Pharmacy education is in a state of flux as we deal with teaching more students with a shortage of faculty members. We, as pharmacy educators, also have to deal with our lack of formal training in the area of course and lecture design. Backward course design is one method that can guide individual instructors as they struggle with designing their own courses or even an individual lecture. The steps in backward course design include: (1) identify the desired results, (2) determine the acceptable evidence, and (3) plan learning experiences and instruction. By focusing on the end results first, we can help students to see the importance of what they are learning and make our activities more meaningful and based less on what we have seen others do or how we were taught. This type of course design can also help us teach students to become lifelong learners.

Consider these 2 classroom vignettes from a traditional classroom setting. The first focuses on a common problem seen among our students and the second on a problem faced by many teachers. A National Assessment of Educational Progress mathematics assessment asked the following question: “How many buses does the army need to transport 1,128 soldiers if each bus holds 36 soldiers?” Many of the eighth grade students answering this question gave the answer “31 with a remainder of 12.” In other words, the students were able to construct the mathematical equation to determine the answer, but they failed to apply their results to the context of the question, ie, a 32nd bus would be required to transport all of the soldiers.

An example of a common problem teachers face can be seen in the following scenario. A world history teacher realizes late in the year that he is not going to finish presenting the information in the textbook to his class unless he covers 40 pages a day in a lecture-based format. Because of this he eliminates all of his active-learning activities and instead covers the leftover textbook material in a fast-forward lecture mode. In this example, the teacher forgoes the activities that may help the students remember and relate the material being presented to the world around them in favor of covering all of the facts necessary to pass the examination.

Many pharmacy educators can identify with one or both of these vignettes. Many of us have been given answers to examination questions like that in the first example when we asked for the number of tablets or particular doses. We have all been faced as well with the dilemma of realizing that we have more lecture material to cover than time in the class period or semester allows. Why is this?

It is because we are caught in the “twin sins”1 of typical instructional design. These sins are activity-focused teaching and coverage-focused teaching where we either teach to “cover” the material required for an examination or we give students activities to complete without making sure they understand the concepts we want them to learn (eg, for a problem such as “calculate the dose of warfarin needed to bring the patient’s INR to the therapeutic range,” we get answers like 5.65 mg daily).1

Educators should keep the following question in mind: “How do we make it more likely by our design that more students really understand what they are asked to learn?” To do this, we need to train teachers to be able to demonstrate knowledge of their course content and different methods of pedagogy, knowledge of their students, knowledge of selecting suitable instructional goals, knowledge of the resources available to help in their teaching, the ability to design coherent instruction, and the ability to assess student learning.2

Traditional models of curriculum, course, and lecture construction have the following steps: (1) define the goals, purposes, and objectives of your lecture/module; (2) define experiences or activities related to the goals; (3) organize the experiences and activities, and (4) evaluate the goals. This method of teaching leads to “coverage-oriented” teaching where topics are checked off as they are covered. It also leads to conducting assessments at the end of a lesson or module because it has to be done, not because the teacher wants to see if the students understood the material.2
Backward course design changes the order of the steps: (1) identify the desired results, (2) determine the acceptable evidence, and (3) plan learning experiences and instruction. This model of design is standard-oriented instead of activity- or coverage-oriented because the teacher starts with what he/she wants the students to be able to do when the lesson has been completed rather than what material needs to be covered. This design also makes assessment part of the learning process and not just something to do at the end of a chapter or section because the student needs a grade.\textsuperscript{1,2} The purpose of this paper is to define backward course design, outline the steps for this process, provide an example of this process, and explain where this type of course design can be used in pharmacy education.

**BACKWARD COURSE DESIGN**

**Theory and Definition**

One way to think of course design is to compare it to software design. Software is designed to increase the productivity of its users just as course design should help to make learners more productive. Our students are our clients and the effectiveness of our lectures, curriculums, and assessments is determined by their ability to “learn” the material we present.\textsuperscript{1}

Just as a computer software designer is given a set of standards to follow when developing a new program, we as pharmacy educators are given a set of standards to follow when developing our curriculum and even individual lectures. These standards should guide our choices of what we teach, the activities we choose to have students complete, and the assessments we conduct.\textsuperscript{1}

Backward course design is developed on the premise that the teacher needs to state with clarity what the students should learn, understand, and be able to do at the end of the curriculum or lecture in order to know what material should be “covered” and what activities and assessments should be completed. Backward course design forces educators to shift the focus from content-focused design to result-focused design. This type of course design helps educators answer the age-old student questions of “why are we doing this assignment, what is its purpose, and will I ever use this in real life?”\textsuperscript{1}

Backward course design by definition is where the teacher teaches for students to be able to use the understandings that are presented to them as opposed to just giving them the understandings and then hoping they can apply them to different situations.\textsuperscript{1} There are 3 questions that backward course design asks:

1. What should students walk out the door able to understand, regardless of what activities or texts we use?
2. What is evidence of such ability, and
3. What texts, activities, and methods will best enable such a result?\textsuperscript{1}

**Steps in Backward Course Design**

In order to design a lecture, course, or curriculum using backward course design, it is important to understand the 3 main steps: identifying the desired results, determining acceptable evidence, and planning learning experiences and instructions.\textsuperscript{1}

The first step of the backward design process is to identify the desired results. In order to accomplish this step, a teacher must ask him/herself the following question: “What do I want students to be able to do or understand at the end of my course or lecture?” One way to answer this question is to review the course goals and objectives for which the lecture is given or examine national accreditation standards to see what is required for the course. By completing this first step, the teacher clarifies the goals of the lecture or course, making it easier to determine what content is important.\textsuperscript{1}

In this step, the teacher first establishes the large goals that students should obtain by the end of the course or lecture.\textsuperscript{1} From this list of goals, the teacher then asks the following: “What are the big ideas? What specific understandings about these ideas are desired? What student misunderstandings are predictable? What provocative questions will foster inquiry, understanding, and transfer of learning? What key knowledge and skills will students acquire as a result of this lecture/course? What should the student eventually be able to do as a result of such knowledge and skills?”\textsuperscript{1}

In order to see how the first step may be accomplished, consider a traditional ambulatory care clinical clerkship. In order to begin step 1, the teacher must first determine what the large goals of the rotation are. I used the goals given by both our College of Pharmacy and the Center for Advancement of Pharmaceutical Education (CAPE) to determine the goals for the rotation. A couple of examples of these goals include:

1. Using the principles of pharmaceutical care, be able to design, implement, monitor, evaluate, and adjust care plans that are patient specific and evidenced based. This includes the ability to obtain and analyze a complete medication history.
2. Communicate and collaborate with prescribers, patients, caregivers, and providers to engender a team approach to efficient, cost-effective care. This includes making the correct choice of written versus oral communication and use of appropriate language and terminology.\textsuperscript{1}
Once these goals were determined, the next step was to determine from these goals what understandings students needed to have when they left the rotation, what questions they should be able to answer, and what knowledge and skills they should have obtained. From the above goals, here are some examples of the understandings, questions, and knowledge/skills that I expect students to obtain from my rotation:

- **Understanding**: Pharmaceutical care is a complex process that involves knowledge about the pathophysiology of disease, pharmacology of drugs, and social, ethical, and legal issues. Patient-specific information (social, economic, medical) is needed to implement evidence-based treatment plans. The choice of written versus oral communication can affect how a recommendation is perceived as well as the quality of that communication.
- **Questions**: How do we use pharmaceutical care in the ambulatory care setting? What is evidence-based medicine and how and why should it be used to generate a patient’s treatment plans? How should drug-related questions be communicated to other health care providers versus patients?
- **Knowledge/skills**: Definition of pharmaceutical care and evidence-based medicine, pathophysiology of disease, conducting medication histories, designing evidence-based treatment plans.

The second step of backward design involves determining acceptable evidence to conclude whether students have met the goals determined in step one. This section helps a teacher think about what assessments and activities will prove the students have met the desired goals and objectives instead of planning on assessments and activities and hoping at the end, the student has learned what was desired. By planning the assessment activities before a teacher plans the content of the lecture, it makes it easier to know what content should be taught.1

Assessment evidence can be divided into 2 components: performance tasks and other evidence.1 For performance tasks, teachers should ask themselves: “Through what authentic performance tasks will students demonstrate the desired understandings and by what criteria will performances of understanding be judged?”1 Other evidence covers the more traditional activities such as quizzes, tests, and homework. In this section, teachers should have students do self-assessments of their learning when appropriate.1

I first determined what performance tasks, other evidence, and self-assessment activities should be used to help me determine if the students obtained the understandings and knowledge/skills that I determined in step 1. Some of the performance tasks I came up with were: conducting medication histories, writing in-depth care plans that are evidence-based, and writing SOAP notes to physicians. Other evidence that I will use to show the students meet the stated goals are: pathophysiology quizzes during our morning discussions and an initial/final assessment test on a large array of internal medicine topics. Lastly, the student self-assessments that I created are to have the students answer questions on what they think pharmaceutical care is, what evidence-based medicine is, and where they would find evidence-based medicine. Students will answer these questions at both the beginning of the rotation and again at the end to see if their answers have changed based on our discussions throughout the rotation. Once I determined what assessments I would be using for the rotation I then developed grading rubrics and directions for each activity to make sure that the activity truly did assess the goal I was trying to achieve.

The third step in this process is planning the learning experiences and instruction.1 Just like in the other steps, there are several key questions that teachers need to think about: “What enabling knowledge (facts, concepts, principles) and skills (processes, procedures, strategies) will students need in order to perform effectively and achieve the desired results? What activities will equip students with the needed knowledge and skills? What will need to be taught and coached, and how should it best be taught, in light of the performance goals? What materials and resources are best suited to accomplish these goals?”1

The following acronym can be used when designing a lesson plan: WHEREto.1 The W stands for “Where is the unit going and what is expected?”1 In this section the teacher thoroughly explains to the students before each lecture or activity what is expected of them and what goal this activity will achieve.1 The H stands for “Holding the students’ interest.”1 Again, by explaining to the students why they are completing this activity or listening to a particular lecture will help the students see the relevance and be more engaged.1 The first E stands for “Explore, experience, enable, and equip.”1 Here the teacher must go back and look at the activities and assessments that were planned in stage 2 and the goals in stage 1 to determine what lecture content and activities will help the students be able to do well in these final assessments and what type of activities will help the students to better understand the questions developed.1 The R is for “Reflect, rethink, and revise.”1 Here the teacher needs to plan time for the students to reflect on the “big ideas” for the lecture and to be able to self-assess their own
learning and activities. The second E stands for “evaluate work and progress.” In this section the teacher should place time in each lecture or course for the student to again self-evaluate items that they may have not learned as well as those they would have liked to learn or understand better. The T stands for “Tailor and personalize the work.” In this section the teacher needs to look at the lesson plan and assessments and make sure they include activities that cover all student learning styles, levels of prior knowledge, and interests. The O stands for “Organize for optimal effectiveness.” The teacher needs to think about the best organization for the course/lecture to maximize student engagement and learning.

The second step should flow from the previous 2. Here is an example of how I used the acronym for my rotation:

W: Go over rotation objectives and syllabus and explain to the student why they would be doing each of the required activities during the rotation (tie the activities to the larger goals for the rotation).

H: When the student is doing a specific activity (such as a medication history), remind them why they are doing that activity and what they are expected to learn from that activity. I will also explain to the student how the skills/knowledge from the activity they are completing may be used in “real life” no matter what career path they choose to follow.

E: I will demonstrate a proper medication history prior to asking the student to complete one. Demonstrate how to complete a patient care plan using evidence-based medicine before having the students complete one. We will also complete a number of morning discussions on an array of internal medicine topics to ensure the student gains the required drug and disease state knowledge needed to complete the rotation tasks.

R and E: These two sections of the acronym go together and will be accomplished in numerous ways during the rotation. The last day of the rotation I will have the students pick one thing they learned on the rotation that they could use in their future career. The students also complete an initial multiple-choice examination the first day of the rotation. I give this examination back and give the student’s time to see what topics they need to work on during the rotation. The students then repeat this examination the last day of the rotation to see if they improved and to help them see what areas they still need to work on during future rotations.

T: The whole rotation has a mixture of activities for all learning styles (written assessments, discussions, written and oral examinations). Students also have the opportunity to help tailor the rotation to what they want to learn as they complete their own goals for the rotation and they get to pick many of the morning discussion topics.

O: The first week of the rotation is set-up for orientation and each new activity is introduced in general in the first day orientation but then is discussed in detail when it is time to complete that task. Many of the large ambulatory care topics that come up on a daily basis during the rotation are discussed during the first week or so of the rotation to make sure the students have the needed knowledge to care for patients. The rest of the rotation is then flexible depending on what learning activities arise during the rotation.

Studies on Backward Course Design

At first glance this process may seem overwhelming and difficult to complete, but the results are worth the time and effort. Also, step one does not have to be completed before going on to the next step. It is just important to think through all of the steps before completing the course or lecture design. There is little evidence in the literature that compares backward course design to traditional course design and no evidence to this author’s knowledge of this type of course design in the medical literature.

Kelting-Gibson and colleagues conducted a study comparing backward course design to a more traditional classroom design method in elementary school teachers involved in a teaching training program. This study found that teachers designing coursework using the backward course design method outperformed teachers using the more traditional approach. Teachers using the backward course design method showed better content knowledge, made better connections between the content and other disciplines, and developed plans that reflected research on pedagogical practices better than teachers using a more traditional method of design. Backward design teachers also set clearer and more suitable goals for their students, developed better plans that linked learning activities and teaching resources to instructional goals, and better recognized students’ skill levels and approaches to learning. Despite the better results seen with the backward course design approach to course development this study did find that both groups needed work in the areas of demonstrating the knowledge level of the students and assessing student learning.

Pharmacy School Uses for Backward Course Design

Backward course design could be useful for the individual pharmacy professor as well as colleges and schools of pharmacy as a whole. The concept of backward course design can be used not only to help pharmacy professors prepare their individual lectures, courses, and rotation coursework but also to design whole curriculums.

Pharmacy is in a great position to use this approach because the curriculums are based on a core set of
standards handed down from the American Council of Pharmaceutical Education. These standards can be used to guide not only whole curricular design but also individual lectures and course design.

SUMMARY
Backward course design is one method to guide colleges and schools of pharmacy in formulating or revising whole curriculums, and help the individual instructor as he/she struggles with designing his/her own course or lecture. By focusing on the end results first, we can help students to see the importance of what they are learning and make our activities more meaningful and less based on what we have seen others do or how we were taught. This type of course design can help us teach students to become lifelong learners as we focus on teaching larger concepts that students can apply in many professional situations rather than on isolated pieces of information that they may rarely or never encounter.

REFERENCES