

## INSTRUCTIONAL DESIGN AND ASSESSMENT

### Evaluating Student Perceptions of a Learner-Centered Drug Literature Evaluation Course

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**Objective.** To evaluate pharmacy students' perceptions of a drug literature evaluation course implementing learner-centered teaching principles.

**Design.** A drug literature evaluation course was redesigned to create a more learner-centered course through the inclusion of optional assignments, self-reflection opportunities, and a point-based grading system. A questionnaire was developed to assess student perceptions of the course and preferences for the learner-centered approach.

**Assessment.** One hundred two questionnaires were returned (94.4% response rate). The most highly rated items were those related to student control in determining their overall grade ( $4.7 \pm 0.6$ ; mean  $\pm$  SD), less pressure to perform well on every examination or assignment ( $4.5 \pm 0.9$ ), and a less stressful learning environment ( $4.4 \pm 1.0$ ). Eighty-eight percent of students found that completing the optional assignments helped reinforce material presented in class.

**Conclusions.** Learner-centered methods were viewed favorably by students. The effects of learner-centered teaching on pharmacy education deserve further study.

**Keywords:** learner-centered teaching, student perceptions, course design, drug literature evaluation, assessment

## INTRODUCTION

Over the past few decades a shift has occurred from the idea that educational institutions should provide instruction to the idea that they should produce learning.<sup>1</sup> This paradigm shift is supported by research suggesting that traditional pedagogical approaches, such as the instruction-centered approach, may not be producing desired student learning outcomes.<sup>2,3</sup>

Learner-centered teaching is becoming more widespread as its principles align well with new findings on how individuals learn.<sup>4</sup> This pedagogical approach views learning as an active process and promotes students (learners) taking increased responsibility in the learning process.<sup>5,6</sup> Learner-centered teaching has been examined in numerous higher educational settings, including the health professions.<sup>5,7-10</sup>

Despite the existing research on learner-centered teaching, few studies have examined the impact of learner-centered teaching principles on student perceptions of learning. This article describes the design of

a learner-centered drug literature evaluation course and the evaluation of student perceptions of various course characteristics. The results from this study will add to the body of evidence surrounding learner-centered teaching, specifically as related to pharmacy education.

## DESIGN

*Drug Literature Evaluation* is a required, 4-credit course in the third year of the Doctor of Pharmacy Program at Virginia Commonwealth University. The general objectives of the course include obtaining a basic understanding of biostatistics and research methodology and developing skills in the critical evaluation and application of biomedical literature. Two faculty members coordinate the course and provide the majority of course lectures. Five guest speakers provide lectures on specialty literature areas, such as special populations, adverse drug reactions, pharmacokinetics and pharmacodynamics, and pharmacoeconomics. Lectures by guest speakers account for approximately 25% of the total course time.

Based on feedback from students and long-term curricular goals of the School of Pharmacy, the *Drug Literature Evaluation* course was redesigned in 2006 to create a more learner-centered structure as described by

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Weimer.<sup>11</sup> These changes included the use of optional assignments, opportunities for self-reflection, and a point-based grading system (Appendix 1). Previously, there were no graded homework exercises or opportunities for reflection; course activities consisted of 4 required examinations (3 midterm examinations and 1 final examination) that were each worth 20% of the final grade, and a required formal critique of a published research article worth 10% of the final grade. The remaining 10% of the course grade came from class participation. Under the previous course format, final course grades were assigned based on a fixed percentage scale (A = 90% - 100%, B = 80% - 89%, C = 70% - 79%, D = 65% - 69%, F = 0% - 64%). Both the old and the revised course used lecture format as the primary method of content delivery. In the revised course, 1 week was set aside for a required journal club activity to allow students the opportunity to apply their literature evaluation skills in a small group setting. The purposes of the changes in the course were to provide students with more control in the learning environment, to create more opportunities for students to demonstrate mastery of the course material, and to create a less stressful learning environment.

A course evaluation questionnaire was developed by the coordinators for the purposes of gaining insight into students' perceptions of the course and facilitating improvement of the course in future years. This questionnaire was used in addition to the university-required evaluations, which the coordinators felt did not provide sufficient information for the purpose of evaluating student perceptions of the course changes. The initial questionnaire was tested on a small group of students at the midpoint of the semester. Feedback from the pilot group resulted in minor wording changes for readability and clarity. The final questionnaire consisted of 20 items about opinions and perceptions of the course structure and policies, preferences for the learner-centered approach, and preparation for class and examinations, as well as 4 general student information items. With the exception of the questions regarding student preparation and student information, all items were measured on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Students were also provided space to share any additional comments about their experiences with the course. All 108 students enrolled in the course were offered the opportunity to complete the questionnaire.

Descriptive statistics were calculated for questionnaire items from both a continuous (mean  $\pm$  SD) and a categorical (percentage in agreement or disagreement) standpoint. Responses of "agree" or "strongly agree" were used to calculate the percentage in agreement. Similarly, responses of "disagree" or "strongly disagree" were used to calculate the percentage in disagreement.

In addition to descriptive statistics, differences in student perceptions by prior degree status and grade point average (GPA) were examined using *t* tests and ANOVA (or an appropriate nonparametric test) for continuous responses and Fisher's exact test for the percentage in agreement. This comparison was done to determine whether student perceptions varied by level of previous educational experience or GPA. Free-text comments were solicited from students but were not formally analyzed. All responses were anonymous. The Institutional Review Board approved this study as exempt research. Data management and statistical analyses were performed using Stata/SE version 9.2 (Statacorp LP, College Station, TX) with an alpha level of 0.05.

### ASSESSMENT

Of the 108 students enrolled, 104 returned questionnaires; however, 2 questionnaires were blank, resulting in 102 usable responses (94.4% response rate). Approximately two-thirds of the students were female, and over half had earned a degree before entering pharmacy school. Other student characteristics are provided in Table 1. The median number of optional course assignments completed was 11 of the 13 optional assignments, and almost all students (97.1%) completed both optional midterm examinations.

Table 1. Characteristics of Pharmacy Students Enrolled in a Drug Literature Evaluation Course

Variable	Result
Female, No. (%) <sup>a</sup>	74 (67.2)
Age in years, Mean (range) <sup>a</sup>	25 (21-41)
Race/ethnicity, No (%) <sup>a</sup>	
Caucasian	74 (67.2)
Asian	20 (18.2)
African American	8 (7.3)
Other	8 (7.3)
Any prior degree, No. (%)	60 (58.8)
GPA at the end of prior academic year, No. (%)	
3.50 – 4.00	28 (27.5)
3.00 – 3.49	51 (50.0)
2.50 – 2.99	20 (19.6)
<2.50	3 (2.9)
Optional assignments completed, Median (25th, 75th percentile)	11 (9, 13)
Students taking both optional exams, No. (%)	99 (97.1)

<sup>a</sup>Information obtained from student services office rather than from individual students, so the percentages are based on original size of the entering class (110)

When looking at student perceptions of the course structure, the items with the highest levels of student agreement (mean  $\pm$  SD) related to student control in determining the overall grade ( $4.7 \pm 0.6$ ), less pressure to perform well on every examination or assignment ( $4.5 \pm 0.9$ ), and a less stressful learning environment ( $4.4 \pm 0.9$ ). The full results are presented in Table 2. Overall, 88.2% of students found that completing the optional assignments helped to reinforce material presented in class. With respect to course policies, 93.1% of the students found them to be transparent and 78.4% found them to be generally supportive of their learning. Students felt that they prepared differently for classes and examinations (63.7% and 76.5%, respectively) in the learner-centered course than in a non-learner-centered course. Approximately 59% of students spent less time preparing for class and approximately 76% spent less time preparing for examinations.

Approximately 77% of the students preferred the learner-centered drug literature evaluation course over a similar non-learner-centered course. Over 80% said they would rather take courses with a similar learner-centered approach. When comparing student perceptions by previous degree status (any previous degree vs. no previous degree) and by previous semester GPA, no significant differences were found.

## **DISCUSSION**

Learner-centered teaching is a pedagogical approach that is consistent with the body of research surrounding how individuals learn.<sup>4,5</sup> Tagg outlined the key features of a learning paradigm (or learner-centered) college in his recent text. These include promoting intrinsically rewarding goals, requiring frequent and authentic student performances, providing consistent student feedback, providing a long time horizon for learning, and creating purposeful communities of practice.<sup>12</sup> Arguably, the most important component of Tagg's outline is that the learning paradigm college strives to align all of its activities around the core mission of producing student learning. When working to make their own classrooms more learner-centered environments, the key principles that Weimer recommends faculty members to keep in mind are the balance of power, the function of content, the role of the teacher, the responsibility for learning, and the purpose and processes of evaluation.<sup>11</sup> Both Tagg's and Weimer's characterizations of learner-centered teaching generally follow the learning-centered psychological principles set forth by the American Psychological Association.<sup>13</sup>

In general, students had positive views of learner-centered teaching methods and felt that the structure used in this course provided them with more control while

creating a learning environment with reduced stress. The students also felt that optional assignments helped reinforce the course material. These findings are consistent with those of other published studies. In a qualitative study, Maypole and Davies found that students in an American history course that was taught using constructivist learning principles reported having no problems completing the assignments independently and felt they actually learned more in the course compared to in other courses using traditional teaching methods.<sup>14</sup> Howell noted that freshman and sophomore students enrolled in a college composition course and an introductory humanities course reported that their increased autonomy and active role in the course helped them to learn course material better and become more confident in their writing abilities.<sup>15</sup> In both studies, students generally reported working harder in the learner-centered courses; however, they found the learning environments in these courses more enjoyable and generally more relaxed. These characteristics supported their overall learning.

In redesigning this course, the instructors wanted to provide students with multiple methods of assessment and to increase the number of opportunities students had to demonstrate application of course material. Assessment plays a key role under the learner-centered teaching approach. Rather than testing knowledge of disjointed facts, assessment is focused on specific, desired learning outcomes.<sup>16</sup> Although traditional testing may form a component of assessment in a learner-centered course, assessments should also include opportunities that represent how course content will actually be used in practice.<sup>5</sup> The exercises for the drug literature evaluation course were carefully developed so that students were required to use the information to demonstrate mastery of specific course objectives rather than simply to recall memorized facts. In addition to traditional multiple-choice examinations, there were numerous opportunities for student assessment, such as statistics problem sets, online quizzes for research principles, and diagramming study designs in published articles (Appendix 1). Since the primary objective of the course was for students to be able to pull together the individual concepts presented in the course, the primary assessment activity was the formal written critique of a published original research article. The majority of the students agreed that there were multiple opportunities for them to demonstrate learning (Table 2). One student noted that focusing on the assignments resulted in more learning than simply attending class and taking examinations. Admittedly, this was one of the goals in developing the assignments used in the course.

Initially, the finding that 58.8% of students reported spending less time preparing for class and 75.5% spent less time preparing for examinations was somewhat troubling.

Table 2. Student Perceptions of Course Structure, Activities, and Policies

	Mean (SD) <sup>a</sup>	Range <sup>a</sup>	Agree, % <sup>b</sup>	Disagree, % <sup>c</sup>
Course structure and activities				
My ability to learn the material presented in class was enhanced.	3.5 (1.0)	1 – 5	61.8	17.6
I prepared differently for class.	3.7 (0.9)	2 – 5	67.6	12.7
I was provided with increased opportunities to demonstrate that I had learned the material.	3.9 (0.9)	2 – 5	73.5	10.8
I studied differently for exams.	3.9 (1.0)	1 – 5	74.5	9.8
I felt I was in a less stressful learning environment.	4.4 (1.0)	1 – 5	86.3	6.9
I was provided with increased opportunities to demonstrate mastery of course material.	3.8 (1.0)	1 – 5	73.5	13.7
I was provided adequate feedback to guide my learning throughout the course.	3.8 (0.9)	2 – 5	70.6	9.8
I felt I had more control in determining my overall course grade.	4.7 (0.6)	1 – 5	98.0	9.8
I felt less pressure to perform well on every exam or assignment.	4.5 (0.9)	1 – 5	91.2	4.9
I was able to focus on learning rather than just getting a good grade on an exam or assignment.	3.9 (1.1)	1 – 5	66.7	13.7
I felt I was able to learn the material <i>and</i> obtain the grade I desired.	4.0 (1.0)	1 – 5	75.5	11.8
I was able to focus on learning rather than just getting a good grade in the course.	3.7 (1.2)	1 – 5	64.7	19.6
I found that completing the assignments helped reinforce the material presented in class more than studying alone.	4.3 (0.7)	2 – 5	88.2	2.0
Course Policies				
Course policies were transparent (ie, clearly stated and openly available).	4.4 (0.6)	3 – 5	93.1	0.0
Course policies supported my learning in the course.	4.0 (0.8)	2 – 5	78.4	3.9
Course policies helped me to obtain the grade I desired.	4.3 (0.7)	2 – 5	85.3	1.0
Preferences for the learner-centered approach				
If given the option, I would rather take a drug literature evaluation course using a learner-centered approach than a drug literature evaluation course with a more “traditional” approach.	4.1 (1.2)	1 – 5	77.5	11.8
If given the option, I would rather take other classes using learner-centered approaches.	4.3 (1.0)	1 – 5	82.4	6.9

<sup>a</sup>Student perceptions measured using the following Likert scale: 1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree), and 5 (Strongly agree)

<sup>b</sup>Percentage in agreement was calculated using those who responded “Strongly agree” or “Agree.”

<sup>c</sup>Percent in disagreement was calculated using those who responded “Strongly disagree” or “Disagree.”

One of the students offered a potential explanation: “Just to clarify the ‘less time preparing’ question. . . I spent less time preparing for class and exams because I felt that I was ‘taught’ the material in class and it was reinforced through the assignments.” It is possible that students were actually interacting with the course material to a greater extent given the nature and number of assignments used throughout the course. The result was that students spent less time on activities traditionally associated with preparing for class or examinations (eg, reading over notes, rewriting

notes) and more time interacting with course material, which can facilitate learning.<sup>5</sup> This is one area that certainly deserves further exploration.

Another goal in redesigning the course was to create a less stressful learning environment for students. Given the role of statistics and research methodology in the course, students have historically had relatively high stress levels associated with that portion of the course. This “statistical anxiety” is well known in the educational literature and is often related to perceived irrelevance of statistics to the

student or math anxiety.<sup>17-19</sup> While some level of stress or anxiety may be beneficial, it is generally believed that high levels of stress can adversely affect student learning.<sup>13</sup> Some of the most positive results from this study were for those items looking at the level of stress associated with the learning environment of the course, suggesting that the course redesign was successful from the perspective of reducing stress levels within the course. These results were reinforced by students' written comments from the questionnaire.

Not all students had positive perceptions of the learner-centered methods used in the course. Student responses to the questionnaire did include "strongly disagree" or "disagree" responses for all items except the one referring to transparent course policies (Table 2). Some students may not rise to the challenge of becoming actively involved in the learning process as expressed in one student's comment: "I need to be told what to do." In some situations, students may actively resist learner-centered methods. Weimer attributes this resistance to anxiety in students who lack confidence in their own learning abilities.<sup>11,15</sup> Hansen and Stephens provide a number of other sources of resistance that should be considered when implementing learner-centered methods.<sup>20</sup> Fortunately, students did not meet the learner-centered changes in the *Drug Literature Evaluation* course with active resistance. There was some confusion and general unease among students at the beginning of the semester; however, these feelings subsided as they became accustomed to the different course structure. Toward the end of the semester, the students actually provided unsolicited suggestions to improve the course in future years.

Based on the experience with the revised course, some changes were made for the following year. First, the grading scale was revised so that the B range was higher. Toward the end of the semester, some students appeared to reduce their effort significantly once they met the minimum point value for a B. Also, in an attempt to ensure that students put forth acceptable effort on all attempted assignments, the syllabus was revised to state that students had to earn at least 50% of the possible points for an assignment in order for it to count toward the final grade. In the first year, the required written critique of an article had to be completed individually. In the second year, students were allowed to complete this required assignment in groups of 3 or 4. The coordinators felt that students could benefit from formally critiquing articles in a small group. Since almost all students took the midterm examinations, changing one required assignment from individual work to group work was not expected to have a significant impact. More time was also devoted to in-class examples and activities during the second year compared to the first year. While this would have been a useful

change for the first year with the revised course, the coordinators felt that changes in the course structure would be easier to implement and streamline first before changing the content delivery methods. The changes in the course structure appeared to have relatively little impact on guest lecturers. Two of the guest lecturers were already familiar with learner-centered teaching methods, either from teaching in concurrent courses or through attending faculty development seminars, which may have been a contributing factor. Also, in redesigning the course, one secondary goal was to minimize the potential effect on guest lecturers. Since these individuals frequently only give 1 or 2 lectures, requesting significant changes in content delivery could be problematic and burdensome. Instead, the decision was made to develop homework activities and assignments that would supplement course material regardless of the method of delivery (eg, lecture versus in-class activities).

## CONCLUSION

A learner-centered drug literature evaluation course was developed and student perceptions of the course were evaluated. In general, students viewed the course positively, experienced reduced stress in the course and more control of the learning environment, and had multiple opportunities to demonstrate their learning. More research is needed on the implementation of learner-centered principles in pharmacy curricula, especially with respect to its effects on students' study habits and learning outcomes.

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## Appendix 1. Course Characteristics and Sample Activities

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### Grading

Course grades were based on total points earned using the following scale:

- A = 348 – 435
- B = 187 – 347
- C = 165 – 186
- D = 108 – 164
- F = 0 – 107

### Activities and Assignments

Only two assignments were required of all students: the final examination and the written critique of a published article from the primary literature. Two optional mid-term examinations were offered. Other optional assignments included research methodology quizzes, statistics and epidemiology problem sets, self-assessment opportunities, and writing exercises. The optional assignments offered a mixture of individual and group work. All assignments had a due date after which no submissions were accepted. A few detailed examples of assignments are provided.

- Writing exercise: “Importance of drug literature evaluation skills” – In no more than two (2) pages, present your thoughts on the importance of drug literature evaluation skills in contemporary pharmacy practice. If you feel that these skills are not important, it is your task to present and defend your point of view. You must complete the assignment without help from other individuals.
  - Article search and study design outline – Using Medline, find five (5) primary literature articles for a given disease state or treatment. For each article, provide the research objective(s) and the relevant null hypothesis for the study endpoint. (Note: If there are multiple, you need only provide a hypothesis for the primary study endpoint.) Using the “X and O” terminology discussed in class, you should also diagram the study design and indicate what the “X” was in the article and what each “O” was (eg, “X” may be administration of a drug and “O” may be a blood pressure measurement). To earn full credit, you should briefly describe your Medline search process. You may complete this in groups no larger than three (3).
  - Self-assessment – Take a few moments to review your progress in the course. Overall, you should provide an assessment of your perception of your progress at this point in the semester and how that relates to any assessments completed to date (Test 1 or other assignments) as well as a plan for the rest of the semester. You might consider discussing whether you felt prepared for the test and whether your score reflects how you thought you were doing in the class. If you did not feel prepared or did not like your score, discuss your plans to learn from the results of the test. If you did not complete the test, consider your scores on assignments graded to date and their relation to your perceptions of progress in the course. If you have not completed any assignments up to this point, take a few moments to assess how well you feel you know the material and your plans for the rest of the course. Responses should be no more than three (3) pages in length. This assignment must be completed without the help of other individuals.
  - Evaluate a news story in the lay press – Find a news report (either print, broadcast, or Internet) that refers to a primary literature article directly or some treatment modality that can be briefly researched through the primary literature. After reading the news report, compare it to the referenced study and assess whether the information in the study was appropriately reported (eg, equal time devoted to advantages and disadvantages of treatment, sensationalism avoided, etc.). You may complete this in groups no larger than three (3).
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