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Self-directed learning through journal use in an elective pharmacy course

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Description of Course: In a toxicology doctor of pharmacy elective course, students completed self-directed assignments based on in-class material in an electronic journal. Students participated in group discussions based on the assignment. Journals were graded for completeness and pursuit of individual interests was encouraged.

Evaluation: Students responded positively to journal assignments and their educational value. Faculty members also recognised a high level of learning by students based on their group discussions. Performance on course learning objectives and quality of in-class discussions also indicated that the use of journals in the elective course was successful.

Future Plans: Based on these findings, journals will continue to be used in this course, will be further assessed, and may be expanded to additional courses in the pharmacy curriculum.

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Self-directed learning through journal use in an elective pharmacy course

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Keywords: *self-directed learning, reflective learning, teaching innovations, journal-based course*

Introduction

Encouraging students to teach themselves is a growing theme in education (Knowles *et al*., 2011). Rather than attempting to retain information from lectures, utilising learned skills to acquire and retain new knowledge might be of the greatest benefit to students in their future professional lives. Numerous studies emphasise the importance of promoting self-directed learning (SDL) skills in professional education to enable future success, including a number of recent publications that describe and assess methods that encourage SDL in health professions education (Strohfeldt & Grant, 2010; Deyo *et al*., 2011). Murad *et al*., (2010) reviewed the effectiveness of SDL and concluded that incorporating SDL into the curriculum is associated with improvements in overall knowledge. Similarly, Benedict *et al*. (2013), concluded that certain types of SDL can be as effective as more traditional, didactic teaching methods.

Self-directed learning can employ many strategies, including self-testing, reflective assignments and case studies, and in recent years has often employed the use of technology (Nicol *et al*., 2006; Murad *et al*., 2010; Tsingos *et al*., 2014). In this study, electronic journals were used to introduce SDL in a doctor of pharmacy elective course. This type of self-directed, reflective process allows students to record both their learning process and the information collected, resulting in a compilation of evidence that demonstrates student abilities including their growth of knowledge and SDL skills over time. In many aspects, the SDL journal resembles a type of portfolio that documents SDL specific to the individual. Portfolios with this purpose have been used successfully in higher education to encourage diversity among students and provide subjects for richer conversation and discussion among peers and faculty members (Roecker *et al*., 2007; Ziegler & Montplaisir, 2012). In many of these cases, the portfolios were highly assessed, and used formally to supplement, and sometimes replace, other types of assessments (Buhagair, 2007).

The goals of this study were to individualise student learning experiences and increase understanding of course topics through the use of SDL journals. We hypothesised that the SDL journals would encourage students to find information that interested them, expand their abilities to research relevant information and reflect on their own work along with the work of others, all while increasing their learning and understanding in a pharmacy elective course.

Methods

In a doctor of pharmacy elective course in Forensic and Environmental Toxicology, the use of electronic journals was implemented in order to tailor broad subject matter to students' specific interests, encourage SDL, and assess these students' learning during the course. The study was conducted over a two year period with a total sample size of 52. This study was approved by the St. John Fisher College Institutional Review Board as an exempt study.

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At the beginning of each semester, students were given instruction regarding journal use for individualised and reflective learning. Each student journal consisted of responses to four different assignments given after corresponding topics were introduced during class lectures (see Table I for an example). Students were then given until the next class period to complete each assignment in their electronic journal. Each of the four assignments consisted of the same requirements, which included researching and providing references on a specific topic that related to the broader topic covered in class. Students were then asked to complete three tasks in relation to what they found. These tasks were: (1) summarise and describe the contents of their findings; (2) relay how their research related to the topic covered in class; and (3) divulge what they found was the most interesting part of their research. Some assignments included additional, more specific questions for the students to answer during their research. On class days following the completion of a journal assignment, a class discussion was held where the entire class shared the information they found from their research in an informal round-table setting. While the beginning of the discussion focused on the journal assignment findings, students were free to ask each other questions, and broach other subjects of interest sparked by thoughts and responses from their peers.

Table I. SDL: Journal Assignments

Assignment
For your favorite therapeutic drug, research the method by which levels of the drug (or metabolites) can be measured within the body.
Find a news article of a criminal poisoning within the past 10 years. Include details of the case and any outcome of the trial if available.
Find an article dealing with research in forensic or behavioral toxicology.
Pick any environmental chemical that interests you and find a research article that looks at its effects on human health. The study does not have to be in humans, but should have applicability to human health.
Research a plant or animal toxin. As part of the required questions, describe its source, mechanism of action, where it is found and any other interesting information.

Each student journal was completed using Google Docs® – a free, online program linked with Gmail® where anyone can create a document using their email account, and share it with others. These shared documents allow multiple people to view and make edits and changes in real-time. Along with the added benefit of being environmentally friendly, this program was chosen for its convenience. Students could edit their work easily and faculty could leave comments and feedback. Faculty review of each assignment ensured that each student's work was unique. As the journals were used as tools to encourage SDL, assignments were graded on completeness according to the assignment requirements. If the assignment was completed on time and all of the necessary questions relating to the topic were answered, the student received full credit. The journal then made up a portion of the student's grade at the end of the semester (15%). To support successful course performance, SDL journal assignments were developed to link to the learning outcomes of the course. As shown in Table I, each assignment given in class corresponded with a different learning objective in the course.

To evaluate the use of SDL journals, students in the course participated in two different surveys: a self-assessment of the accomplishment of the learning objectives that corresponded with each journal assignment (Table II) and a report of their level of agreement or disagreement in response to standardised statements about the use of the journals (Table III). An important component of validating the usefulness and effectiveness of SDL journals was to have other faculty members (unrelated to the course) assess the students' learning. For the current study, three faculty members were invited and each attended a different session. Each faculty member was asked to provide an evaluation of student learning, enthusiasm and impression of SDL journals. All of the faculty and student comments were analysed for themes based on grounded theory (Cresswell, 2006).

Table II: Learning Objectives vs. Course Evaluation Scores

Learning Objective-Linked Course Evaluation Question	Student Average Score ± SD (N=52)	Max/ Min Score	% Strongly Agree or Agree (Score of 7 or 6)
I am able to describe the principles and uses for common methods used in applied toxicology	6.46 ± 0.64	7/5	96.2%
I am able to discuss different environmental toxins and describe how they impact human health	6.40 ± 0.66	7/6	100%
I am able to list different types of analytes tested for in forensic toxicology and discuss the proposed mechanism of action of each and the symptoms associated with poisoning	6.45 ± 0.65	7/5	98.1%
I am able to list the major areas of toxicology and explain the importance of each.	6.48 ± 0.59	7/6	100%

Student scores were based on a Likert Scale of 1-7 (1=strongly disagree; 7= strongly agree);

SD= Standard Deviation

Table III: Survey Scores from Student Response Surveys

Question	Class Average Portfolio Score ± SD (N=52)	Max/ Min Score	% Strongly Agree or Agree (Score of 5 or 4)
The use of portfolio assignments helped me to learn about additional topics not specifically covered in class.	4.71 ± 0.49	5/4	100%
Portfolio assignments were a productive use of my time.	4.65 ± 0.63	5/3	92.3%
The topics covered by portfolio assignments were relevant to the course.	4.82 ± 0.44	5/4	100%
The use of portfolios promoted self-directed learning.	4.88 ± 0.43	5/4	100%
Portfolio assignments provided a good basis for small group and class discussions.	4.71 ± 0.53	5/3	98.1%
Completion of portfolios online (via Google Docs) instead of paper was beneficial.	4.82 ± 0.39	5/4	100%
I would recommend using portfolio assignments in this course in the future.	4.76 ± 0.59	5/3	94.2%

Average score is based on a Likert Scale of 1-5 (1=strongly disagree; 5=strongly agree);

SD= Standard Deviation

Evaluation

Table II shows the self-reported learning of class objectives that corresponded with journal assignments. Based on the use of a Likert Scale of 1-7 (1 equaling strongly disagree and 7 equaling strongly agree), scores averaged 6.46, 6.40, 6.45, and 6.48 for completing the four corresponding learning objectives. The majority of students agreed or strongly agreed with learning the information that the assignments supported. This survey was a standard evaluation completed for all courses developed by school administrators. In addition, students performed well in the course overall, with a course average of 92%.

In a separate instructor-developed and externally reviewed survey based on a Likert Scale of 1-5 (1 equaling strongly disagree and 5 equaling strongly agree), students rated the use of SDL journals specifically (Table III). The majority of students agreed or strongly agreed that journals supported SDL, were a productive use of time, related well to the course, were a good way of individualising the course, and provided a good basis for discussion. They also felt completion online was beneficial and would recommend continued use of SDL journal assignments in this course.

Faculty members not related to the course also helped to validate that the SDL journals were an effective learning tool in their comments stemming from the class discussions they observed. All faculty members indicated that students demonstrated high levels of learning and recall of information, great enthusiasm and appearance of enjoying learning, sharing, and reflecting. Similarly, student comments expressed that portfolios were beneficial and useful to learning, were enjoyable, fostered thorough research, were different and interesting learning tools, and encouraged great discussion and enthusiasm during class. Students recommended using journal assignments in the course in the future due to their overall benefit in learning additional material, encouraging thoughtful discussion, promoting SDL, and ease of online completion.

Compared to previous teaching methods, implementation of the SDL journals did not significantly increase preparatory or grading time. A decrease in time required to prepare lectures was balanced by the time involved in reading online journals. However, in a large class size (>35 students), this method may increase the workload burden on faculty members. While discussions were usually very productive, there were also scenarios where time limited participation by all students. In these scenarios, the objective of fostering SDL was still met, but topics researched by students were not all shared. If mandatory topics are being covered by SDL journal assignments, in-class discussions would need to be modified to include time for each student to share results. Along these lines, it would be difficult to completely replace traditional didactic teaching with this method. Self-directed learning journals would be most successful when combined with instructor-led delivery of introductory or background material.

Future Plans

Based on the results from the faculty and student observations, discussions, and surveys, the use of SDL journals in a one-semester course was successful. From an instructor perspective, the assignments were valuable because they often led to discussions with probing questions, debate, and enthusiastic involvement amongst the students.

Due to the success of the SDL journals in the course, their use will be continued and possibly expanded to other pharmacy courses. SDL journals in this instance were utilised in a small pharmacy elective course (17-35 students), although they could be tailored to fit into many different pharmacy courses. Based on observation from the implementation of SDL journals, key points for consideration before implementing SDL journals in a class include: What assignments allow for the most freedom in SDL? What course goals need to be met? How can information for SDL journals be effectively and efficiently shared with other students in the course? One of the benefits of journals in this case is that many topics can be introduced, where they otherwise may be left out of the curriculum due to time constraints.

Data from the use of SDL journals in this study supports the benefit of SDL in medical education that has been previously reported. Reflective learning in pharmacy education, specifically, has been shown to develop critical thinking and problem solving skills, as well as skills necessary for life-long learning (Tsingos *et al*., 2014). This development of life-long learning is a necessary skill in the pharmacy field, with ever-changing treatment guidelines, available medications, and regulations (Tsingos *et al*., 2014). Additionally, student perspectives on SDL are largely positive, which is reported to help student buy-in and participation in the process (Douglass & Morris, 2014). Finally, SDL appears to improve knowledge acquisition, and shows benefit to student learning directly in the classroom (Murad *et al*., 2010). Future studies of SDL journals will be aimed at directly measuring the benefit of SDL journals on knowledge acquisition and academic performance.

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Conflicts of Interest

None to disclose.

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