical was supported by two online modules on introductory statistics which students completed before the class)	Biostatistics	Ted wants to persuade his physician to import an expensive drug via a drug company. The company representative (student) must make his case to an oncologist who can request a subsidy for import Emma’s daughter has found a new treatment that may work in a scientific journal. She wants the doctor (student) to explain if it is useful for her mother Andy’s son (student) is interested in finding out if he can make a case to get workers compensation for his dad by proving his work exposure to chemicals increased the risk of lung cancer. He compares two studies that has conflicting conclusions	The company representative calculates the number needed to treat (NNT) to demonstrate the cost-effectiveness Students take the role of the doctor to explain on the interpretation of a hazard ratio Students compare a human case control study that shows no association between chemical exposure and lung cancer against an animal study that does show an association to see which type of evidence is reliable.
4. What are my options?	Treatment options	Ted is recommended surgery and adjuvant chemotherapy Emma undergoes hormonal therapy and chemotherapy but is then referred to radiotherapy after a metastatic fracture compresses the spinal cord Andy is considered for targeted therapies but is eventually referred to palliative care.	Students discuss and argue which of the following treatment modalities are best for their patient: chemotherapy, surgery, radiotherapy, hormonal therapy, targeted therapy, and palliative care
5. If I knew earlier, would it have mattered?	Screening	Patients and / or relatives (student) want to know if it could have been diagnosed early	Understand the basic concepts of screening and explore potential screening tests for the cancer type of their “patient” Search for evidence to see if these screening methods would make a difference for other family members
6. I am a person, not a disease	Research ethics	A biopsy is taken from Ted during a follow up visit when he was under sedation without consent Emma is in severe pain. She is given the option of enrolling in to a trial that gives larger than usual dose of pain killers Andy is given the opportunity to enroll in to a trial. He will get an attractive insurance policy if he says yes.	Identify key ethical issues in doing medical research on cancer patients using the given case scenarios List the key considerations in granting ethical clearance for a research study
	Terminal events	Emma dies suddenly Andy becomes critically ill with sepsis	Describe the pathophysiology of events leading to death in cancer

Use of narratives for learning is supported by constructivism, a learning theory which suggests that people learn from their experience [13]. Narratives help to

organize existing knowledge into a structure or schema, to which new information can be added [7, 14]. This scaffolding can be easily linked to practical applications

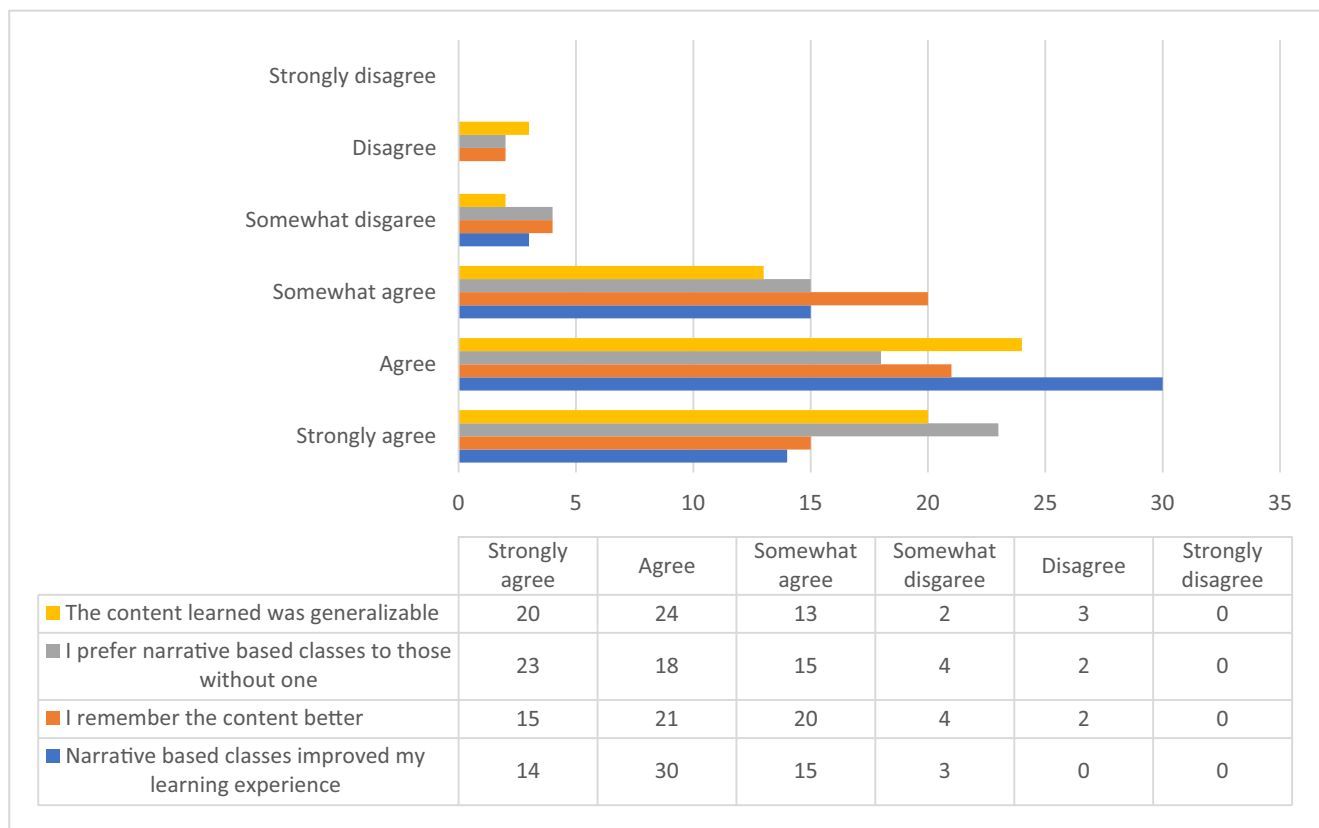


Fig. 1 Student responses to feedback questions regarding narrative-based teaching scored on a Likert scale. Y-axis shows the different response options and the X-axis shows the frequency of answers.

The number of students per question/answer is also indicated in the data table below the figure

and with other related themes. For example, a single patient’s experience can be used to integrate knowledge from anatomy, pathology, pharmacology, research, and

statistics. This type of teaching may be more logical, intuitive, and in line with the career aspirations of students who will obtain a Bachelor of Science/Medical

Table 2 Top recurring themes identified from student responses to open-ended questions regarding the narrative-based practical classes

Favorable	Non-favorable		Suggestions for improvement
	Process	Content	
Easier to retain/remember content	Optimum number of cases (some said three cases were few while others thought it is too much)	Unfamiliarity with clinical investigations and statistics	Include molecular biology and genetics in future iterations
Demonstrated the practical applications well	Unequal attention to each case		More pre-class preparatory material (online modules)
The classes were engaging	Lack of diversity of cancer types discussed		Transcripts or recordings of classes should be made available
Learning with a case study shows how different disciplines of knowledge interconnect	Repetition of information		
Logical flow of information that is easier to follow			

Science degree and seek employment in a wide range of health-related disciplines after graduation [15].

Using the same three case studies throughout a course was challenging. However, we realized that narratives offered more room to explore different aspects of a case by branching out to discuss parts of the story from the perspective of different observers. For example, after the first two practical classes where clinical diagnosis and histology of neoplasia are discussed, the third practical class, in a typical storyline, should discuss staging and treatment. Instead, we diverged by introducing new characters (sons, daughters of patients) and considered the events from their perspective, to discuss a different theme of biostatistics. Narratives provide flexibility for this kind of maneuvering.

One criticism of narrative-based classes was the limited number of cases that could be discussed. Using narratives is time-intensive and not all content in the course can be taught using case studies. A fine balance needs to be struck between the specific details of a case history and the generic concepts that a student can apply across multiple cases. Hence, we believe that narrative-based learning should ideally complement other teaching methods, such as lectures and tutorials rather than being the sole method of content delivery.

The findings of this study are limited to student perception, experience, and the satisfaction regarding the new teaching method. It does not assess the conversion of this satisfaction to better student performance and learning. The content taught at practical classes was not assessed separately in examinations to gauge this aspect through exam performance. In addition, as this was formal teaching of the university, we could not have a control group.

In conclusion, as judged by student feedback in the present study, narratives can be a powerful tool in medical science education to enhance students' learning experience when appropriately complemented by other teaching strategies.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethics Approval Ethical approval for this study was granted by The Human Research Ethics Advisory Panel of the University of New South Wales (Approval no: HC171023).

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