INSTRUCTIONAL DESIGN AND ASSESSMENT

An Instructional Model for a Nonprescription Therapeutics Course

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Objectives. To design and implement curricular modifications to a nonprescription therapeutics course to better meet course objectives.

Design. Improvements included the addition of journaling, mastery grading, case studies, verbal examinations, educational mentors, and encouraging classroom participation.

Assessment. Student course evaluations and grades were used to assess the impact of the pedagogical modifications. Course grades indicated that students succeeded in learning at the set mastery level of 80%. Course evaluations indicated students responded positively to the course modifications.

Conclusion. Ongoing curricular modifications ultimately resulted in a course that met established course objectives.

Keywords: journaling, case-based learning, student evaluations, verbal examinations, nonprescription, therapeutics

INTRODUCTION

The Center for Advancement of Pharmacy Education outcomes describes an environment that allows students to develop “. . . pharmaceutical care plans that are patient-specific and evidence based.”¹ Expectations for these experience-based models are usually focused on the fourth or experiential year of the doctor of pharmacy (PharmD) curriculum. Assessment of technologically mediated instruction should indicate that learning is dynamic and interactive.²

A consensus of teachers of nonprescription therapeutics courses was published in 2006. It presented justification and support for independent nonprescription therapeutics (self-care) courses in pharmacy curricula. It also gave specific recommendations for minimum course requirements and content.³ Four years before these recommendations were published, the Creighton self-care faculty began course modifications to improve student outcomes as self-care therapists. Creighton University School of Pharmacy and Health Professions currently graduates approximately 110 campus-based doctor of pharmacy students annually. The 4-year professional pro-

gram for pharmacy is preceded by a minimum of 63 hours of prerequisites.

Several factors encouraged the redesign of this course including: (1) the American Council on Pharmaceutical Education (ACPE) 1997 guidelines and professional expectations of practitioners (Standard No. 10),⁴ (2) student evaluations that indicated disappointment with content delivery of the existing course, (3) preceptor reports that pointed to weakness in student performance in the nonprescription aisle, (4) desire of the course instructors to create a classroom learning model that more closely resembled the interactions that take place in the nonprescription products aisle. Competence as a professional implies that students have factual knowledge that can be applied in the practice setting.⁵ This goal of “Modeling Professional Behavior” became a theme for subsequent analysis. The combination of these factors and the goal of Modeling Professional Behavior prompted a reconsideration of the pedagogical structure of the Nonprescription Therapeutics course. The result was several modifications beginning in 2003 to support a more comprehensive and practical learning model.

In 2003 a mastery level learning model was instituted, an experiential process was emphasized, and active-learning activities were incorporated into a learner-centered educational model. The ultimate goal was to have nonprescription knowledge internalized as performance behavior.⁶

The educational literature is rich with a variety of models for behavioral approaches to learning.⁷⁻¹⁶ Grades

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are a reasonable and commonly available proxy measurement for learning.¹⁷ Mastery learning postulates that given sufficient opportunities, all students can learn. This model for instruction allows students to “acquire some basic intellectual competencies which will help ensure that they can undertake the subsequent learning demanded of them by their schools and eventually their vocations [professions].”¹⁸ The model utilizes frequent graded activities and assessments to give students multiple opportunities to learn. In addition to the modifications discussed above, if students fail an examination (scores less than 80%), they are given an opportunity to take it again. According to Zimmerman and Dibenedetto, this will skew the usual bell-shaped curve around the point of mastery.¹⁹ This manuscript describes the implementation, progression, and assessment of this course over 6 years.

DESIGN

The Nonprescription Therapeutics course was a 5-credit-hour course (3 hours prior to 2002) that encompassed the traditional Food and Drug Administration (FDA) approved nonprescription products. It also covered dietary supplements (nutraceuticals) and home medical equipment. The course was taught in the spring semester of the second year. The instructional model used in 2002 involved conventional lectures, 2 examinations, and a comprehensive final examination. From 2003 to 2008, pedagogical modifications were made to the instructional model, including: (1) number and type of examinations, (2) required journaling, (3) simulated patient

cases, (4) increased learning expectations, (5) interactive classroom exercises, (6) regular quizzes, and (7) partnership with educational mentors (Figure 1).

Examinations

From 2002 (the reference year) to 2008 the number of examinations administered in the course was increased from 3 to 7 (6 written and 1 oral). Examinations became more product oriented and situation based. Images and pictures were added to improve product recognition. Examination questions were based on core information that all students should have learned by the end of the course.

In 2006 a verbal examination process was implemented. Instructors embedded questions in the PowerPoint presentations that all students were expected to research and be prepared to answer. During class, a randomized class list was used to select individuals to answer the embedded questions. During the semester each student was called upon at least once before a second randomized list was started. All students began the semester with 100 points (100%) for this examination. If a student was absent when his/her name was called, 25 points were deducted from their grade. Responses were graded by the instructors, who deducted up to 10 points per question based on the quality of a student's answer.

Journals

A semester-long cumulative journal was introduced in 2005. Recognizing the need to foster therapeutic decision making and professionalism, formative individualized

Figure 1. Modifications made to a nonprescription therapeutics course over a 6-year period. Abbreviations: E5Q = Examination Question 5. Refers to a verbal examination question administered to students on a randomized basis throughout the semester.

weekly feedback regarding journal entries was instituted in 2006.²⁰ Students were required to answer specific questions about a patient situation and a related reflective topic each week in their journals. Graders reviewed the entries and provided feedback.

Cases

Since this was a nonprescription therapeutics course, the instructors analyzed the interactions that occurred between a pharmacist and a patient asking about a health care issue amenable to self-care. A little over half way into the 2003 semester, the students did their first case using the instructor generated 7-step process. What was needed was a way to simulate and document the components of therapeutic decision making in the nonprescription products aisle. By parsing their experiences and observations, the primary authors developed 7 steps to force the students to consciously work through the process (Table 1). Formative individualized feedback was provided within a week of each case submission.

Learning Expectations

Mastery level learning was instituted for all graded activities. The passing course grade was set at 80%. Students could repeat examinations with some restrictions when they received a grade of less than 80%.

Interactive Classroom

Students gained additional points in the course toward their combined examination grades by earning “funny money,” fake currency that was handed out for substantive active class participation. The “money” was turned in at the end of the semester and the corresponding number of points were added to their total examination score. The most successful students added 15-20 points to the possible total of 600 points for the 6 examinations.

Quizzes

Starting in 2003, regular weekly quizzes were administered to keep students involved in course content, except for weeks in which there was an examination. Once the number of examinations was increased and verbal examination questions became a regular part of the course, the quizzes became redundant and were discontinued in 2008.

Mentors

Mentors were practicing pharmacists who were graduates from the school and were utilized to grade journals and cases and assist in course content development. The utilization of educational mentors is essential to providing prompt formative feedback to students on a regular basis. Each member of the faculty-mentor team provided

Table 1. Standard Objectives for Cases for Therapeutic Sections

Step	Objective	Process
1	Assess the patient.	Why is the patient here to see you? How serious is the patient's complaint? What else can you ask the patient that would help you understand the situation?
2	Determine the level of care that is appropriate.	Four probable levels of care are: 1. Nonprescription therapy (this is the most likely category during this course) 2. Referral to Physician 3. Emergency room or call for immediate medical care
3	List the therapeutic options.	What is the world of possible products and treatments that might be considered for this situation?
4	Evaluate risk/benefit of therapeutic option(s).	What is the risk and what is the benefit of each therapeutic option from step 3.
5	Develop and suggest a specific care plan for this patient.	What product(s) or therapy do you want this patient to use? What specific dosage form, dose(s), schedule, and length of therapy would you recommend? What other suggestions would you make? Note: This is not the time to refer something back to the physician.
6	Follow-up.	What monitoring or follow-up with this patient would you suggest? What outcomes should the patient expect and when should they occur? What additions could you have as options if the current therapy is not successful?
7	Defend care plan.	Why did you choose the option or options that you did? Why did you not choose something else that was on your list of therapeutic options? In other words, if we challenge you, could you provide some logical reason or scientific evidence for what you have suggested?

feedback to 25-30 students each week. The journals and cases were submitted electronically, read, given comments, graded, and returned within 5 days. To ensure consistency among graders, the mentor-faculty team was rotated between groups over the semester. A day-long training seminar on campus provided training to the mentors and content input to the faculty members. Mentors received financial compensation for the 4-6 hours per week dedicated to grading. The process of achieving the outcomes of the course would not be possible without the contribution from mentors.

Discussion Board

A structured discussion board requiring input and feedback by students with faculty monitoring was introduced in 2006. The discussion board was an attempt to have students interact with each other in small groups (3-4 students/group). It required each student to post an opinion about a self-care issue. All students had to respond to the postings of each member of their group.

EVALUATION AND ASSESSMENT

Evidence of Student Learning

The frequency data for overall course grades (Table 2) showed a shift in grade performance in the class. Prior to mastery learning, approximately one-fourth to one-half of the class received a grade of C+ or below. In the 6 years following the conversion, no students received a grade below B. The percentages of students receiving various course grades changed over the 6 years.

Course Evaluation

Student perceptions of the course were assessed using a required course evaluation consisting of 7 items rated using a Likert-scale ranging from strongly disagree to strongly agree, and 1 open-ended item. Two consensus thematic coding schemes were employed in evaluating the students' responses to the open-ended question. In the first scheme, the thematic coding dichotomized all

responses into 2 general categories of "modeling professional behavior" and "other" (no response or response unrelated to professional behavior). Further coding of the "modeling professional behavior" responses identified 2 subsequent themes supporting the professional behavior of applying knowledge learned and increasing student confidence in real world situations. Thus, this first coding scheme resulted in 3 thematic responses of "real world applicability," "increased confidence in ability," and "other." Real world applicability refers to comments indicating they used or applied classroom knowledge outside the academic setting. Increased confidence in ability refers to comments from students indicating they had a level of comfort and confidence in their nonprescription counseling abilities as a result of the course. The "other" response indicated the student made no comment, or the comment did not involve applicability, confidence in ability, or any other specific professional behavior. The second coding scheme basically stratified all responses into positive, negative, or neutral. Nonresponses were omitted from the coding and subsequent analyses. For both schemes, the consensus coding was conducted by the 2 lead authors.

Data Analysis

Descriptive statistics (ie, response frequencies) were conducted for student grades, responses to individual questions on the course evaluation, and themes emerging from open-ended responses. All variables were treated as categorical and analyzed using the chi-square test. For omnibus tests, a two-sided *p* value of 0.05 indicated significance.

Responses from the 7 Likert-type-scale items within the course evaluation were collapsed into agree or disagree, with the neutral response excluded from analysis. When appropriate, post hoc tests using a Bonferroni adjustment to reduce the probability of type I errors resulting from multiple comparisons were conducted for each question individually, with a two-sided *p* value of 0.002 indicating significance.

Table 2. Distribution of Student Grades in a Nonprescription Therapeutics Course by Academic Year (2002-2008)

Grades	2002 (n = 99)	2003 (n = 100)	2004 (n = 106)	2005 (n = 110)	2006 (n = 105)	2007 (n = 109)	2008 (n = 109)
A	11	100	69	101	97	61	33
B+	14	-	32	9	8	41	56
B	27	-	5	-	-	7	20
C+	21						
C	16						
D	10						
F	-	-	-	-	-	-	-

Frequency data from responses to the 7 questions within the course evaluation based on the 5-point Likert-type scale were collapsed into positive or negative responses, with neutral responses excluded from analysis. There was a significant difference for all 7 questions between years ($p < 0.001$). There were significant differences between 2002 and all subsequent years (all $p < 0.001$), with 2002 students providing more negative responses. All other comparisons between years were insignificant except regarding the instructors' interest in student success. In 2006, students had more negative responses than in 2003 and 2004 ($p < 0.001$ respectively). Pertaining to instructor professionalism and regarding respect between student and instructor, 2006 students had more negative responses than 2003-2005 and 2007-2008 students (all $p < 0.001$).

Evaluation of Open-ended Responses

As stated above, 2 coding schemes were employed from the open-ended responses within the course evaluation. For the first scheme, the omnibus analysis compared the dichotomized coded responses of "modeling professional behavior" or "other" across the 7 years, followed by 6 planned comparisons in which each of the 2003-2008 years were compared to the reference year of 2002, with a Bonferroni adjusted two-sided p value of 0.008 indicating significance. No further comparisons were conducted for the 2 resultant themes of real world applicability and increased confidence in ability. For the second scheme, responses were stratified as positive, negative, or neutral as described previously. The responses coded as neutral or nonresponse were excluded from analysis. The omnibus analysis consequently compared the positive and negative response across the 7 years. Post hoc tests employing a Bonferroni adjustment were conducted to assess for differences between years, with a two-sided p value of 0.002 indicating significance.

Table 3 provides frequency data for open-ended responses categorized as real world applicability, increased

confidence in ability, and other. As stated above, real world applicability and increased confidence in ability were collapsed into the modeling professional behavior theme, which was then compared to other responses. There was a significant difference in responses between years ($p < 0.001$). Students in 2002 responded with modeling professional behavior comments less often than students in years 2003-2005 (all $p < 0.001$) and 2007 ($p = 0.003$). Due to the high number of responses categorized as other 2008 did not reach a significant comparison.

Open-ended responses were further classified as positive, negative, or neutral. Table 4 provides frequency data for these 3 classifications. The neutral response was excluded from analysis. There were significant differences between years ($p < 0.001$). Students in 2002 responded more negatively than students in years 2003-2005 and years 2007-2008 (all $p < 0.001$). Further, students in 2006 responded more negatively than students in years 2003-2005 (all $p < 0.001$).

The data analysis highlights the contrast in outcomes between a traditional lecture/examination teaching style (pre-2003) and a student-centered teaching style (years 2003-2008).

Learning Expectations

The guiding expectation was for students to be competent in making nonprescription recommendations in the practice setting after completing the course. Summary data from the 7 Likert-style questions indicated that students believed the course helped them think like professionals. In the open-ended comments (Table 3), students voluntarily evoked the 2 themes of "the course had real world applicability" and "increased confidence in ability" to make nonprescription recommendations.

DISCUSSION

The implementation of these course changes produced the learning outcomes and classroom environment that the instructors hoped to accomplish. Student perceptions

Table 3. Thematic Analysis of Optional Student Responses, No. (%)^a

	2002 (n = 100)	2003 (n = 95)	2004 (n = 105)	2005 (n = 110)	2006 (n = 91)	2007 (n = 90)	2008 (n = 101)
Real World Applicability	27 (27.0)	58 (61.1)	56 (53.3)	46 (41.8)	10 (11.0)	17 (18.9)	25 (24.8)
Increased Confidence in Ability	0	15 (15.8)	21 (20.0)	11 (10.0)	27 (29.7)	27 (30.0)	20 (19.8)
Other	73 (73.0)	22 (23.2)	28 (26.7)	53 (48.2)	54 (59.3)	46 (51.1)	56 (55.5)

^a Statistical analyses conducted on the categories "Other" and "Modeling Professional Behavior" (real world and confidence responses collapsed) across the 7 years and compared to the 2002 referent year. For 2003-2005 (all $p < 0.001$) and 2007 ($p = 0.003$) when compared to 2002. All other year comparisons were not significant.

Table 4. Pharmacy Students' Positive, Neutral, and Negative Responses

	2002 (n = 86)	2003 (n = 95)	2004 (n = 105)	2005 (n = 97)	2006 (n = 91)	2007 (n = 90)	2008 (n = 101)
Positive	27 (31.4)	58 (61.1)	56 (53.3)	48 (49.5)	56 (61.5)	58 (64.4)	72 (71.3)
Neutral	36 (41.9)	36 (37.9)	46 (43.8)	45 (46.4)	10 (11.0)	20 (22.2)	15 (14.9)
Negative	23 (26.7)	1 (1.1)	3 (2.9)	4 (4.1)	25 (27.5)	12 (13.3)	14 (13.9)

Students in 2002 responded more negatively than students in 2003-2005 and 2007-2008 (all $p < 0.001$).

of the course improved and when vetting the course outcomes against national guidelines, the course fared quite well. There were some obstacles to overcome and some lessons learned involving grade inflation, student workload (relating to the discussion board), and faculty workload.

At the beginning of each semester, the instructors made a grading contract with the students. In the first 2 years, the students took advantage of the contract to improve their grades. For example, the students would deliberately score below the retake threshold in order to get a look at the examination and then retake it for a higher grade. Each year the contract was modified until by spring 2008 a reasonable course grade distribution was achieved. The number of students utilizing the retake option has fallen over the years from about 60% in 2003 to less than 5% since 2005. By spring 2008, the instructors believed that a satisfactory grading procedure has been attained as a result of (1) setting the examination retake score to less than 80%, (2) setting the maximum grade achievable on retakes at 85%, (3) not allowing a student to receive an A grade in the course if they have had a retake, and (4) raising the course percentage grade required to receive an A grade from 90% to 93%.

A second retake was available to those students who were having serious difficulties with the course and did not pass the examination on the first retake. This second retake required the student be tutored by a faculty member prior to retaking the examination. The second retake was pass/fail with a maximum achievable score of 80%. Fortunately, this option was seldom used.

A consequence of having only 3 examinations in a 5-credit-hour course encouraged students to "cram" for examinations. The amount of content per examination made them essentially high-stakes examinations. This encouraged "binge and purge" learning.²¹ Increasing the number of examinations allowed a better evaluation of specific content areas and we believe helped students maintain a more consistent study pattern.

The driving force that encouraged institution of a journaling process was the resistance on the part of students to commit to a therapeutic choice or product to help a patient in a specific situation. The instructors felt that students needed to see the difference between personally using

nonprescription products and professionally recommending them to patients. Journals were ultimately simplified to 1 clinical situation and 1 reflection. Journaling done at the end of the semester tends to be treated like a term paper and reflect work cobbled together the night before it is due. An end-of-term journal also limits constructive or corrective input from faculty members. The instructors learned that in order for reflective journaling to be relevant, effective, and formative, it had to be done on a regular basis (weekly) with individualized feedback from faculty members.

Although students consider cases to be labor intensive, their performance improved with repetition even though each case varied in content and increased complexity. Course evaluation comments by students frequently mention that cases were a positive and helpful learning experience.

Student attitudes improved significantly from 2002 compared to subsequent years, with the exception of 2006. The combination of verbal response questions and positive faculty encouragement (eg, awarding funny money) created an environment where students felt safe to express their ideas and share their experiences in the classroom.

A major downturn in course satisfaction (positive versus negative statements in evaluations) occurred in 2006 due to 3 factors (Table 4): (1) the introduction of verbal response questions, (2) the institution of weekly journals, and (3) the discussion board. Students did not appreciate the amount of time required to prepare responses to the verbal questions for class. Also, this exercise required students to attend and be prepared for class every day. Many students tend to be taciturn and nonparticipatory and were vitriolic in their reaction to having to verbally answer questions in class. A contributory factor was that it took faculty members nearly half the semester to calibrate the appropriate number of verbal questions to use in PowerPoint presentations. Once the number of questions reached 3-5 per 50-minute class session, student complaints seemed to subside.

Students felt the requirement to contribute to the discussion boards was a major workload issue. Faculty members also found the discussion board posts time consuming

to grade, and that they provided limited contribution to learning. Discussion board assignments were not continued in subsequent years.

Faculty workload must also be considered in making changes. The intensity required to design, create, produce, and implement course modifications simultaneously was daunting. Weekly feedback was a major workload issue that required distribution over more personnel. The examinations and quizzes were administered online in Questionmark (Norwalk, CT) a test authoring software combined with the School's secure browser. Questionmark grades any keyed question automatically. As journals and cases became more clinically relevant and allowed instructors to better evaluate written indications of student learning, the need for short-answer examination questions declined.

The mentors and faculty members each average 4-6 hours per week grading and responding to journals and cases. Students submit their assignments (journals or cases) electronically to a designated e-mail folder. The faculty members provide a basic key for grading that is distributed to all graders before all assignments.

The regular regimen of quizzes, journals, examinations, and cases forced the students to do some work for the course continually, rather than marathon studying just before examinations. The faculty members realized that too many activities can negatively impact student attitude and potentially impair the learning process. Students see an assortment of student activities as "busy work." Faculty members see activities as practice and essential modeling in the development of professional skills. Evaluating student feedback was essential to maintaining a balance between these 2 perceptions.

The 6-year evolution of this course has resulted in a required course that addresses the goals set by Center for the Advancement of Pharmaceutical Education (CAPE), the North Central Accreditation (NCA), and other organizations.^{1,2,3,20}

SUMMARY

Extensive modifications were made to a Nonprescription Therapeutics course over 6 years resulting in better learning and performance. The data support achievement of the instructors' goal for students to acquire practical professional patient care skills for the nonprescription drug/products environment. Grades and students' attitudes, as measured in course evaluations generally improved.

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Appendix 1. Example of a Case

PAIN

Jarrod is a 44-year-old male who is 5'9" and weighs 160 lbs. His complaint is that he has occasional pain in the right knee, some stiffness in that knee and occasional aching. He says his parents and grandparents all complained of some form of arthritis by age 50 or 60. He is not taking any prescription medications and is otherwise in good health. He is a jogger. He just came from his annual physical examination where his doctor told him he might have a touch of osteoarthritis and to consult with you, the pharmacist, about short- and long-term nonprescription (over-the-counter) options for treatment of his symptoms. What do you say or recommend?