Are You CAPE-A.B.L.E.?

Center for the Advancement of Pharmacy Education:

An Assessment Blueprint for Learning Experiences

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Table of Contents

Foreword

Michael J. Fulford and Jane M. Souza

The future of pharmacy practice and thus pharmacy education is at an historical intersection. As physician and Forbes magazine contributor Dr. Joon Yun recently shared, "a tectonic power shift is catalyzing a revolution in healthcare as information becomes demystified and liberated to consumers. The Gutenberg press liberated the printed word and the human mind, spawning an unprecedented era of human progress. As consumers take control of the future of healthcare, an unprecedented era of medical progress will soon be upon us."[1] The revolution discussed by Dr. Yun affirms the patient-centered focus that is the core of pharmacy practice. The Center for Advancement of Pharmacy Education (CAPE) Educational Outcomes 2013 explicitly reinforces the patient-centered focus of pharmacy education.

Closing the Loop: Connecting Curriculum Design and Assessment Design

Pharmacy education is a practiced-based education. The curriculum is grounded in professional practice and graduates are expected to achieve outcomes within the affective domain as well as in knowledge and skills. The list below offers themes and terminology of practice-based learning common across health professions.[2]

- Learning experiences are work-based.
- Learning experiences are work-integrated.
- Learning experiences apply theory to practice.
- Learning experiences aim to enhance employability by supporting students in the development of career management skills.
- Learning experiences embed industry input into programs.
- Learning experiences support development of skills to work professionally with their discipline's knowledge.
- Learning experiences value the importance of role models (preceptor, faculty, students, alumni).
- Learning experiences are formal and informal and also uncover the effects of the hidden curriculum.

Engaging students in a practice-based education means developing a learning environment where they gain knowledge, skills, abilities, and attitudes within the authentic context of the profession. The CAPE

Outcomes help define the components of a practice-based education within PharmD programs. The operationalization of CAPE Outcomes will be a challenge for individual programs. In order to offer a learning experience that embodies the CAPE Outcomes and develops pharmacy graduates prepared for the future challenges within healthcare, the curriculum and corresponding assessment must be aligned, integrated, and flow through a continuous cycle of checks and balances to ensure appropriate depth and rigor of all activities. In essence, the success of practice-based learning experiences as offered in pharmacy education is reliant on the successful implementation of this cycle.

A closer analysis of the core principles of pharmacy practice, curriculum design, and assessment demonstrates a strong connectivity between the models. The Patient Care Process envisioned by the Joint Commission for Pharmacy Practitioners (JCPP)[3] is established within an interprofessional context and states that using principles of evidence-based practice, pharmacists will: (1) Collect subjective and objective data. (2) Assess the information collected. (3) Generate an evidenced-based care plan. (4) Implement the plan. (5) Follow-up by monitoring and evaluating the plan.

In comparison, the teaching and learning cycle as illustrated by Banta follows a similar cycle within the context of best practices in education.[4] This cycle of continuous quality improvement is as follows: (1) Articulate desired student learning outcomes (SLOs). (2) Design a curriculum and assessment of learning. (3) Implement curriculum and assessment activities. (4) Gather data from the assessment. (5) Analyze that data. (6) Make evidence-based improvements.

In both the healthcare and educational environments, practitioners place great value on making evidence-based plans for continuous quality improvement. Therefore, the challenge for pharmacy educators is to make this connection clear and meaningful for its stakeholders. Instead of using terms and strategies that may

be unfamiliar to the majority of the faculty, directors and deans of assessment and curriculum can frame their work in terms that can be embraced by the faculty: translating patient centeredness to student centeredness.

The patient-centered/student-centered comparison can be employed to elucidate another essential concept in education: the interdependency of curriculum and assessment. Just as care providers should evaluate the effectiveness of patient care plans, faculty members should assess the effectiveness of the curriculum. In both cases, the goal is to ultimately improve outcomes – for the patient and the student.

The purpose of the two papers written by the Curriculum and Assessment Special Interest Groups (SIGs) of the American Association of Colleges of Pharmacy (AACP) is to help programs incorporate the CAPE Outcomes into their on-going curriculum and assessment activities. The papers are written so that taken together they will allow colleges and schools of pharmacy to formulate curriculum and assessment plans that will ensure graduates meet the new CAPE Outcomes in whatever form the college or school chooses to implement them. Recognizing that curriculum and assessment must work hand in hand to achieve the objectives of PharmD programs, these two papers have intentionally been written through a common lens: the curriculum and assessment cycle. A specific aim of these papers is to offer pharmacy educators a blueprint for learning experiences with one paper focusing on a curriculum blueprint and the other sharing an assessment blueprint as they relate to the CAPE Outcomes. Together these papers may be considered a Curriculum and Assessment Blueprint for Learning Experiences (CABLE).

Part I of the assessment segment of this paper provides key elements necessary in the implementation of the assessment cycle. Nine individual topics collectively address everything from articulating desired outcomes, to selecting the appropriate assessment tools, to evaluating assessment plans. Each topic is presented such that it may be referenced independently to meet the needs of the reader. Therefore, if the paper is read in its entirety, necessary redundancies may be observed.

Part II of the paper narrows the focus to the domains within the CAPE Outcomes. The assessment fundamentals are applied to the unique challenges of addressing these domains: Foundational Knowledge, Essentials for Practice and Care, Approach to Practice and Care, and Personal and Professional Development.

Part I

The Key Elements of the Assessment Plan Related to CAPE Outcomes

Organized into nine topical sections, Part I of Are You CAPE-A.B.L.E. presents key elements of the assessment cycle as they are applied across the curriculum and shares recommendations that should be considered the core of assessment plans related to the CAPE Outcomes.

What Should Best Practice in Assessment Look Like in Pharmacy Education?
Greg Alston and Jacqui McLaughlin

The landscape for assessment in pharmacy education is rapidly changing. The CAPE Outcomes were intentionally expanded beyond knowledge and skills to include ability-based educational outcomes that append the affective domain. The proposed 2016 ACPE Standards directly incorporate the CAPE Outcomes and set new demands for assessment of each standard. Similarly, under the Affordable Care Act, health care professions face increased scrutiny to demonstrate the value of professional services to more knowledgeable patients. Given these ongoing trends, pharmacy educators are tasked with determining the most appropriate way(s) to assess student development within the context of expectations to educate and train competent graduates with the knowledge, skills, abilities, and attitudes grounded in the current and future practice of pharmacy.

A growing body of literature highlights best-practices for assessment in higher education. Six foundational educational assumptions about learning and assessment were outlined by The Consortium for the Improvement of Teaching, Learning and Assessment. These key assumptions include:

1. Student learning is a primary purpose of the educational institution.
2. Education goes beyond knowing to being able to do what one knows.
3. Learning must be active and collaborative.
4. Assessment is integral to learning.
5. Abilities must be developed and assessed in multiple modes and contexts.
6. Performance assessment with explicit criteria, feedback and self-assessment is an effective strategy for ability based, student centered education.

In addition, nine principles of good practice for assessing student learning were defined in 1992 by the American Association for Higher Education. The nine principles are as follows:

1. The assessment of student learning begins with educational values.
2. Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed in performance over time.
3. Assessment works best when the programs it seeks to improve have clear, explicitly stated purposes.

4. Assessment requires attention to outcomes but also and equally to the experiences that lead to those outcomes.
5. Assessment works best when it is ongoing, not episodic.
6. Assessment fosters wider improvement when representatives from across the educational community are involved.
7. Assessment makes a difference when it begins with issues of use and illuminates questions that people really care about.
8. Assessment is most likely to lead to improvement when it is part of a larger set of conditions that promote change.
9. Through assessment, educators meet responsibilities to students and the public.

In 2013, a group of higher education associations and regional accrediting commissions endorsed The Principles for Effective Assessment of Student Achievement.[6] This consensus statement was designed to facilitate an effective collaboration between institutions and their accrediting bodies. This report stated, "Federal law requires that a higher education institution undergoing accreditation provide evidence of success with respect to student achievement in relation to the institution's mission." Both aspects of this requirement—the insistence upon achievement and the tailoring to institutional mission—are important. The demonstration of quality is a fundamental responsibility of all colleges and universities, but both the definition of quality and the methods used to measure it will differ depending on the mission of the institution."[6]

Specifically all institutions are required to provide evidence of achievement in three domains:

1. Evidence of student learning experience: Schools should be able to define and evaluate how their students are learning.
2. Evaluation of student academic performance: Schools should be able to develop meaningful curricular goals and create defensible standards for evaluating whether students are achieving those goals.
3. Post-graduation outcomes: Schools should be able to defend how their institution prepares their students for meaningful lives, successful careers and additional education.

Approaches to measuring these three domains should vary depending upon the mission, structure, and goals of the institution.[6] The following direct quote from this statement can help guide schools and colleges of pharmacy as they work towards demonstrating quality and meeting the requirements of the accrediting body.

> The accreditation process needs to allow institutions flexibility with regard to the methods for measuring progress toward these goals. It is a mistake to conflate particular means for measuring goals with the achievement of those goals. Measures of all kinds will work best if they are integrated into the teaching

> and administration of colleges and universities, analyzed on a regular basis, and summarized in the accreditation process.[6]

These educational assumptions and principles lay a foundation for designing and implementing approaches to assessment in pharmacy education that align with the CAPE Outcomes and the proposed 2016

ACPE Standards. As pharmacy educators meet the demands of applying these standards to their own PharmD programs, monitoring and evaluating educational outcomes demands the same rigor and attention to detail that is encouraged for clinical decision making.

As discussed in the foreword, clinical decision making is grounded in quality data. Educational decision making should follow the same process of drawing conclusions based on evidence. As in the clinical environment, professionals in education should use caution when drawing conclusions from data, since making generalizations from incomplete data, disregarding important contextual factors, or relying on incorrect assumptions can misrepresent reality. One common error is failing to understand the critical distinction between using a norm referenced assessment strategy that ranks students according to a bell curve and a criterion referenced strategy that assesses competence according to a standard. In pharmacy education, our goal is to demonstrate mastery not rank. Further, pharmacy educators should consider diversified approaches to assessment and recognize the impact of different cultures, resources, and institutional missions on educational approaches and outcomes.

In light of the CAPE Outcomes, student learning assessment professionals should assist their stakeholders in developing, interpreting, and reporting evidence to document their program's success. Key stakeholders are colleagues charged with curriculum development and revision. One challenge is recognizing the level of understanding stakeholders have about the purpose and role of assessment in pharmacy education. In a 2010 survey on the state of learning outcomes assessment in higher education in the United States, Kuh and Ewell[7] discovered the following:

1. The most common use of assessment data was for accreditation and self-study
2. The primary driver of assessment was accreditation
3. The two greatest needs to advance assessment were greater involvement of the faculty and more expertise, resources and tools to conduct assessment
4. Outcomes assessment is undercapitalized and underfunded

Kuh and Ewell's survey confirms that assessment is currently utilized mainly for the purposes of compliance with standards and resources are generally not dedicated to advancing assessment beyond basic measures of accountability. For a pharmacy program to excel, effective assessment should clearly extend beyond the requirements of accreditation self-study. Student learning cannot be documented without assessment and the impact of an educational program cannot be demonstrated without assessment data. Assessment is a vital component to demonstrate the value of educational programs and student learning to internal and external stakeholders. Just as a clinician would never treat a patient without monitoring the effects of a treatment plan, good assessment practices are required to revise and improve the outcomes of educational programs.

This brief introductory explanation of the foundational principles of assessment, combined with a call for scientific rigor in the application of these principles, provides the philosophical underpinnings for understanding the importance of data-informed decision making and evidence-based quality improvement within the context of pharmacy education. Presenting an appreciation for these principles and best practices lays important groundwork for identifying appropriate strategies and approaches to generating and interpreting assessment data. Some examples of best practices will be described throughout the paper following a description of the process of assessment as described by the assessment cycle.

An Overview of the Assessment Cycle

Linda Garavalia and Kari Franson

The CAPE Outcomes and proposed 2016 ACPE Standards mark the evolution of pharmacy education and provide new guidance for pharmacy programs. As in the clinical setting, evidence-based decisions are essential when modifying the curriculum, developing educational strategies, and interpreting assessment data. Pharmacy practitioners follow an algorithm in making sound clinical judgments and a practice-based education is essential to developing this skill. Application of the assessment cycle in a practice-based education can be likened to an algorithm for making sound judgments about educational strategies, assessment, and the curriculum. A framework that demonstrates the interconnectivity of these three components can serve to demystify the teaching and learning process. At the core of this educational enterprise is constant quality improvement; thus, change is required. However, the key is to make change that is warranted. Being an evidence-based model, the assessment cycle aligns the logical unfolding and flow of the curriculum with the collection of valuable data on student learning so key decision-makers can make informed decisions about the program and its underlying educational interventions.

A Guiding Conceptual Framework

The assessment cycle is a useful tool for pharmacy educators striving to track the impact of instructional interventions across the curriculum or seeking areas for quality improvement. Professional programs are in the process of reviewing curricula, educational strategies, and assessment in relation to the proposed 2016 ACPE Standards and the CAPE Outcomes. Increasingly, federal guidance compels accrediting organizations to require colleges to provide proof of evidence-based decisions and quality improvement initiatives. The assessment cycle is a conceptual model that documents relationships among components of the educational enterprise, in particular, the interplay between curriculum, instruction, and assessment.[5,6] The assessment cycle has been an integral part of pharmacy curricula ever since the early 1990's. At that time, Robert Chalmers with the

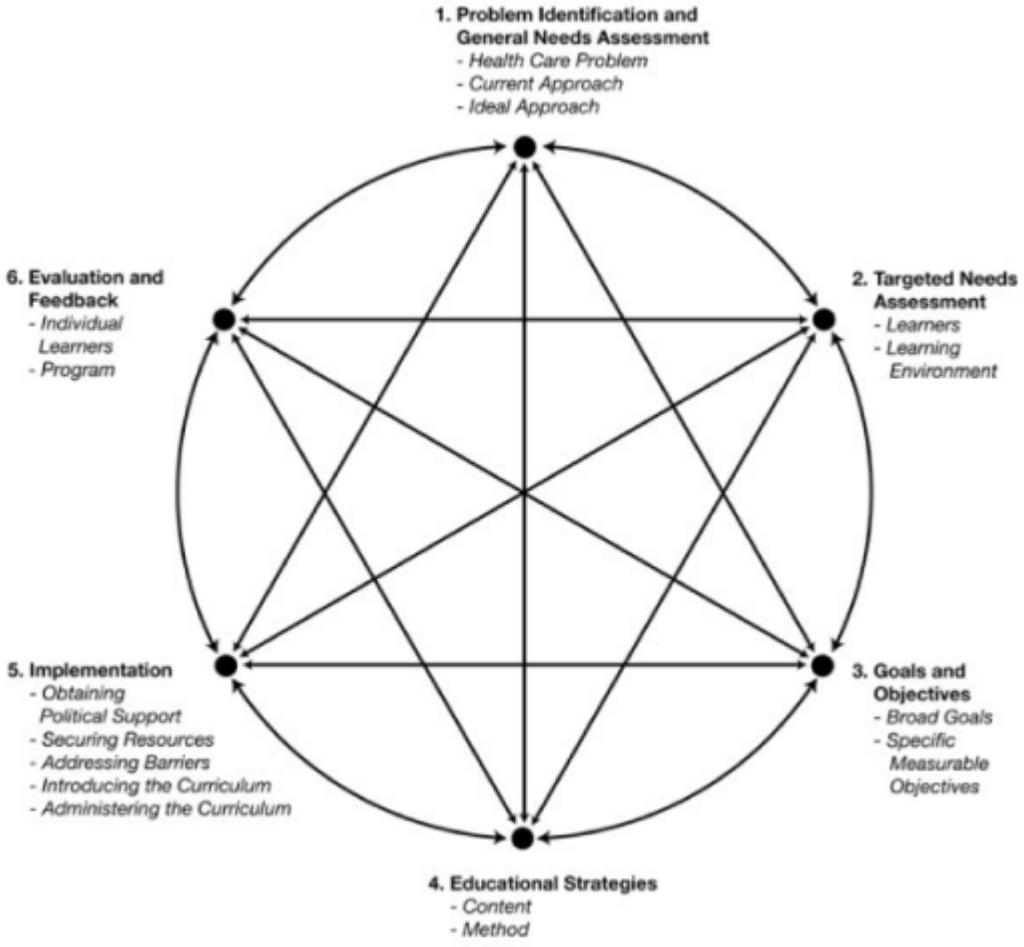
assistance of Georgine Loacker at Alverno College[7] and Trudy Banta at Purdue[8] led the Commission to Implement Change in Pharmacy Education and moved the academy toward developing "outcome measures in designing curriculums and assessing student learning."[9] Emphasizing the complexity of professional pharmacy education, Chalmers and his colleagues argued that traditional curricula focused on the accumulation of knowledge rather than the interrelated development of knowledge and skills.[7] They advocated for an "outcome-based, assessment-guided curriculum."[7]

Educational researchers study the alignment among the components of the assessment cycle and note that using assessment data to revise programs is neither easy nor common.[4,10,11] As professional programs adopt the CAPE Outcomes, the Commission's challenge to pharmacy educators is more pertinent than ever -- to implement assessment processes that "facilitate learner development within and across courses, as well as continuous improvement processes within individual courses and across the curriculum" (p. 111).[8]

The Assessment Cycle Model

Models can assist in conceptualizing the interrelationships between the curriculum, educational strategies, and assessment. In David Kern's model,[12] the components have an interdependent, reciprocal relationship to one another, such that when one component is changed, a corresponding impact is experienced in the other components of the model (Figure 1).

Figure 1. *David Kern's six step model for curriculum development*



Using a dynamic cycle such as the Kern's model is ideal for pharmacy education programs. Practice-based programs like the PharmD are more directly aligned with the current and future practice within the profession. A new drug is made available or a new way of administering a drug is developed and these factors have a direct impact on what and how pharmacy education is delivered. The personal attention given to students through pharmacy practice experiences creates a coaching and mentoring relationship where feedback on outcomes can be received quickly and in some cases cause ripple effects in how educators address the various points of the cycle.

Pedagogical Considerations

Answering the call for outcomes-based learning and assessment requires pharmacy programs to foster collaboration among the faculty to ensure that courses are not developed and delivered in isolation. For example, using the cycle provides a reminder when developing objective structured clinical examinations (OSCEs) to plan appropriate instruction for performance-type outcomes and to explicitly identify how the performance-based OSCE relates to the program curriculum. As can be seen in Figure 1, the implications of each step can be driven down to the level of an individual learner in a course or up to the impact of the curriculum on the health care system.

As pharmacy programs adopt the CAPE Outcomes and prepare for the 2016 proposed ACPE Standards, the assessment cycle can assist in guiding efforts to align curricula with the outcomes and standards.

Problem identification and general needs assessment. Pharmacy programs identify gaps in their current program objectives in relation to standards such as the CAPE Outcomes and the 2016 proposed ACPE Standards. This initial review may lead to revising goals, instruction and other learning experiences, and assessment practices. For example, the proposed 2016 ACPE Standards emphasize interprofessional education (IPE). This expanded focus may present challenges for PharmD programs and require some initial reconsideration of development, implementation, and assessment of program goals and objectives.

Needs assessment of targeted learners. Kern's model also incorporates contemporary approaches to learner-centered instruction that focus on the needs of the learners as opposed to other starting points, such as an instructor's a priori plan for topic coverage or the level of complexity with which a textbook presents material. With regard to the CAPE Outcomes, the subdomains define the successful achievement of learning outcomes as culminating at the time of graduation. The program and each teacher's role is to establish the beginning point for learners. This can be accomplished with a needs assessment of targeted learners. As learners progress

through the cycle, needs assessment data will derive from prospective assessments as well as existing program evaluation data.

Goals and specific measurable objectives. The CAPE subdomains are stated in behavioral terms with corresponding examples of learning objectives. How are these goals and objectives reflected in the program curriculum? Mapping the goals to specific courses and assessments is a critical documentation strategy. Additionally, the program must consider the measurability of the goal and identify the key data that will determine achievement of the objectives.

Educational strategies. Appropriate teaching and learning strategies should be developed to meet each of the goals. Are performance-based outcomes likely to follow from lecture-and-listen instructional strategies? Backward design can be used to assist faculty members in developing strategies that will move learners from their starting points to the desired outcomes. A good educational strategy will align pedagogical methods with levels of desired student learning outcomes. For example, a lecture assessed by a multiple-choice exam may not be the best way to teach and assess critical thinking skills or objectives in the affective domain such as professionalism. Attention to taxonomy of learning and ways of knowing is imperative and covered in more detail later in this paper.

Implementation. It is important to document students' level of engagement throughout the educational process. Consideration should also be given to the appropriate amount of time devoted to learning various concepts and skills. First ask: Have students developed the foundational knowledge? Then: Do the instructional strategies connect knowledge and skills? Finally, are students able to transfer learning to a simulated or real practice setting? Attention to taxonomy of learning and ways of knowing is imperative and covered in more detail later in this paper.

Evaluation and feedback. As Chalmers and his colleagues noted, "How we assess student abilities in our courses drives their learning strategies" (p. 111).[7] How students are evaluated and how they receive feedback in relation to the knowledge, skills, abilities, and attitudes they are learning will have an impact on how they will apply them in practice. Selecting the right assessment tools, processes, perspectives, and timing offer the best opportunity to understand student learning from multiple angles. Some key considerations are as follows:

- Use more than one data point or assessment tool.
- Use direct and indirect measures.
- Use formative and summative assessment.
- Be careful in the use of the data.
- Insure valid application and inferences by interpreting assessment data in an appropriate manner.
- Examine incremental impact over time across a number of variables.

Assessment data about in-class performance, student satisfaction in course evaluations, performance in skills labs and Introductory Pharmacy Practice Experiences (IPPEs), performance on milestone measures, competency in Advanced Pharmacy Practice Experiences (APPEs), and involvement in co-curricular experiences can be used by pharmacy educators to triangulate measures of student learning experiences.

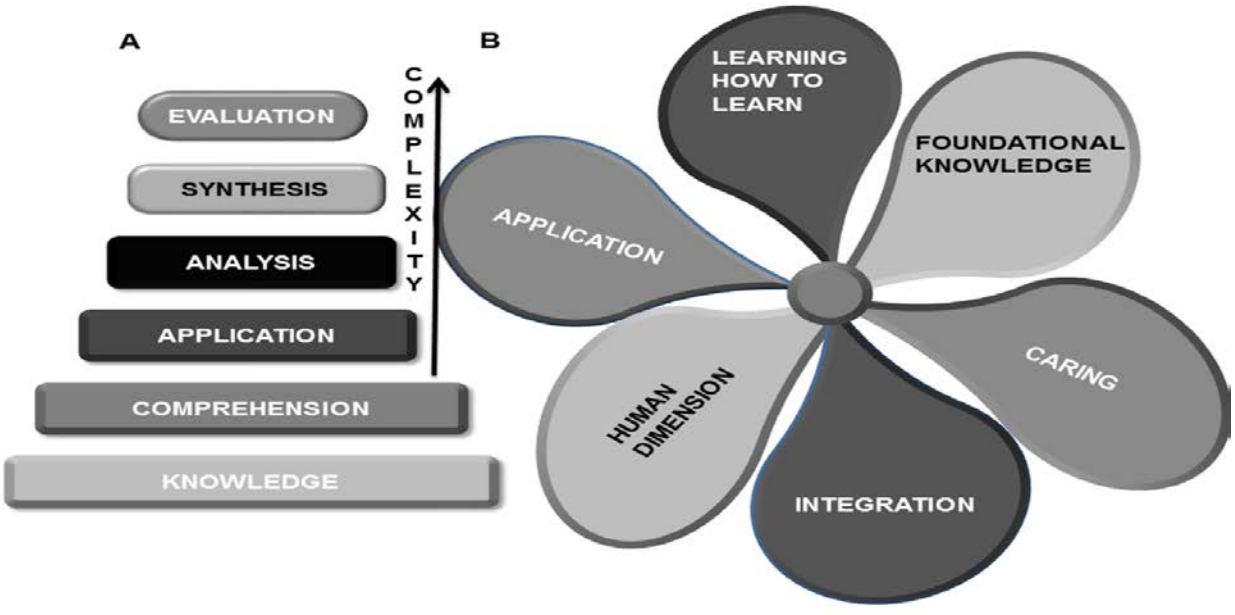
Stakeholders in pharmacy education can enter the assessment cycle at any point. Just as the learning process is complex at the individual and programmatic level, so is the assessment of learning. Curriculum, individual courses, educational strategies, or assessment are not always reviewed from start to finish. Ideally, the cycle is a continuous loop where improvement at each point helps keep the cycle moving and balanced.

Kern's cycle captures the complexity and dynamic nature of practice-based education programs like the PharmD. Each activity in the cycle is subject to modification as new information becomes available which parallels the way in which pharmacy practice addresses the patient care process. Therefore, assessment cycle in practice offers an excellent tool for organizing the components of the curriculum, educational strategies, and assessment.

Understanding Levels of a Taxonomy
Milinda Fowles, Ashim Malhotra, William Ofstad, and Michael J. Fulford

Taxonomies of learning are systems that classify educational goals into outcome-focused domains associated with cognitive, affective, or psychomotor educational assessment of students. Taxonomies have found wide acceptance in developing well-constructed learning outcomes and assessments of student learning. In programs that are practice-based, considering the taxonomy of learning is an important aspect of tracking student progression from one level to the next and ultimately to a level of readiness to be an entry-level pharmacy practitioner. Some of the more widely known models are Bloom's, Fink's, and Anderson, and Krathwol's taxonomies of learning (Figure 2).[13-16] The application of the taxonomic categorization to the development of student learning outcomes and implementation of the curriculum can provide valuable assessment data that describes the breadth and depth of student achievement of learning outcomes provided that taxonomic classes are applied appropriately and used consistently and judiciously by all faculty members.

Figure 2. *Representations of Bloom's (A) and Fink's (B) Taxonomies of Learning*



Overview of Taxonomies

Learning taxonomies differ in their approach towards defining and achieving educational goals, objectives, and outcomes. Taxonomies also differ in their internal structures, reflecting variations in the assumptions about learning styles and the learner audience. A comparison of Bloom's Taxonomy with that of Fink's Taxonomy of Significant Learning further illustrates this point. Bloom's Taxonomy has been extensively applied by teachers and scholars across various disciplines, proving its flexibility and adaptability. Bloom's Taxonomy is a hierarchical system that categorizes, emphasizes, and explains the sequence of cognitive development. Students progress linearly from lower-order thinking such as recalling and applying information to higher-order skills such making decisions and creating innovations. While Fink's taxonomy, takes a multi-center, multi-modal approach that stresses integrated and core performance ability.

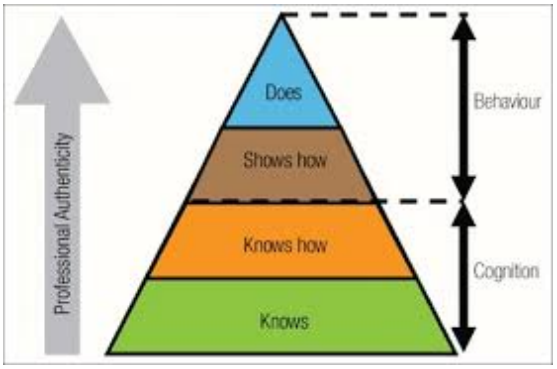
While Bloom's and Fink are adaptable to many types of educational settings, they can at times be too broad for programs that have specific outcomes and progression due to the nature of the profession. As the CAPE Outcomes have outlined, pharmacy education exemplifies this type of program due to the need for graduates to have a breadth and depth of knowledge, skills, abilities, and attitudes necessary to function successfully as a pharmacist. Miller's Pyramid of Assessment offers a learning model that is simple and specifically applied to practice-based education programs like the PharmD.[17] Miller discusses the unique challenges facing pharmacy education in relation to levels of learning. The following quote summarizes the value of Miller's Pyramid in clinical training programs like the PharmD.

> It is the quality of being functionally adequate, or of having sufficient knowledge, judgment, skill, or strength for a particular duty that Webster defines as competence. Despite the significant advances in testing procedures that probe these qualities, skeptics continue to point out that such academic examinations fail to document what students will do when faced with a patient, i.e., to demonstrate not only that they know and know how, but can also show how they do it. The evaluation of this performance objective represents a challenge now being addressed most aggressively, even though

> many clinical teachers still claim they make just such judgments about student performance through encounters on the wards or in ambulatory settings. Such a claim regrettably ignores a growing body of evidence suggesting that these judgments are generally based upon limited direct observation and equally limited sampling of clinical problems (which means an inadequate database); they seem more often related to the product of student interaction with patients, that is to the accuracy of diagnosis and the nature of management, than to the process through which these conclusions were reached. [17]

The simple, yet insightful, model offered by Miller and shared in Figure 3 offers a highly relevant structure to apply to outcomes of a PharmD program. The AACP Curriculum SIG's CAPE paper[18] which serves as a companion document to this paper shares many examples where Miller's Pyramid of Assessment is applied to curriculum design. With that in mind, it may be valuable to consider these levels when developing an assessment plan and aligning material throughout the curriculum.

Figure 3. *Miller's Pyramid of Assessment*



Assessing how students apply gained knowledge and skills in delivering patient care provides programs with learning results, such as if students valued the training, if knowledge and skills can be demonstrated, if learning is used in practice, and does training impact the University, community and profession more broadly. In Kirkpatrick's learning and training evaluation theory, these outcomes are framed as "reaction", "learning", "behavior", and "results".[19,20] In essence, when a student emulates the attributes of a problem solver, educator, advocate, collaborator, include and communicator, then they are introduced to those appropriate patient care

delivery methods that form the unique approach to pharmacy practice. Bradley-Baker and Murphy describe the Kirkpatrick Evaluation Model applied to pharmacy education and professional development training as:[21]

1. *Reaction* (student satisfaction and perceived value of training)
2. *Learning* (student development of knowledge, skills, abilities)
3. *Behavior* (transfer of the learning to the practice or other settings)
4. *Results* (the impact on individual patients, health care settings, population, and community health)

For the assessment of outcomes for new programs and training, the Kirkpatrick Evaluation Model may be a more focused framework for identifying and organizing outcomes and developing assessment strategies around new teaching and learning initiatives. Introduced in 1959 as a four level training evaluation model in the US Training and Development Journal, Kirkpatrick's Evaluation Model has been applied across education and business management literature. Recent updates and adaptations include a 2005 publication by Kirkpatrick revisiting the model as a method to transfer learning to behavior,[22] using the Kirkpatrick Evaluation to plan for programmatic goals and evaluation strategies,[23] and the adoption in 2009 by the Best Evidence Medical Education (BEME) Collaboration of the Kirkpatrick's Hierarchy for educational literature reviews.[19] A key benefit of this evaluation model is the examination of the training's impact beyond the classroom, which is important for aligning educational and assessment activities. Additionally, the CAPE Outcomes set expectations that learning experiences go beyond the traditional didactic classroom setting.

CAPE Outcomes and Educational Taxonomies

The revised CAPE Outcomes were formulated to emphasize higher levels of learning that appropriately reflect and capture the complexity of a pharmacist's job, which requires analyzing multifaceted data in order to formulate, implement, and evaluate patient treatment plans and solve therapeutic problems. This necessitates faculty-driven assessment of student learning to occur at correspondingly greater levels of complexity, including more than just assessing foundational knowledge. Unfortunately, research indicates that instructors have the tendency to ask lower-order test questions.[24] A possible explanation may be the inherent ambiguity in

differentiation between the levels of a hierarchical taxonomic system, which makes navigation and application of the taxonomy a challenging task for pharmacy educators. This problem encountered is observed often when applying Bloom's taxonomy to an educational field such as medicine or pharmacy, since success in these fields is usually based on an amalgam of foundational knowledge and skills and other affective, personality-based attributes such as aptitude and attitude. Interestingly, these deficiencies are better addressed by Fink's Taxonomy of Significant Learning. In introducing this revised framework, Fink argued that application of Bloom's Taxonomy to the educational arenas of medicine and pharmacy results in confusion, misidentification, and ultimately misaligned assessment, not because of flaws in the taxonomy, but due to the coerced attempt to assess a multi-dimensional professional field by the use of a rigid hierarchical system.[16] Further, since pharmacy education includes development and application of skills, and the simultaneous inculcation of environmental-response factors such as attitudes or communication skills when consulting with patients, Fink recognized that assessment needs changed correspondingly. Varying taxonomic approaches would help solve the problem of mismatched labeling or confusing the level of cognition being assessed.

Using an assessment method that does not match the taxonomical level of the learning objective or outcome can also result in data collection errors. For instance, CAPE provides a sample Learning Objective under the "Outcome" rubric that states students will "evaluate personal, social, economic, and environmental conditions to maximize health and wellness." Thus, simply asking a student to list conditions that should be considered when creating a plan to improve health and wellness fails to meet the cognition level for this objective. A preferred assessment method would be to observe students in a real or staged clinical setting where the student meets with a patient and then, based on that consultation, evaluates the patient's conditions and creates a wellness plan. Using a more robust qualitative or mixed-method approach offers an assessment of the student's knowledge as it intersects with application of that knowledge in practice-based educational setting like a simulation or live experience.

Lower level exam questions are appropriate as students learn basic concepts. Accordingly, faculty members should exercise care to classify their assessment at the proper level, with the understanding that the student has not mastered that learning objective until a higher level assessment has been conducted. The faculty and students will receive an inaccurate view of student progress toward programmatic learning outcomes if assessments are not aligned with the appropriate level of taxonomy.

The Emergence of Blended Taxonomies for Pharmacy Education Assessment

In additional to the foundational learning taxonomies, various independent taxonomies have been developed to meet the specific needs of disparate pedagogies and learning outcomes. For example, the University of Queensland in Australia used a model by Barnett and Coates to review their curriculum. This model employs three curricular domains: knowing, acting, and being.[25] The diversity of models in the literature offers schools and colleges of pharmacy options as they seek to implement a pre-existing system or adapt one to their current program.

The PharmD program's model of learning taxonomy whether adapted or created should follow two key standards. First, it must clearly differentiate between levels of cognition, distinguishing between lower and higher-ordered thinking and skills. As the University of Queensland example demonstrates, using a smaller number of more focused domains may be helpful in distinguishing between the levels of cognition. Secondly, regardless of the system used, the model should be applied consistently across the curriculum by the faculty and administration in order to collect valid and timely data regarding student learning. The assessment data and documentation of student data will be flawed if faculty members interpret domains differently.

Understanding levels of taxonomy may require additional professional development for the faculty and others responsible for evaluating students. As faculty members develop student learning outcomes, using levels of taxonomy provides for better mapping of the expected progression of students as they move through the

PharmD program. Within the authentic context of a practice-based education, these levels of learning allow the faculty and preceptors a language to evaluate the subtle differences and complex tasks that are core to pharmacy education. Consistent training on and application of these models can assist programs in developing outcomes that are better aligned and mapped throughout their curriculum. Better mapping and alignment may provide relevant and timely data to inform curricular revisions and empower programs to provide their students with a more thorough and accurate representation of their own knowledge, skills, abilities, and attitudes.

Writing Student Learning Outcomes
Julie Szilagyi and Kathy Kelley

The increased demand for assessment at all levels of an educational program has dictated the importance of having learning outcomes in place in a curriculum. Adopting specific learning outcomes provides a basis on which to determine whether or not students have learned by defining what students know and can do as well as serving as a basis for what educators will assess. Additionally, learning outcomes serve as a basis for designing remediation exercises that bring students to appropriate levels of achievement. Therefore, writing student learning outcomes is crucial in establishing and contributing to the assessment process within an institution. Establishing learning outcomes should be the first step in curricular design or revision processes. Learning outcomes must also be aligned with the mission and goals of the college/school of pharmacy. The process of writing student learning outcomes should begin with a vision of what students should be able to do in term of knowledge, skills, abilities, and attitudes when they complete a program. Additionally, as shared in the previous section, these outcomes should also take into account the levels of taxonomy of the learning process. These are frequently expressed as program outcomes and are more general in nature. With the program outcomes in mind, faculty members can work from that point downward through the curriculum and courses. In other words, "…product defines process…" and the process is to design down (backward design).[26]

Pedagogical Considerations

Learning outcomes are statements that describe what an individual is expected to know or be capable of doing upon completion of a program or course. The outcome statements articulate what is expected and thus form a set of standards for achievement. Program level outcomes can be written with a broader content whereas course or experience level outcomes may be more specific and detailed. In the case of pharmacy education, learning outcomes should be mapped to the CAPE Outcomes and should be written to reflect what actual knowledge, skills, abilities, and attitudes students are expected to attain upon completion of a program or course

and what level of learning has taken place from basic levels like remembering to higher levels such as applying and analyzing. That is, what should students be able to do (skills), to recall and apply (knowledge, abilities), and what students choose to do (attitudes/values).

Student learning outcomes are not only used to determine student achievement or competence, but are valuable in determining course content and guiding the selection of pedagogical techniques (e.g., case studies, active learning, etc.). Ideally, outcome statements make clear what students are expected to accomplish and whether or not they simply need to have knowledge of the topic or need to apply their knowledge to a situation in order to achieve the outcome. The statements also serve as a guide for faculty members in developing their lectures, teaching and learning strategies, practice opportunities, and assessment strategies (e.g., examination questions should be linked directly to an outcome statement). What takes place in a class, laboratory, or practice site must provide students with the opportunity to successfully achieve the outcomes. The significance of adopting student learning outcomes is that they define the educational environment in terms of process and product.[26]

Best Practices

There are several critical characteristics of student learning outcomes.

- The statements must be well-defined and clear in their purpose. While being specific, they should not include multiple outcomes or subjects. There should be no ambiguity regarding what is expected of the student.
- The outcome must be measurable by a variety of qualitative and quantitative assessment tools/methods. Active verbs are used to describe specifically what a student must do to be successful. Examples include calculate, describe, identify, prioritize, formulate, discuss, design, etc. Terms such as “understand” are not measurable.
- There should be some indication of what criteria will be used to assess success in attaining the outcome. A level of mastery should be indicated. The level of knowledge/skills should show progress and increase from beginner to expert throughout the course and curriculum.
- The process of writing student learning outcomes should include review by a variety of stakeholders and ultimately be agreed upon by all participants and, eventually, by the faculty as a whole.

- Student learning outcomes must be linked throughout the curriculum so that it is clear how a student builds upon what they have learned as they move on to the next level. Outcomes should illustrate the continuum of the learning experience.

Thus, quality student learning outcomes must have certain characteristics that clearly define what constitutes success.

Solid student learning outcomes guide several important educational processes. First, the outcomes define and set standards for what students will be capable of doing upon completion of a course or program. Second, student learning outcomes are especially useful as a guide for the faculty in designing what and how to teach. Finally, learning outcomes establish the foundation of what should be assessed. Coupled with applying levels of a learning taxonomy, well developed learning outcomes will offer the blueprint for the breadth and depth of learning experiences needed to guide students towards successful completion of the PharmD program. The CAPE Outcomes are diverse and address both the cognitive and affective domains and require a multi-faceted approach when assessment of these outcomes is considered. This makes developing clearly defined and measurable student learning outcomes extremely important as programs seek to determine whether students successfully demonstrate the knowledge, skills, abilities, and attitudes of an entry-level practitioner.

Ways of Knowing: Quantitative and Qualitative Methods
Ashley Castleberry, Michael Peeters, and Tara Jenkins

The CAPE Outcomes are diverse and address both the cognitive and affective domains. Assessment of these experiences should also be diverse and combine robust quantitative and qualitative measures (i.e., mixed methods) to best capture this variety in student learning outcomes. Assessment measures serve as ways of knowing that students are achieving the student learning outcomes developed by PharmD programs. The practice-based nature of pharmacy education requires a balance of didactic and pragmatic experiences that help students take knowledge from multiple and diverse sources, synthesize that knowledge, and apply it to a multitude of settings. Matching these experiences with appropriate quantitative and qualitative measures offers a more holistic picture of student learning.

Quantitative measures allow consolidation of large amounts of data into summary statistics, and allow insights into what and how much knowledge students have gained throughout their learning experiences. Qualitative forms of assessment can offer rich data into understanding *how* students make decisions and can even directly measure demonstration of some skills, attitudes, and abilities. Examples of qualitative data include transcripts from interviews, questionnaires containing open comment items, transcripts from focus groups, field notes from direct observation, video recordings, images, portfolios, and reflections.[27] Though qualitative methods are generally less present in pharmacy education scholarship, they are often used by faculty members in pharmacy education and can provide depth and insight into the educational experience. The richness of data provided through qualitative analysis allows for powerful formative and summative feedback that is a key component of assessing practice-based education. To avoid problems, such as ecological fallacy by using *only* quantitative summary statistics,[28] triangulating quantitative and qualitative data sources seems prudent. Mixed-methods--using both quantitative and qualitative methods--can be synergistic in assessing student performance across an entire curriculum, and is appropriate when assessing the CAPE Outcomes. Overall, there are many

considerations when determining the best methods and combinations of methods to use for assessment of pharmacy education at both the course and program level.

The expectations set forth for schools/colleges of pharmacy by the CAPE Outcomes and the proposed 2016 ACPE Standards require a varied approach to both curriculum and assessment. Pedagogy and assessment should be driven by the college's mission and curriculum along with its available resources. Institutions that can provide very fast turnaround on student achievement of program level outcomes are able to inform faculty members in later courses of the cohort's strengths and opportunities so pedagogy can be altered to best suit particular cohort needs.

Ways of Knowing

Assessment is a broad concept and should involve using a variety of assessment measures within a pharmacy curriculum. Some common assessment terms and processes are described below along with best practices for use of these measures. These should be used in combination to best assess student learning.

Direct vs. indirect assessment. Student learning can be assessed both directly and indirectly. Direct measurement includes artifacts of student work that prove learning has occurred such as scores on written exams, projects, presentations or performance on skills-based exams. Indirect measures of assessment include learner or teacher perceptions of learning as provided in reflections, surveys, or focus groups but do not objectively prove that learning occurred. Each measure provides insight into the process of student learning and should be used in combination with others (i.e, triangulation) to identify achievement of learning goals. It is imperative to not make decisions based on one data point but rather multiple data points, including direct and indirect measures, to triangulate information in order to answer an assessment question.[29]

Psychometric fundamentals of reliability and validity. Reliability and validity are quality indicators of assessment and are imperative within the testing standards for *fairness* to test-takers. Reliability and validity are often made analogous to darts hitting a dartboard. Quantitatively, reliability is about *consistency in (statistical) discrimination*. With repeated dart throws, do those darts land close together as a bunch (i.e., high reliability and little 'measurement error' between darts), or do those darts land far apart (i.e., low reliability and large 'measurement error' between darts). Qualitatively, reliability refers to *credibility* and speaks to whether sources are trustworthy enough to use further. Regardless of quantitative or qualitative methods, validity is a unitary concept; there is only *one* validity. Validity is often denoted as *accuracy* and in our dart analogy it would be how close to a dart-board's bulls-eye do the darts land. Different measures can provide evidence to make a valid conclusion and these include content evidence (also known as content validity), response process, internal structure (also known as reliability and construct validity evidence), relationship to other variables (also known as criterion validity), and consequences. Of these, reliability evidence and content validity evidence are important in each instance of administering a learning assessment, while other evidence can be added as further investigations allow.[30]

Learning vs programmatic assessment.[31] Traditionally, a test (or measure) of students within an individual classroom is termed *a learning assessment* or simply an *assessment.* A more recent development to this concept is *programmatic assessment* or *program evaluation;* culminating individual classroom-based learning assessments into curricular-level (i.e., *curricular assessment*) or at level of an entire program. It is important to note that learning assessments--with their important, rigorous psychometric characteristics described above--are appropriate for assessment at both curricular and programmatic levels.

Formative vs summative assessment functions. There are two major types of assessment activities.[32] First, formative assessment is used when feedback to learners, and/or course improvements are sought; it is

accomplished during a course to impact current learners and not at the end (i.e., summative). For this function, assessments often use qualitative information. Second, summative assessment (i.e., evaluation) is judgment-based and is used much more often than formative assessment. In arriving at a course grade or other total score, summative assessment employs quantitative data. A well-crafted assessment can serve both functions; it can allow quantitative scoring while also providing for qualitative learner feedback. Over the past decade, a major shift in assessment programs has been from purely summative 'assessment *of* learning' towards newer models integrating formative functions and fostering 'assessment *for* learning'.[33]

Norm- vs criterion-referenced grading. Norm-referenced grading is based on a comparison among a learner's cohort of peers.[34] It often employs a Gaussian or normal distribution in assigning grades (i.e. "grading on a curve"). Conversely, criterion-based grading does not compare learners, but measures how well each student demonstrates mastery of a criterion, such as a course-level or program-level outcomes. Criterion-referenced grading should be and is becoming a best practice.

Rubrics. Rubrics provide a standard framework for scoring a *subjective* performance; rubrics are a means towards *objectivity* in scoring.[31] However when creating a rubric, we need to work toward being more objective by specifying detailed elements of a performance as opposed to scoring the performance more holistically. The more detailed a rubric is, the more difficult it can be for raters, requiring more rater training; meanwhile a simple rubric used for multiple performance occasions can become acceptably reliable through the multiple occasions.[30]

Conclusion

Assessment measures should mirror the diversity of the learning experiences in a practice-based education. The assessment methods used in pharmacy education should align with measurable learning outcomes that take into account the level of taxonomy of the outcome. Higher order outcomes may require

triangulation of data from multiple types of assessment. In contrast, foundational knowledge may only require singular forms of evaluation to determine mastery of the outcome.

However, it is imperative that an assessment plan for pharmacy education include quantitative and qualitative methods. In order to gain a more holistic view of student learning, assessment plans should utilize formative and summative evaluations that use both direct and indirect measures. Combining methods can produce results that demonstrate a longitudinal pattern of growth and development that allows educators to address accountability at the student level and programmatic level. Data gleaned using multiple methods and multiple learning experiences allows for an integrated assessment of the PharmD curriculum. Proper selection of methods, alignment with measurable outcomes, and use of appropriate levels of taxonomy offers a more reliable way of knowing student attainment of the knowledge, skills, abilities, and attitudes outlined in the CAPE Outcomes. As pharmacy educators identify the best methods for evaluating their student learning and programs and move on to selecting appropriate assessment tools resources, it is important to keep in mind that while assessment *of* learning is a foundation, assessment programs need to shift toward focusing on assessment *for* learning.

Selecting the Appropriate Assessment Tool
Timothy J. Bloom and Sharon McDonough

Assessment methods must be aligned with the curricular outcomes of the program since they are intended to determine the progress of students toward those outcomes.[35] As Epstein discusses in regard to assessment in medical schools, "Balance the use of complex, ambiguous real-life situations requiring reasoning and judgment with structured, simplified and focused assessments of knowledge, skills and behavior."[36] This balance has obvious implications for creating and maintaining an assessment program, as coordination and planning across the various assessable areas and over the time spent in the PharmD program will not be easy. As previously discussed, many factors are important to consider in selecting appropriate assessment tools. First and foremost, assessment instruments should be valid and reliable. This means they are actually measuring what is intended to be measured and that scores are reproducible either across scorers, across repeated measurements of the same student, or across different populations of students.[37] There are many assessment tools that can be used to generate valid and reliable information, but every tool is not necessarily appropriate for every situation. In practical terms, that means a particular assessment activity may be suitable for assessing knowledge but not skills, and consequently, thought must go into choosing the varied methods of evaluation within an assessment plan[36,38]

As discussed earlier, some tools measure learning directly while others measure it indirectly. As a program considers when to use assessment tools that directly or indirectly measure student learning, the following factors are important to consider. First, direct measures may be valued more highly by accreditors because they are direct observations of learning rather than reflections on learning.[39] Second, indirect measures provide a useful complement to direct measures because they can lend additional support to validate additional data.[38,39] However, assessment tools and activities that offer indirect measures may not tell the whole story by themselves. Last, in some cases learning outcomes are difficult to measure by direct observation (e.g., life-long

learning and other attitudes and values). When there is little or no opportunity to use a tool that offers direct measures, then multiple indirect measures from various sources (e.g., students, faculty, preceptors, and alumni) can be triangulated to support the validity of claims that learning outcomes have been achieved. In the end, an appropriate blend of direct and indirect measurement tools can offer the greatest benefit when assessing a PharmD program.

Institutional factors are important when considering the feasibility of using different assessment tools. One needs to consider the cost, the facilities, and human resources available, the culture of the institution, and the curriculum. In many cases, these factors may prohibit or limit an institution from being able to take advantage of the best direct or indirect measurement tool for their program. At this point, pharmacy educators must then become creative and collaborative in order to offer the best solution.

Cost Considerations

In many cases, cost concerns may become the greatest deciding factor in what type of assessment tools and activities may be utilized by a College of Pharmacy. Although nationally standardized tools that are commercially available address validity and reliability, provide supporting documentation, and may provide benchmark data,[4] they may come at a prohibitive cost. Even if the institution has the money available, it is important to consider whether or not the measure will provide feedback that is meaningful enough to be worth the cost. This cost-benefit analysis may lead the institution to create its own tools or collaborate with peer institutions to develop new ones.

Performance based assessments like OSCEs have been utilized by many educators in the health care fields. However, OSCEs can be expensive to administer as well, even though they may be one of the best ways to measure certain skills. In addition to cost, human resources come into play with OSCEs, which can take multiple people to accomplish, from writing and validating cases to training standardized patients and

evaluating performance. With a limited budget and limited human resources, one needs to weigh how many OSCEs are feasible to do in a program and whether that amount is enough to provide the assessment data needed both in terms of programmatic assessment data and individual feedback for students. One solution to the cost issue is the option of testing representative samples of students if the interest is in program evaluation rather than individual student evaluation.[39]

Institutional Culture

It is important to consider the culture of the institution in terms of how highly assessment is valued. What is the level of support you can expect from the dean and upper level administration that control the budget? This is an important question when considering what is financially feasible. What is the level of faculty members' buy-in to assessment activity? This can have some effect on the human resource issue because faculty members are willing to engage in assessment activity that they value. Equally important, how receptive will students be to the assessment activity? As noted by Sundre after years of work in student assessment, the single biggest threat to validity is student motivation.[6] Palomba points out that professional programs, which typically require capstone experiences in the final year, are well positioned to have students participate in assessment that requires them to synthesize their knowledge and skills, engaging in activities that are placed within the authentic context of practice.[40] While the capstone part of the curriculum is an advantage to pharmacy programs, it is clear that regardless of the tools we choose, we must nurture an environment that encourages faculty members and students to value assessment activity, thereby enhancing their motivation to participate seriously in it.

Curriculum Considerations

A final factor within the institution is the curriculum itself. Does the structure lend itself better to embedded assessment in the didactic classroom, in experiential settings, or to separate assessment activities not

tied to courses? For example, in some programs students return to the campus at some point during their final year where a capstone OSCE or other type of cumulative assessment could be possible. In other programs where students do not return to the main campus during the final year until graduation, an embedded approach throughout APPEs might be a better choice.

The CAPE Outcomes include four domains that encompass student foundational knowledge, essential skills, approaches to practice, and personal/professional development. These domains can be aligned with the common educational terms of knowledge, skills, abilities, and attitudes. As noted in the previous section, a successful assessment program will require methods that can measure each of these areas with reliability and validity. Therefore, the tools used to evaluate students and programs must have the same level of rigor.

There are many suitable approaches for assessing knowledge and skills. Written exams are good for assessing knowledge, and are applicable to cognitive levels to the top of Bloom's taxonomy. This means written exams can be suitable for assessing not only basic and pharmaceutical science knowledge, but also the foundational knowledge upon which essential skills, approaches, and attitudes are based. Written exams are amenable to inclusion of rich content, allowing not only assessment of factual recall but also the ability of a student to discriminate between low-relevance and high-relevance information. This helps to develop and evaluate the critical thinking skills of students.

Multiple choice exams are widely used as they have the benefit of being easily scored and can be made highly reliable. Their use can be complicated, however, as they may allow students to recognize an answer they might not otherwise have chosen, a phenomenon known as cueing.[38,39] They also have a high risk of focusing on recall of factual information. This tends to drive student learning to passing the test rather than an understanding of concepts, and faculty members may also base teaching plans on covering material that will be on the exam. Alternatives include extended matching, wherein a long list of options is provided for students to

choose as matching each of a series of prompts, and structured essays. The latter has reliability implications both with respect to time required, which means fewer items can be included, and scoring consistency. The degree of objectivity in scoring determines the impact of the scorer on the reliability of the test.

OSCEs using standardized or simulated patients are widely used for assessing clinical skills including communication and teamwork. OSCEs and other observation-based approaches focus on student ability rather than knowledge, although it may be more correct to say that they assess how foundational knowledge is applied. Depending on the format, reliability is affected by not only the student and the scorer but also the patient used. With enough stations and well-trained scorers and patients, OSCEs can be very reliable for assessing student skills. The emphasis on application in an OSCE can focus student learning on skills mastery, which may lead to disconnect from foundational content. Skills can also be assessed by observation by a preceptor at a clinical site. Validity of observation-based methods can vary depending on the number of observations and the natural inclination to alter one's performance when being observed. When using clinical observation, there is also the problem of inter-rater reliability as generally not all students will be assessed by the same preceptors.

Abilities and attitudes are more difficult to assess, as they are demonstrated most readily in real-world interactions with patients and colleagues. Approaches that have been described include self-assessment through the use of portfolios and peer assessment. Portfolios include documentation of performing specified tasks as well as reflection on what was learned through completion of the tasks. The reflective component provides insight into abilities and attitudes.[36] Peer assessment has advantages over observation by preceptors due to the increased amount of time students usually have with peers as compared with preceptors, and the increased comfort with peers may reduce the extent of altering performance due to being observed. However, care must be taken to train students in peer assessment and a safe environment that avoids destructive comments must be carefully nurtured.[36]

Selecting the appropriate tool for evaluating student learning can be a complex task that involves multiple layers of considerations. However, careful planning and patience can have long-term benefits to assessing the program. The tool should not drive the outcomes and methods, but instead be a reflection of the development of measureable outcomes and multi-faceted assessment methods that take into consideration levels of taxonomy in the learning experiences. With the advent of learning technology, selecting the right assessment tools has become even more complex with so many options available to support the teaching, learning, and assessment of programs. However, careful consideration of all the factors discussed in this section must be done before simply picking a technology tool. Sometimes, the right tool may not be a technical one.

Technology Use in Assessment

Margarita DiVall and Wallace Marsh

Assessment activities in PharmD programs require a tremendous amount of data collection, aggregation, and analysis. Examples of such data used for programmatic assessment include local and national survey data from various stakeholders and results of the North American Pharmacist Licensure Examination **(**NAPLEX) and Multistate Pharmacy Jurisprudence Examination (MPJE). Attainment of educational outcomes is documented through examinations and performance-based assessment. As shared in previous sections, thoughtful consideration is needed when determining ways to assess a particular outcome and selecting the best tools to do the job. It is possible to conduct all assessment activities without the assistance of technology; however it is also easy to get lured by various technologies that promise to solve the assessment and accreditation challenges. Purchasing such technologies will neither automatically solve assessment challenges nor guarantee sound assessment practices. Technology is a tool and it should be used as such. To ensure that a tool can be useful in assessment activities, proper evaluation and selection is needed to result in a meaningful use of time and resources associated with the implementation of the tool. Too often, meaningless implementation of technology can result in gathering too much data that is disconnected from the outcomes. However, when used appropriately, technology can offer major benefits in collection of data, analysis and dissemination of results to key stakeholders, and targeted evidence-based decision making.

Programmatic assessment

A number of tools are available to assist faculty members and administrators to collect and aggregate assessment data for continuous quality improvement and accreditation needs. Simple tools such as spreadsheets (e.g. Excel, Microsoft, Seattle, WA) or survey tools (e.g. Qualtrics, Qualtrics LLC, Provo, UT) can assist with specific tasks such as curricular mapping or web-based collection of data from various stakeholders. Comprehensive assessment solutions, such as TK20 (TK20, Inc, Austin, TX) or WEAVEonline (Centrieva,

LLC, Henrico, VA) allow for flexibility of tracking strategic planning, curricular mapping, competency documentation, and productivity. These comprehensive systems are specifically designed to help gather data from different units across large institutions, generate reports, and meet accreditation needs. These technology solutions allow for efficiency in data aggregation, storage, and reporting. A product designed specifically for pharmacy is the Assessment and Accreditation Management System (AAMS) developed in partnership through AACP and ACPE. The purpose of AAMS is to assist PharmD program coordinators in assessment and accreditation-related activities. AAMS allows for storage of assessment reports and documents, tracking of progress for each ACPE standard between accreditation self-studies, and streamlined reporting and preparation of self-studies.

Learning outcomes assessment

Technologies available to assist with documentation of outcome achievement include electronic testing software, electronic rubrics, audience response systems, and electronic portfolios. Some solutions (e.g. ExamSoft, ExamSoft Worldwide, Inc., Boca Raton, FL) may offer several of these tools to allow programs to conduct formative and summative exam-based and performance-based assessments. The advantages of these technologies include the ability to map questions and rubric criteria to learning outcomes, content areas, and levels of learning and then aggregate data for reporting of student success on an individual student level and at the program level. Additional benefits include grading efficiencies, question banking and sharing, and ability to embed assessment of content throughout the curriculum, as well as comprehensive documentation of student achievement across the entire curriculum. These technologies are also eco- and space-friendly preventing the printing and storage of numerous exams and rubrics. ACPE Standards mandate documentation of achievement of learning outcomes on aggregate and student specific levels across the entire curriculum and many programs struggle accomplishing this without some assistance from technology.

Technology selection and adoption

Considerations for technology selection and implementation include access, availability of various tools within the same software suite, integration with existing technologies, reporting options, technology support at the vendor and institutional level, and cost.

Access. Access considerations include ability to customize access and restrictions for individual users, single sign-on features, requirements for Wi-Fi, ease of use on mobile devices, and availability of applications for mobile devices (i.e. apps).

Variety of tools. The complexity of the assessment needs of pharmacy educators continues to increase. The CAPE Outcomes emphasize knowledge, skills, abilities, and attitudes in the cognitive, psychomotor, and affective domains. Systems that allow for exam-based and performance-based assessments will enable faculty members and administrators to document attainment of learning outcomes across all assessments within the entire curriculum. Such systems can be used to administer electronic exams and rubrics for self-, peer-, and faculty-assessed performance-based assessments.

Integration. Many PharmD programs operate within large institutions and must consider whether the new technology they plan to adopt integrates with existing technologies used across their institution. For example, whether e-testing or e-rubric software can integrate with a learning management system to import grades or with a registrar's system to import student user data are important considerations.

Reporting options and flexibility. Assessment technologies should enable programs to answer specific questions, analyze data, and meet accreditation needs. Ability to map data to specific objectives, outcomes, or accreditation standards should enable robust reporting. Additionally, the ability to aggregate data across many courses and the entire curriculum, benchmark data against peers/other units, and track progress over time is

important. Availability to download and upload raw data further enhances the ability to analyze and create custom reports.

Technology support and training. Considerations for technology adoption should include vendor, as well as institutional support. Training resources, as well as technical support for end users are important for successful implementation. Extensive training whether through the institution or vendor is essential.

Challenges to Implementation

Many users may be resistant to the use of technology either because of their preferences or because they themselves lack technology skills. Others have had negative experiences with technology failure and would rather rely on proven methods of assessment or data collection. For some, it may be easier to grade on paper than using an electronic rubric on a computer or mobile device. The type of assignment being graded may also affect this preference – for example, when grading oral presentations involving groups of students it may be particularly difficult to grade using electronic rubrics that require online access. Using a paper rubric and entering data at a later time into an online database can help meet instructor preferences and the need to aggregate performance based assessment data. Additionally, all technologies come with the risk of technical difficulties or failure. This can be particularly disruptive during exams, presentations, or performance-based assessments. Instructors need to anticipate the potential for technology failure and have back up plans, either by bringing paper exams and rubrics, additional devices, or allowing for scheduling flexibility in cases of wide-spread network or power outages.

Best Practices for Technology Implementation and Use

Technology can be a useful tool but it can also be a burden to the faculty, students, and other stakeholders. For example, the timing of requests for surveys or other data from various stakeholders should be

considered. The final exam week might not be the best time to distribute surveys to the faculty and students, while the popular vacation time summer months might not be the best time to administer surveys to alumni and preceptors. One must be cautious to not overburden faculty members, students, and other stakeholders with too many survey and data requests.

In order to increase the chances of a successful launch of a new assessment technology tool, it is important to involve the faculty in the evaluation and selection of the tool and try to obtain their buy-in before purchase. Finally, initial and ongoing training is a key to successfully implementing any technology.

In conclusion, technology is not always the answer to a particular assessment need, but more and more it proves to be beneficial in terms of efficiency, sustainability, managing volume, and connecting with the current generation. Implementation of technology requires careful consideration and presents its own set of challenges. In practice-based education programs like the PharmD, appropriately using technology can eliminate the need for in-class lecture time and allow for more engagement during designated class time through cases, applied exercises, oral presentations, and guided discussions. Technology still relies on laying a solid foundation in the planning and implementation of curricular activities in order for it to benefit students, faculty members, and administrators. Technology use may also be determined by overall resource issues and availability that are unrelated to its benefits to the program.

Resources
Matthew Dintzner and Doug Ried

As discussed in foreword, the former American Association for Higher Education (AAHE) drafted nine principles of good practice for assessing student learning, including several that relate to the allocation of resources. As PharmD programs consider their assessment needs in the wake of new standards and documents such as the CAPE Outcomes, the resources required to meet those needs must be considered. Herein, are presented some of the financial, human, and capital resources that may be needed for effective implementation of an assessment plan in an outcomes-based curriculum.

Historical Context

Colleges and universities have gradually increased their efforts toward the assessment of teaching and learning since the 1980s.[41] By 2000, nearly 50% of colleges or schools of pharmacy surveyed reported having established an assessment committee,[42] though at the time most were "only in the early stages of establishing an institutional culture of assessment and comprehensive outcomes assessment plans."[26] In 2004, a report from the AACP's Academic Affairs Committee outlined resources in place at that time to assist programs in assessment[43] and, in 2007, the development of an Office of Teaching, Learning, and Assessment in a Pharmacy School was described, including a thoughtful discussion of the resources required for doing so.[44] While most of the resources described in the literature are still generally applicable, the CAPE Outcomes, many of which are part of the affective domain of thinking and learning, may inspire new ways of thinking about assessment and require additional resources to support it.

Connecting Required Resources to the Assessment Cycle

Different types of programs (e.g., private vs. public) with different missions and different available resources will have different plans for assessment, but central to any effective assessment initiative are well-

articulated guidelines for success and a commitment to continuous quality improvement. These guidelines as well as the assessment cycle has been discussed in previous sections.

Every PharmD program requires financial, human, and capital resources and those resources might be effectively used to complete vital assessment tasks within the assessment cycle. Based on the current direction of standards in pharmacy education, the role of assessment in pharmacy education is expanding, and the resources and operating budgets allocated to assessment will need to expand accordingly.

Resources Required for Competencies & Objectives, Mapping, and Curriculum Implementation

The CAPE Outcomes serve as an authoritative source for competency and objective development. Developing new and/or revising existing competencies and objectives and then linking (or mapping) them to the CAPE Outcomes is essential for assessing alignment of the curriculum with the guidelines that form the basis of the proposed 2016 ACPE Standards. The activities surrounding this important task requires significant human resources (HR) in the form of staff and faculty members' time, effort, and expertise, as well as institutional financial and capital resources, such as computers and software. Addressing gaps or deficiencies that are identified within the curriculum will require the allocation of significant resources in the development and implementation of new courses, labs, or experiences and even the adoption of new assessments. Some new assessments have been standardized and validated while others will require significant resources to do so.

Standardized and validated assessment development may gain additional importance as many of the CAPE Outcomes fall in the realm of the affective learning domain. Hence, collecting and analyzing data about student performance about newer and conceptually difficult to assess domains will necessitate additional training and professional development for personnel responsible for assessment; this, of course, will require time and money. In addition, the CAPE Outcomes strongly promote interprofessional education (IPE). Successful coordination and assessment of IPE relies heavily on the allocation of appropriate resources across

several departments and colleges/schools. Resources that must be coordinated across academic units include faculty members, staff, and preceptors with the expertise to act as facilitators or willingness to be trained to do so; funds to support training and professional development of the faculty, staff, and preceptors; capital and financial resources to support shared interprofessional learning opportunities (e.g., simulation labs).

A key component to the assessment of curricular effectiveness is the comparison of different strategies for implementing the curriculum and provides opportunities for academic scholarship (e.g., comparison of lecture-based versus team-based learning pedagogies), but also requires significant resources. Assessment of curricular effectiveness may require significant training in educational research and may provide logistical challenges in presenting the classes so that the differences can be measured (e.g., one section lecture-based and another section team-based learning). Some universities have university-wide support for these activities in the form of consulting faculty members within schools or colleges of education or offices of institutional effectiveness or the equivalent. However, colleges and schools of pharmacy throughout the country are affiliated with institutions of varying size and scope and have different resources to call upon.

Resources Required for Data Collection and Reassessment & Evaluation

Data collection requires significant human resources, which has a direct financial impact in terms of salaries and benefits for personnel. First, although half of the colleges and schools had assessment committees in 2000, only 22% of them had one or more persons with ≥0.5 FTE commitment to assessment and only 11% had ≥1 FTE. This ratio will need to be more appropriately balanced as pharmacy education moves toward the future and if a program is to demonstrate achievement of the CAPE Outcomes and proposed 2016 ACPE Standards.

In addition to the direct personnel financial expenditures, other HR needs include training programs for the professional and administrative personnel. For example, assessment conferences are offered each year that

attract pharmacy educators from all over the country including the regional, national and international academic institutes, such as the Southern Association for Institutional Research, IUPUI Assessment Institute, and the International Assessment in Higher Education Conferences. In addition, vendor-based live and webinar-based conferences are offered that support products such as LiveText (LiveText, Inc., LaGrange, IL) and ExamSoft (ExamSoft Worldwide, Inc. Boca Raton, FL).

Data available for comparative purposes are available from professional pharmacy organizations such AACP, ACPE, and National Association of Boards of Pharmacy (NABP). Data from AACP includes the Alumni, Faculty, Preceptor, and Student Surveys (i.e. the Curriculum surveys) in addition to those community-reviewed tools shared among colleges and schools in the Pharmacy Education Assessment and Accreditation Services (PEAAS) tool-box such as employer, experimental education, facilities/resources, progression and summative exams, and mapping instruments to name a few.

As mentioned earlier, AAMS is a proprietary software product jointly developed by AACP and ACPE that facilitates the collection, management, analysis and reporting of data core to the assessment and evaluation activities associated with accreditation. Data on student learning outcomes is central to the accreditation process and can be stored in the system. The AAMS system has the ability to organize data according to ACPE standards. These tools/resources are valuable contributors to the successfully implementing a program's assessment plan.

Adequate resources are required for college and schools of pharmacy to show that they are CAPE-ABLE. This paper used a curricular Continuous Quality Improvement (CQI) model to illustrate how these resources might be applied to achieve specific tasks required to assess curricular effectiveness. Other factors that will impact the program’s resource requirements might include: the “age” of the program; the type of

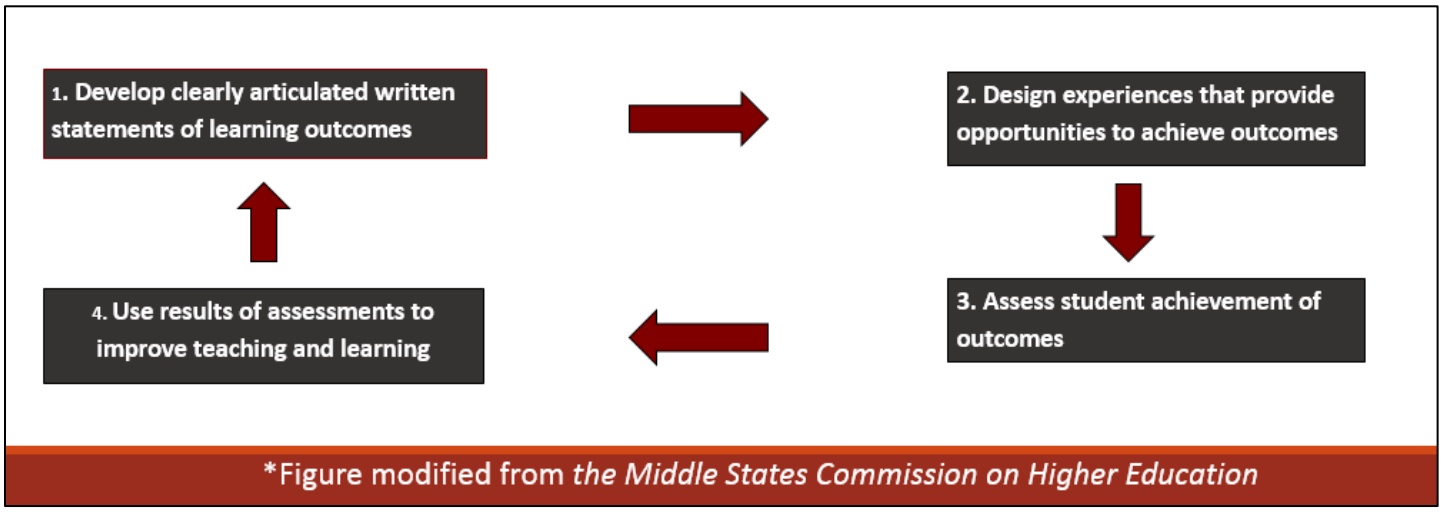
institution; the commitment of the institution to teaching and assessment; the requirements of reporting to upper echelons (e.g., dean, the faculty, higher education board, legislature, and federal government).

Evaluating Assessment Plans and Activities
Jane Souza, Kathy Kelley, and Tim Stratton

ACPE has underscored the critical role of assessment in its 2016 revision of standards. Under the heading "Revision of Standards: What's Different?" the Council states: "the new Standards emphasize assessment as a means of improving the quality of pharmacy education. Having valid and reliable assessment mechanisms in place will provide additional insights to programs regarding their strengths and deficiencies,"(p.6). [45]This statement suggests the need for all schools of pharmacy to have plans in place to collect data that informs continuous programmatic improvement. While this evaluative process should include both data from Section I: Educational Outcomes and Section II: Structure and Process to Promote Achievement of Educational Outcomes, the current discussion will focus solely on assessment plans and activities that support the evaluation of educational outcomes.

The various models for the assessment cycle contain common elements that link curriculum and assessment processes. Borrowing a model from the Middle States Commission on Higher Education (MSCHE) (Figure 4), the process by which the curriculum informs assessment and assessment data informs revised curriculum is readily seen. Clearly articulated educational outcomes and activities supporting student achievement of those outcomes constitute the curriculum. Collection of evaluative data and subsequent analysis and use of the data to improve teaching and learning constitute the assessment role in the cycle. Together these components are combined to ensure a process of continuous improvement as suggested in the ACPE Standards.

Figure 4. *A Model of the Assessment Cycle from the MSCHE*



Having an assessment plan in place ensures that the assessment cycle is employed routinely and monitored regularly. The National Institute for Learning Outcomes Assessment (NILOA) suggests that assessment plans for "gathering evidence of student learning might include institution-wide or program specific approaches that convey how student learning will be assessed, the data collection tools and the approaches that will be used, and the timeline for implementation."[46] This statement defines the fundamental components of an effective assessment plan. Additional key aspects of a useful assessment plan have been added to the list below:

1. Goals/objectives to be assessed
2. Outline of approaches to assessment
3. Data collection tools employed (see discussion on Technology Use in Assessment)
4. Timeline for implementation of assessment tools
5. Departments/positions responsible for data collection and reporting
6. Timeline for reporting assessment data
7. Process for documenting changes made based on the data
8. Plans to follow-up on efficacy of evidence-based changes made
9. Plans to communicate regularly with key constituencies

Evaluating the Assessment Plan

Evaluating an assessment plan is not very different from evaluating a goal. It is recommended that goals be specific, measurable, achievable, relevant, and time-bound (SMART). An effective assessment plan begins with an articulation of the specific desired outcomes and identification of the approaches and tools that will be

used to measure them. The target outcomes are achievable. Relevancy is made by aligning the goals with accreditation standards or/and strategic plans. The entire processes involved are scheduled to ensure timely implementation.

Additional Components of Quality Assessment Plans and Activities

Ideally, assessment planning would be an inclusive process. The faculty, students, and administrators would all have the opportunity to provide input into the plan. Many institutions employ committees to initiate the process. Due to the interrelatedness of curriculum and assessment, both the Assessment Committee and the Curriculum Committee would be leaders in the plan development. However, the Curriculum Assessment Plan is not solely the purview of these two committees. As the faculty claim collective ownership of the curriculum, they should likewise share collective responsibility for the assessment of the curriculum. Furthermore, it is essential that the executive committee or institutional leadership also play roles in the curriculum assessment process. These leaders have the ability to lend positional and financial support to assessment plans.

Effective curriculum assessment plans incorporate multiple forms of assessment including direct, indirect, formative, and summative assessments of student learning as described in the sections above. Effective curriculum assessment plans incorporate communication strategies to ensure that all key constituencies are informed about the progress of the implementation of the assessment plan. Students, faculty, staff, administrators, preceptors, and external partners should all be aware that multiple assessment tools and approaches are being used to inform continuous improvement of the educational program. Mechanisms should be in place to allow information to flow both to and from the assessment plan implementation team.

Curriculum Assessment Plan Evaluation Rubric

Faculty from the Committee on Institutional Cooperation-Pharmacy Assessment Collaborative (Big 10 CIC-PAC) have drafted a rubric that may serve as a foundation for evaluating a Curriculum Assessment Plan

(Appendix C) This draft rubric is informed by the elements outlined by NILOA, the CAPE Outcomes, and the proposed 2016 ACPE Standards.

PART II

Best Practices in Assessment Within the CAPE Domains

Presented in four sections, each focusing on one of the four CAPE Domains, Part II offers best practice ideas and presents unique assessment challenges that face pharmacy educators as they develop their curriculum and assessment plans related to the CAPE Outcomes.

CAPE Domain One: Foundational Knowledge
Fadi Alkhateeb and David Gettman

According to CAPE Outcomes Domain 1 - Foundational Knowledge, "the graduate must be able to develop, integrate, and apply knowledge from the foundational sciences (i.e., biomedical, pharmaceutical, social/behavioral/administrative, and clinical sciences) to evaluate the scientific literature, explain drug action, solve therapeutic problems, and advance population health and patient-centered care."[45] In general, pharmacy curricula are designed so that foundational courses in the biomedical and pharmaceutical sciences and communications occur early and address the outcomes within this domain. From this foundation, a transition is made to more clinical and practice-based courses with coverage of the subsequent domains.

The foundational knowledge domain poses significant challenges for pharmacy educators. The report of the 2011-2012 Argus Commission articulated two important challenges.[47] First, the explosion of new knowledge makes it unlikely that some of the content of the foundational disciplines generally perceived as "pre-pharmacy" can be acquired in the traditional pre-pharmacy curriculum, prior to matriculation into pharmacy school. Second, there is the challenge of curricular overload and fatigue.[47] This raises questions about what is "core" and what pedagogical approaches best enable students to become inquisitive, life-long learners capable of recognizing when their current knowledge base is insufficient to resolve the problems that confront them. As the authors of the report state, "the answers to these challenges have broad implications for our admissions policies, our influence on pre-professional education at all of our feeder schools, our assessment methodology, and the extent to which foundational knowledge is incorporated into the professional curriculum."[47]

Changes in higher education, pharmacy practice, and health care continue to drive the need to evaluate the pre-professional curriculum. Colleges and schools of pharmacy should consider adopting a more consistent

pre-professional curriculum on a national level. “This pre-professional curriculum should be multi-dimensional, based on needs for future practice, and revised over time.”[48]

Best Practices of Assessment

Preadmission criteria. Grade point average, composite Pharmacy College Admission Test (PCAT) score, California Critical Thinking Skills Test (CCTST) score, the Health Reasoning test (HSRT), type of school where organic chemistry was completed; age; advanced courses taken in chemistry, biology, and math; and attainment of a BS, BA, or MS degree are all often used as preadmission criteria and as a preliminary indication of a candidate’s level of preparation in the foundational knowledge domain. It has been found that the composite PCAT score is the strongest predictor of success and failure on the NAPLEX.[49] However, the combined predictive ability of PCAT and CCTST scores, pre-pharmacy average (PPA), and age was relatively low. Thus, a full review of each candidate's application is justified.[49] It is also worth noting that having no unsatisfactory grades in the pre-pharmacy program has been identified as significant predictor of success.[50]

Student portfolios. Qualitative data can be reported and used successfully to assess the foundational knowledge domain. Representative examples of student work could be presented from early, middle, and later portions of a course or curriculum. Alternatively, representative answers to reflective questions can be used to illustrate common strengths and weaknesses.[51] When used properly, student portfolios can be one qualitative methods of assessing foundational knowledge. However, it has been suggested that although most colleges and schools of pharmacy have a portfolio system in place, few are using them to fulfill accreditation requirements. Colleges and schools need to carefully examine the intended purpose of their portfolio system and follow-through with implementation and maintenance of a system that meets their goals.[52]

OSCE/mile marker examinations. It has been found that the addition of an OSCE to written examinations can provide a more comprehensive assessment of the problem-based learning experience.[53]

However, it has also been found that although there is wide interest in using OSCEs within pharmacy education, few colleges and schools of pharmacy conduct OSCEs in an optimal manner (e.g., with medical mannequins and/or standardized patients), and most do not adhere to best practices in OSCE construction and administration.[54] Closely related to the OSCE, are mile marker and gateway examinations. The mile marker, or benchmark, examinations are annual comprehensive assessments to evaluate student learning and retention at each level of the didactic portion of the curriculum.[55] Gateway examinations assess only senior level students' readiness for the advanced pharmacy practice experiences.[56]

Pharmacy Curriculum Outcomes Assessment (PCOA). The PCOA is a standardized examination for assessing student content knowledge and may be used for assessing academic progress of pharmacy students if administered in multiple years. The PCOA blueprint has followed Appendix B of the (ACPE Standards 2007).[45] Although no other national benchmarking tool is available, the PCOA has only been adopted by about one-third of colleges and schools of pharmacy. Of these colleges and schools of pharmacy using the PCOA, most administer it solely to third year students. The PCOA can be used to measure individual student performance as well as for review of the curriculum. In one study, a comparison of subtopic results helped to identify areas of strengths and weaknesses of the curriculum. It was concluded in the same study that the PCOA provides useful comparative data that can facilitate individual student assessment as well as programmatic evaluation.[57] In a second study of PCOA use, a lack of correlation was found to exist between what students perceive they know and what they actually know in the areas of pharmaceutical science; social, behavioral, and administrative science; and clinical science.[58] To ensure that PCOA scores are an accurate reflection of student knowledge, incentivizing and/or filtering for low motivation-effort among pharmacy students should be considered fundamental best practice when the PCOA is administered as a low-stakes test.[63,64]

North American Pharmacist Licensure Examination (NAPLEX). Since 2004, passing the NAPLEX has been a requirement for earning initial pharmacy licensure in all 50 United States.[59] The first-time pass rate data published annually on the National Association of Boards of Pharmacy (NABP) includes all candidates who reported graduating from one of the reported schools/colleges of pharmacy and took the exam within the same year. In a 2012 study, it was concluded that students requiring remediation for deficient course grades had a lower pass rate on the NAPLEX compared with those who did not require remediation.[60]

Conclusion

CAPE Outcome Domain One states the need for pharmacy students to develop and apply knowledge from the foundational sciences. Assessing a student's ability to meet this outcome begins with careful assessment at time of admission and continues throughout the pharmacy program. Multiple strategies are available to allow for continuous assessment of student progress such that remediation, if necessary, can be completed prior to graduation and administration of the licensing exam.

CAPE Domain Two: Essential Skills for Pharmacy Practice

Eric Boyce, Lanae Fox, and Fred Doloresco

CAPE Domain 2 encompasses the essential skills necessary for practice and care. This domain includes four subdomains: patient-centered care, medication use systems management, health and wellness, and population-based care. These subdomains cover a wide variety of knowledge, skills and behaviors that would be impossible to assess with a single method or tool. In this section, each subdomain will be addressed individually using a menu approach of assessment methods. These methods are meant to be adapted to each institution, recognizing that not all programs have the same resources available to conduct every activity. This section will also highlight newly emphasized topics within the domain including interprofessional teams and transitions of care.

Pedagogical Considerations

The general pedagogical considerations in the development and assessment of abilities related to the essential skills for practice and care are based on an integrated, progressive approach. The development of these abilities will likely begin in didactic sessions, include practice and simulations, and then be developed to a functional level in experiential pharmacy practice experiences (mostly APPEs but some potentially in IPPEs as well). Therefore, the assessment of these abilities can include formative and summative assessments and should focus mostly on skill and affective domains, but may have components related to the assessment of content knowledge. In general, aggregated data from IPPE and APPE preceptors, OSCEs or OSCE-like activities, comprehensive knowledge and skills assessments may be very useful in providing performance-based/direct assessment data. Self-assessments and surveys may be very useful in providing perception-based/indirect assessment data. However, other assessment methods may also be very useful in specific subdomains.

Best Practices in Assessment

2.1 Patient-centered care (Caregiver). The first subdomain indicates that pharmacy students should provide patient-centered care as the medication expert. This includes training to collect and interpret evidence, prioritize, formulate assessments and recommendations, implement, monitor and adjust plans, and document activities.

While there is not a specific tool to assess patient centered care and all the knowledge, skills and attitudes associated with it, there are some best practices for how to develop and administer the various assessments that are needed to show competence in this area. Ideally, students should have multiple opportunities to practice in these areas and be assessed using multiple methods throughout the entirety of the pharmacy curriculum. Regardless of the assessment method chosen, the following areas should be included[61]:

- Explicit competency statements/outcomes for the activity
- Clear explanation of the desired level of performance
- Use of both formative and summative feedback
- Self-assessment by the learner
- Regular review and revision of the activity as it relates to the outcomes desired

Examples of how these practices have been used in pharmacy education are varied. Traditionally, indirect measures of performance such as multiple choice exams, surveys of students readiness for rotations or pre/post surveys of knowledge gained from an activity have been utilized.[26,55] However, with the introduction of the CAPE Outcomes and the proposed 2016 ACPE Standards moving more towards competency based outcomes, there is a need to develop assessment methods that involve more opportunities for direct observation of these skills.[62]

2.2 Medication use systems management (Manager). Domain 2.2 focuses on the role of the pharmacist as manager of multiple systems including management of the medication use system, technology and information systems, continuous quality improvement systems, physical resources, human resources, and financial resources. Additionally, the domain states that pharmacists must be able to apply best practices,

guidelines, and standards to improve safety and effectiveness. Methods for teaching these topics is likely to be varied and assessment may include equal variation.

Assessment of student learning in human and financial resources management includes preparation of a business plan and participation in a business plan competition[63] while others describe only business plan development focused on implementation of a new clinical pharmacy service.[64] Attempts to assess students' understanding drug use management tools include participation in mock pharmacy and therapeutics committees.[65]

Examples of elective courses which seek to teach leadership have used tools such as surveys,[66] reflections and portfolios,[67] and a variety of methods including poster presentations, guided writing, travel to conferences, reflections, and summative evaluations[68] to assess the effectiveness of these courses.

Assessments of pharmacy-specific informatics courses are not available at the time of writing; however, an examination of multidisciplinary informatics course included assessments of student comfort with informatics topics, membership in informatics-focused organizations (a surrogate for interest in this career path), and performance against course expectations.[69]

2.3. Health and wellness (Promoter) Program learning outcomes and the development of abilities in health and wellness promotion are likely to have some variability among colleges and schools of pharmacy. The development of those abilities will likely be mostly through experiential or service learning courses, following some introductory didactic course material. As a result, the assessment activities selected by each college and school of pharmacy to assess health and wellness promotion will be variable and should target each program's specific learning outcomes and course activities.

The assessment of health and wellness promotion abilities is based on two major components: assessment of program-wide impact of health and wellness promotion activities provided in student-staffed events and assessment of individual (or average) student participation and abilities in health and wellness promotion. The types of assessment data collected to assess the program-wide impact include number of events, number of patients served overall and per event, number of screenings or immunizations or other services provided, number of students participating overall and per event, and outcomes associated with the specific programs provided (savings in Medicare Part D plan selection, number of abnormal readings, patient satisfaction, etc.). Other program-wide evaluations include curricular mapping and the assessment of preceptor and site qualifications and quality. The assessment of student abilities in health and wellness promotion is not as well described, but methods can include the number (i.e. mean and range) of events/hours by students, evaluations of reflections on provision of health and wellness promotion services, evaluations of student products (pamphlets, etc.), evaluations of students by preceptors at events, progress testing on knowledge of health and wellness promotion, OSCE/OSCE-like station(s), and self-assessment or completion of surveys (AACP Curriculum Graduating Student and Alumni surveys, others). Although different terms are used, these assessments appear very similar to those provided in a tool kit provided through the Association for Prevention Teaching and Research.[70] Interprofessional abilities demonstrated during wellness and health promotion can also be assessed within this subdomain through the use of the Interprofessional Team Functioning Survey or the Interprofessional Collaborative Competencies Attainment Survey.[71,72]

2.4. Population-based care (Provider) Program learning outcomes for providing population-based care are likely to be general and fairly similar among colleges and schools of pharmacy. The development of those abilities is expected to be similar in didactic courses, but there is likely to be considerable variability, even within each program, in which types of population-based care activities the students will be able to participate in during IPPEs and APPEs. As a result, the assessment activities selected by each college and school of

pharmacy to assess health and wellness promotion will likely have similar components, but should also allow for assessment of activities that are not uniform.

Population-based care activities are likely to include the following and other activities: formulary management, drug utilization review, medication reconciliation, antimicrobial stewardship, clinical pathway development, pharmacy benefit management, clinical/critical pathways, adverse drug reaction monitoring, and numerous other services. There also may be overlap in abilities development and assessment with the medication systems use management subdomain and the health and wellness promotion subdomain.

The assessment of student abilities in population-based care includes knowledge based assessments (pharmacoeconomics, formulary management, etc.), evaluation of projects or papers on population-based care (drug monographs, clinical pathways, utilization reviews, service proposals or evaluations), preceptor evaluations during population-based care APPEs and IPPEs, and self-assessment and through the AACP Graduating Student and Alumni Surveys. Program-based assessments include curricular mapping and evaluations of preceptor and site numbers, qualifications, and quality for population-based care experiences.

CAPE Domain Three: Approach to Practice and Care

Daphne Bernard, Leanne Coyne, William Ofstad, and Deanna McEwen

The proposed 2016 ACPE Standards[45] state in Standard 3 (Approach to Practice and Care), "the program must impart to the graduate the knowledge, skills, abilities, behaviors and attitudes necessary to solve problems; educate, advocate and collaborate, working with a broad range of people; recognize social determinants of health; and effectively communicate verbally and nonverbally." Standard 3 was adapted from CAPE Domain 3: The Approach to Practice and Care. The manner in which pharmacy practitioners are acclimated to ensuring optimal patient outcomes is addressed within this domain. The domain encompasses those key elements of practice that address the efforts of health practitioners to work actively to ensure adequate health outcomes.

Evaluating competency in each of these unique sub-domains is essential to build a well-rounded pharmacist practitioner, and it requires a validated method that takes into consideration the uniqueness of the training institution. Additionally, the outcomes in this domain are considered a higher level of learning and, in accordance with Fink's taxonomy of significant learning, require integration, caring, and the human dimension of learning.[16] (See also "Understanding Levels of Taxonomy" in Part I above.) A key benefit of this evaluation model is the examination of the training's impact beyond the classroom, which aligns closely with the outcomes proposed by CAPE in Domain 3 and helps to demonstrate meaningful change.

Pedagogical Considerations

Considering the manner in which the instruction in approach to practice supports retention of knowledge, skills, abilities, and attitudes, and progression of students is essential. Training on the proper approach to practice ensures that students know "how to" apply professional knowledge and skills to take provide optimal care.

A broad array of teaching strategies may be used to guide students toward the mastery of the approach to practice and care. Active learning is defined as any instructional method that engages students in the learning process.[73] It is student-focused and is associated with the higher levels of Bloom's taxonomy.[16,74] There are a variety of different active learning techniques that encourage learning in various elements of the standard. For example, Problem-Based Learning (PBL) and Team-Based Learning (TBL) stimulate problem solving (3.1) and encourage the development of communication skills (3.6). Learning by teaching is a form of active learning that allows students to conduct their own research and then teach what they have learned to others, thus improving their ability to educate an audience (3.2). Service learning involves students offering a service and then reflecting on their experiences.[75] This encourages students to become involved in patient advocacy (3.3), and also to practice educating (3.2) and communicating (3.6) with patients. This pedagogy also affords students the opportunity for interprofessional collaboration experiences (3.4). Simulations are used to attempt to replicate situations that may occur in practice. Through simulations, students are able to improve their skills in several areas that are crucial to approach to practice and care, such as problem solving (3.1), decision making, and collaboration (3.4) with others.[76]

Intentionally structured courses and experiences in a PharmD curriculum can create opportunities for students to synthesize what they've learned in other courses and focus more on how they pull the pieces together. A capstone course can be designed to allow students to engage in problem and case based learning. The evaluation of students in these courses can be focused on how they go about solving the problem or how they approach the case. They serve as a place to observe how and if students are making the transition from a habit of mind of being a student to a habit of mind being a pharmacy practitioner.

A more longitudinal model in contrast to the capstone concept is utilized by medical schools where they require an Essentials of Clinical Medicine course that parallels the other courses and experiences in the

curriculum.[77,78] By adapting the Essentials of Clinical Medicine concept to PharmD programs can offer a solution to many barriers that schools experience when attempting to teach and assess in the Approach to Practice Domain. A structure like this mandates that knowledge and skills acquisition be integrated and run simultaneously across the curriculum. Using the variety of pedagogical approaches shared in this section within this setting can challenge students to put the pieces together.

Best Practices in Assessment

It is very important to take into account the levels of a learning taxonomy in the evaluation of CAPE Domain 3 Outcomes. Application of this taxonomy within the assessment of these learning experiences offers the institution some insight into how the student is approaching pharmacy practice.

The following sub-sections offer examples of best practices in the assessment of CAPE Domain 3. These evaluation tools should take into consideration the uniqueness of the pharmacy program and can serve as a valuable means of assessing both course-level and program-level outcomes. Note that the assessment strategies offered below are not limited to one specific subdomain (e.g. 3.1 Problem Solving, 3.2 Educator) but rather may be applied as appropriate across the entire CAPE Domain 3.

OSCE. The OSCE has been extensively utilized in medical education, and many pharmacy programs have incorporated OSCEs as well. The major advantage of OSCEs is the ability to assess key elements of CAPE Domain 3 such as communication, problem solving, team interaction, as well as ethical and professional judgment. These areas all fall under Domain 3, Approach to Practice and Care, and are vital to pharmacy practice. Areas unique to the program's mission such as health disparities, health policy, emergency preparedness, etc., can be incorporated and assessed more effectively and efficiently through a well-designed OSCE as compared to other testing methods such as multiple choice examinations. Thus, the OSCE can serve as a valuable performance-based tool for assessing approach to practice.

Case-based approach. The case-based approach to teaching and learning is widely utilized in pharmacy education. Cases enable learning to take place through the solving of realistic problems that typically require unique approaches to practice with the student demonstrating his/her communication, collaboration, and inclusion ability to reach a solution. Cases encompass a myriad of circumstances and unique interests and assess students' written or verbal performance in a meaningful way.

Clinical performance ratings. Performance appraisals during and after experiential courses can be conducted via the use of rotation evaluations. Using this tool, preceptors are able to provide student performance ratings on areas related to knowledge, skills, abilities and attitudes, and assess what a trainee does in his/her routine behavior. Such feedback informs the pharmacy student as to whether or not the care provided meets the standards of practice using the proper approach.

Survey ratings. Student feedback on progress meeting ability-based learning objectives including those related to Approach to Practice can also be gathered by survey. Course evaluations, the AACP Graduating Student Survey and other valid and reliable instruments available through PEAAS can offer indirect assessment of achievement of outcomes and overall perceptions of curriculum quality.

Student portfolio. Student portfolios are ideal for documentation of learning experiences and for evaluation of performance. Standard 10 of 2016 ACPE Draft Guidelines states that portfolios can be used as a tool for students to document curricular outcome achievement and measure their professional growth and development.

Examples of Portfolio Documentation for specific Domain 3 Sub-Domains are as follows:

1. Problem solving
   SOAP Notes, Adverse Drug Reaction Reports, and Drug Interaction Reports
2. Education
   Health Education Presentations, Brochures, and Health Education Handouts

3. Patient advocacy
   SOAP Notes, Reflective Narratives, Congressional Letters, and Health Policies
4. Interprofessional collaboration
   Group Presentations and Reflective Narratives
5. Cultural sensitivity
   SOAP Notes and Community Service Activities
6. Communication
7. SOAP Notes, Health Education Presentations, and Reflective Narratives

Conclusion

As noted during the October 2013 Institute of Medicine's Global Forum on Innovation in Health Professional Education workshop, pharmacy and other health education programs must address "challenges, opportunities, and innovations in assessment across the education-to-practitioner continuum."[79] Therefore, pharmacy programs must keenly focus on acclimating future pharmacists in the proper way to practice the profession as problem solvers, educators, advocates, collaborators, includers, and communicators. By utilizing effective assessment methods that address CAPE Outcomes Domain 3, programs will be better equipped to prepare new pharmacy practitioners who can provide optimal care.

CAPE Domain: Personal and Professional Development

Alicia S. Bouldin and Katrina Mintz

Pedagogical Considerations

The learning outcomes reflected in this domain are among those shared with the other health professions and, it could be argued, with professions in general. Taken together, the subdomains within Domain 4 describe a learner with initiative and creativity, who engages in reflective practice, is committed to others, and exemplifies effective leadership skills along with a willingness to improve and adapt. While developing such abilities within a curriculum is essential to prepare students for membership on a health care team and within the evolving profession of pharmacy, the broad scope and affective nature of the Domain 4 outcomes (self-awareness, leadership, innovation and entrepreneurship, and professionalism) present challenges for effective instruction and assessment.

Best Practices in Assessment

4.1 Self-awareness. Self-awareness, or attending to one's innate resources, develops along with learner maturity. Student pharmacists enter the program with varying levels of ability in this area; and the faculty, curriculum, and student services must combine to foster learner growth. Immersion and step-wise development can aid in creating "habits of mind" and reflective practice. Learners may need to have these habits modeled in didactic and experiential environments in order for successful adoption to occur.

Pharmacy students are expected to organize competent learning strategies and to dedicate adequate time to study and fully master a wide range of topics and outcomes. Merely possessing knowledge of preferred learning strategies will not lead to better academic performance. The Center for Advancement of Pharmacy Education Outcomes remark that students should be self-aware; reflect on knowledge, skills, abilities, and motivation; and utilize metacognition as a tool for learning. Student's self-efficacy influences perceptions,

motivation and performance and allows learners to develop and use learning strategies effectively. Self-efficacy refers to beliefs about one's capabilities to learn or perform behaviors at designated level.[80] Once established, self-efficacy, unlike self-confidence, is generalizable to new contexts and experiences. A learner's sense of his/her abilities influence how much effort the s/he expends and how long s/he will persist when faced with difficult decisions or tasks. This skill is learned through active practice and immediate feedback and reflection. Learners obtain information to assess their self-efficacy from their performances, vicarious experiences, and persuasions they receive from others. Because students' self-efficacy develops throughout life, pharmacy educators must provide opportunities to practice self-evaluation and goal setting while facilitating access to resources necessary for learning. Self-efficacy, self-regulation and cognitive strategy are positively inter-correlated to predict academic achievement. Employing interprofessional educational contexts along with active and social learning instructional strategies will have a positive impact on the development of student self-efficacy.

To meet the expectations of today's healthcare environment, the student pharmacist must be a responsible owner and manager of his or her learning processes. This habit of managing and monitoring one's own learning forms the foundation for self-directed learning (SDL). Self-directed learners with high levels of self-efficacy are highly motivated students. They take initiative and learn more than passive learners who wait for instructors to deliver content. An important benefit of self-direction in pharmacy learners is the ability to address the exponential growth in knowledge in the field. A single curriculum cannot teach everything pharmacists need to know to be effective practitioners. Obsolescence of knowledge can best be addressed by learners who understand that they must continue to study for the entirety of their professional careers, to set professional learning goals, to map out pathways to those goals, and to secure resources needed to reach those goals through self-initiated processes. Self-directed learning requires both student and instructor to understand the value of empowering learners to take increased responsibility for decisions related to learning. The pathway

to self-directed learning often begins with confusion and frustration; but given the appropriate support, it ends with confidence and skills that will continue to develop throughout the continuing education of the professional pharmacist. For the student, this requires an analysis of learning strengths and strategies and development of the ability to improve goal setting and achievement. For the instructor, SDL involves diagnosis of learning needs, development of a learning plan, engaging learning activities, and varied assessment strategies.

4.2 Leadership. As the healthcare professions change, the role of the pharmacist as a leader of the healthcare team becomes more important. The fact that there is no universal definition of leadership may be very fitting for a time when innovations and interprofessional developments are changing the landscape of healthcare. No globally accepted definition of leadership exists because leadership is studied in multiple ways that require different perspectives. This complicates the notion of "teaching" leadership skills. There are, however, key elements of a definition of leadership: influence, organizational objectives, people- and leader-follower relationships. Leaders hold three roles: interpersonal, informational, and decisional.[81] Certain leadership traits, qualities and ethical dispositions expected of professional pharmacy students are described in Domain 4. Various tools exist to assess leadership aptitude, skills and characteristics. The Leadership Special Interest Group (SIG) produced a CAPE paper that details how pharmacy educators can develop curricular activities and assess these activities.[82]

4.3 Innovation and Entrepreneurship. The pharmacy profession is changing to meet the demands of a dynamic health care environment. Beyond training that enables creative solutions, student pharmacists need opportunities to develop confidence in their ideas as well as a willingness to accept or initiate change. The CAPE Outcomes mention an entrepreneurial attitude, a descriptor which can be broadly interpreted. We typically think of that term as implying a financial investment, but by definition it includes openness to risk. In the case of pharmacy, a valuable attitude for graduates is a willingness to invest energy and time to create

innovative solutions for patients and organizations and to attempt constant improvements in quality. Placing student pharmacists in progressive experiential environments, where the outcomes of innovation may be most visible, can contribute toward inculcation of this attitude.

4.4 Professionalism. It is often difficult to judge a student's professional values, dispositions and attitudes ("professionalism") as described in Domain 4 because we view these elements as subjective and personal. The values, attitudes and behaviors expected of a professional pharmacist are elements of the affective, rather than purely the cognitive domain and may be assessed with consideration of Krathwohl's hierarchy of the affective domain (receiving, responding, valuing, organizing and internalizing).[14] Pharmacy curricula could benefit from instructional strategies and expectations that promote the acquisition of values, attitudes, and behaviors that can be evaluated in a manner that measures specific attributes, such as objective, reflective, interpretative, decisional (ORID) questioning methods. Pharmacy students need a clearly articulated set of expectations for professional behaviors and attitudes, as well as frequent opportunity to exercise and practice the expected behavior, as longitudinal assessments are most useful. Professionalism expectations are measured through qualitative measures such as focus group interviews, meaning mapping, OSCEs or other observations, reflective journaling, video simulations and games, and quantitative measures such as self-reporting questionnaires, pre and post-tests, and attitude scales, importance-performance analysis ratings and Q Tests.[83]

Much of the practical implementation of assessment in this domain may be through self-report. In addition, many of these affective outcomes are multidimensional and even subjective. As such, the validity of certain measures may be difficult to confirm. An observer may be able to tell when the learner "has it," but that "it" is difficult to quantify. These measurement challenges are considerable indeed, but do not prevent learners and programs from making good faith efforts to evaluate development, even if those evaluations are imperfect.

Conclusion

The broad nature of these Domain 4 outcomes would seem to prohibit a single "snapshot" evaluation and require regular evaluation to track the continuum of development and to keep these outcomes near top of mind, so that they become routine or second nature. These factors are important for both the learners and the program, and thus both support and demand integration throughout the curriculum. Just as the pedagogical considerations for these outcomes include immersion and step-wise practice, so should assessment.

In an affective domain, such as this one, there may be challenges with assessment as "measurement." But we should not discount the value of assessment as "learning." Choose tools that will support student learning through their use. Whether the tools are documented as having high validity or not, a tool (such as guided self-assessment) may be valuable because of its contribution to the student pharmacists' growth and development.

Appendices

Appendix A

From the Selecting Appropriate Assessment Tool Section in Part I, this table is a simple representation of suggested types of assessment tools to utilize with the CAPE Domains. Specific tools are shared in Part II of the document and are available in PEAAS.

CAPE Domain	**Suggested Tools**
Foundational Knowledge	Multiple choice questions, short answer (includes fill-in-the-blank and true/false), extended matching, essay questions, oral exams
Essential of Practice and Care	OSCE, simulated/standardized patient, preceptor observations in clinical setting (either live or recorded), log books, assessment by patients
Approaches to Practice and Care	OSCEs, Portfolios, interviews (one-on-one or focus groups), surveys, peer evaluation, role playing
Personal and Professional Development	Portfolios, surveys that measure self-efficacy, interviews and focus groups, rubrics, peer evaluations, attendance and enrollment

Appendix B

Examples of the Assessment Technologies and Vendors

Type of technology and examples[a]	Brief description	Advantages	Disadvantages	Adoption considerations	Non-technology alternative
			Programmatic Assessment		
Comprehensive assessment management solutions Examples: AAMS, Taskstream, TK20, WEAVEonline	Assist with data aggregation for all aspects of programmatic and curricular outcome assessments	-Serve as a central repository for different types of stakeholders -Help meet programmatic and institutional reporting and accreditation needs -Provide a 'One stop shop' for most programmatic assessment	-Some products are very expensive -Some require extensive training	-Consider institutional availability and needs -Products may differ in terms of tool availability and flexibility -Some solutions are cloud-based - consider security and ability to store sensitive information -Integration with existing institution technologies	-Manual aggregation of data from various sources for reporting -Spreadsheets
Survey tools Examples: Qualtrics, SurveyMonkey	-Web-based surveys	-Skip-logic survey design allows for survey customization -Broader reach to stakeholders -Built-in reporting functionality -Low start-up costs	-Emails might be ignored or filtered to spam folders	-Comparison of features between products -Customer and technology support across vendors -Flexibility of account types	-Paper surveys with data analysis via scantron -Spreadsheets or databases

			Curricular Outcome Assessment		
Audience response systems (or "clickers"): Examples: Poll Everywhere, Top Hat, TurningTechnologies	-Formative assessment tool that polls the audience	-Allow to engage every student -Provides instant feedback to the students and instructors that facilitates learning and has been tied to improving learning outcomes	-Often associated with additional costs to the students	-Type of transmission used by the software (i.e online, Wi-Fi, RF) -Integration with LMS -Reporting options -Flexibility of question design	-Question and answer -Think-pair-share techniques
E-Portfolios: Digication, E*Value, LiveText, TaskStream, RxPortfolio	-Web-based solutions that allow users to aggregate documentation of achievement of goals and outcomes and examples of work	-Some products allow for alignments of artifacts within the portfolio with learning outcomes and personal goals -Users can share portfolios with potential employers or others outside their organization -Allow for storage of various types media, including videos	-Integration with other assessment technologies -Student training and dependence on students to update and maintain	-Some products simply offer an online file cabinet without ability to align with learning outcomes	-Traditional portfolio binders
E-rubrics Examples:	-Web-based rubrics allow for	-Aggregation of data	-May be difficult to complete on	-Solutions that provide e-rubric and	-Paper rubrics with manual

Blackboard, ExamSoft, E-Value, LiveText, RxPreceptor	increased access to faculty, preceptor and students -Some products feature the ability to map rubrics to educational outcomes -These have particular utility in assessment of attitudes and skills in the affective and psychomotor domains	-Ease of access for off-site instructors and preceptors -Ability to correlate self-, peer-, and instructor assessment	mobile devices or during live presentations/ activities -Challenges may exist when evaluating group work and generating individual evaluations	e-examinations have the potential to provide the most comprehensive outcome achievement documentation -Consider ease of grading on computer and mobile devices and requirements for Wi-Fi	aggregation of data for reporting
E-testing Examples: Blackboard ExamSoft, LiveText, Questionmark	-Exam management systems allow for creation and administration of exams -These are powered by data analytics to provide assessment results, item analysis, and student performance -Some allow for questions to be mapped to	-Efficiency of exam creation with multiple instructors -Question banking which allows for embedded assessments of previous content throughout the curriculum -Ability to map to outcomes, content and levels of learning allows for data aggregation for	-Some products require students to take the exams online which can overwhelm classroom networks -There is an added risk of technology failure which adds anxiety to exam taking for the students and additional planning for the faculty	-Consider the security features of software products to ensure academic integrity -Software products vary in terms of the ability to map to outcomes and content and to report out data that can be used to document achievement of educational outcomes -Accessibility on computers and mobile devices and whether Wi-Fi is needed for exam administration	-Traditional paper and pencil exams can be mapped manually and data can be tracked using spreadsheets or home-grown databases

	various levels of outcomes, content areas, and levels of learning.	individual students and in aggregate within the course and across the curriculum			
Learning management systems (LMS) Examples: Blackboard, Angel, LiveText, Moodle, Canvas, Sakai, Desire2Learn	-Designed to share course content and materials and engage students via discussion boards, wikis, blogs and other tools. -Assessment capabilities include electronic exams and rubrics to assess	-Allows for various forms of formative and summative assessments -Rubrics can be developed and tied to assessments submitted by the students -Many LMS are able to integrate with other software such as electronic testing, scantron, and audience response systems to import assessment data	-These technologies can be expensive and require institutional technology support and integration; however, majority of institutions have adopted an LMS to satisfy the needs of the current digital generation of students	-Integration with other systems to import student user data from Registrar's databases (e.g. Banner) and other assessment software (e.g. ExamSoft, TurningTechnologies)	-Course packs -Paper tests -Paper rubrics

[a] Examples provided are a representative sample of these technologies and not all inclusive; technologies are listed in alphabetical order

LMS = learning management system; RF = radiofrequency

AAMS (AACP, Alexandria, VA and ACPE, Chicago, IL)

Blackboard (Blackboard, Inc, Washington, DC)

Canvas (Instructure, Salt Lake City, UT)

E*Value (Advanced Informatics, Minneapolis, MN)

ExamSoft (ExamSoft Worldwide, Inc., Boca Raton, FL)

Digication (Digication, Providence, RI)

LiveText (LiveText, Inc, La Grange, IL)

Moodle (Moodle Pty Ltd, Western Australia)

Poll Everywhere (Poll Everywhere, San Franscisco, CA)

Qualtrics (Qualtrics, LLC, Provo, UT)

Questionmark (Questionmark, Norwalk, Connecticut, USA)

RxPortfolio, RxPreceptor, RxOutcome (RxInsider, Warwick, RI)

SurveyMonkey (SurveyMonkey, Palo Alto, CA)

Taskstream (Taskstream, NY, NY)

Top Hat (Top Hot Monocle, Toronto, ON, Canada)

TK20 (TK20, Inc, Austin, TX)

Turning Technologies (Turning Technologies, Youngstown, Ohio)

WEAVEonline (Centrieva, LLC, Henrico, VA)

Sakai (Apereo Foundation, Westminster, CO)

Desire2Learn (Desire2Learn, Inc., Kitchener, Ontario, Canada)

Appendix C

CIC Pharmacy Assessment Collaborative

Evolving and shaping assessment practices for excellence in evidence-based pharmacy education.

Purdue University ● The Ohio State University● University of Illinois-Chicago ● University of Iowa ● University of Michigan
University of Minnesota ● University of Nebraska ●University of Wisconsin ● University of Maryland ● Rutgers University

DRAFT Rubric for Assessing a Curriculum Evaluation Plan

July 8, 2014

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			Where element is present in evaluation plan, rate element.				
The curriculum evaluation plan has:	Yes	No		Commendable	Meets Expectations	Needs Improvement	Comments
Background/Introduction							
1. Statement of philosophy and purpose underlying the evaluation plan.							
1a. The statement makes reference to the school's strategic plan as the strategic plan relates to the school's curriculum, or to the school's educational goals.							
2. Basis for outcome criteria against which the curriculum will be evaluated.							

Plan Structure and Components							
3. Detailed outline of parties responsible for collecting data for different components of the curriculum evaluation.							
3a. Assessment Committee							
3b. Curriculum Committee							
3c. Faculty							
3d. Students							
3e. Office of Student Services							
3f. Office of Alumni Relations							
3g. Office of Experiential Education							
4. Detailed timeline of recurring assessment activities related to evaluation of the curriculum							
4a.When?							
4b. What?							
4c. How?							
4d. Who?							
4e. Results reported to whom?							
4f. Results reported when?							
4g. Follow-up plan to assess changes arising from results?							
4h. Logical connections to educational processes are made (e.g. course review)?							
5. Plan to Assess Student Learning Outcomes							
6. Methods, activities and instruments to be used are clearly identified (including direct and indirect measures, balance of objective and performance tests, consideration of usefulness/relevance of information collected)							
6a. Includes direct and indirect measures of student learning							
6b. Includes anticipated costs, including costs of faculty development efforts							
6c. Describes a framework for using assessment information (anticipated analysis, reports, intended audiences, mechanisms for discussion, review and decision making)							

6.e. Plan includes considerations of continuity of assessment over time							
6.e.i. Plan addresses determination of trends							
6.e.ii. Plan addresses assessment at critical junctures, such as pre-post curriculum change							
Mechanisms for Evaluation of Plan							
6d. Includes specific times and methods for evaluation of the assessment plan itself							
6.d.i. Plan evaluates whether or not the assessment process itself is leading to improvements.							
6.d.ii. Plan evaluates whether appropriate constituencies are represented.							
6.d.iii. Plan identifies problems with assessment processes							
6.d.iv. Plan identifies assessment activities in need of modification							
6.d.v. Plan evaluates whether or not information is being made available to the appropriate groups							
From Section III of ACPE 2016 Draft Standards and Key Elements							
7. Plan incorporates knowledge-based assessments (25.1)							
7.a.Formative and summative assessments included							
7.b. Assessments are systematic							
7.c. Assessments are valid and reliable							
8. Plan includes standardized assessments required by ACPE (Appendix 4) that allow for national comparisons/peer comparisons, e.g., AACP surveys (25.2)							
9. Levels of professional competencies that support Educational Outcomes are defined (25.3)							
10. Student readiness to enter advanced pharmacy practice							

experiences (APPEs) is assessed (25.3/26.9)							
11. Student readiness to provide direct patient care in a variety of healthcare settings is assessed (25.3)							
12. Student readiness to contribute as a member of an interprofessional collaborative patient team is assessed (25.3)							
13. Plan addresses use of assessment measures to improve student learning and achieve Educational Outcomes and competencies (25.4)							
14. Plan addresses assessment of contribution of co-curricular activities to the development of desired professional outcomes (26.4)							
15. Plan includes a variety of assessments allowing comparison of educational parity of alternative program pathways to degree completion (if applicable) (26.6)							
16. Plan addresses regular assessment of clinical reasoning skills and retention of knowledge underpinning these skills (26.8)							
17. Plan addresses correlation of admissions criteria to student achievement both while enrolled in program and after entering practice (26.10)							

Appendix D

CAPE Domain: Personal and Professional Development
Table of Assessment Tools

Instrument	Description	Citation of Example Use
Perceived Stress Scale (Cohen)	10-item Survey (self-report), regarding frequency of stressors within the past month	Cole, Stephen R. "Assessment of differential item functioning in the Perceived Stress Scale-10." *Journal of Epidemiology and Community Health* 53.5 (1999): 319.
Oddi Continuing Learning Inventory	24-item Survey (self-report), regarding dimensions of a self-directed continuing learner's personality.	Oddi, LF (2008) "Development and validation of an instrument to identify self-directed continuing learners." Adult Education Quarterly, 36 (2): 97-107.
Behavioral Professionalism Assessment Form		Hammer, DP et al (2000) "Development and testing of an instrument to assess behavioral professionalism of pharmacy students." AJPE, 64: 141-51.
Pharmacy Professionalism Instrument	18-item Survey (self-report), reflecting 6 domains of professionalism	Chisholm, MA et al (2006) "Development of an instrument to measure professionalism." AJPE, 70:85.
Professionalism Assessment Tool (PAT)	33-item Survey (self-report), based on 5 domains of professionalism and 5 levels of competency in each.	Kelley, KA et al (2011) "Cross-validation of an instrument for measuring professionalism behaviors." AJPE, 75 (9): 179.
Motivated Strategies for Learning Questionnaire (MSLQ)	44-item Survey (self-report), including elements of motivation (intrinsic and extrinsic), cognitive and metacognitive strategies, and learning resource management strategies	Pintrich, PR et al (1991) A Manual for the use of the motivated strategies for learning questionnaire (MSLQ). National Center for Research to Improve Post-secondary Teaching and Learning, Ann Arbor, MI.
Self-Directed Learning Readiness Scale	Self-report instrument to measure the complex of attitudes, abilities, and characteristics that comprise readiness to engage in self-directed learning	SDLRS testing includes 58-items with a 5-point scale for responses, ranging from almost always true to almost never true. The test uses 41 positively phrased questions and 17 negatively phrased. Also, the instrument is available in a number of different languages.
Metacognitive Awareness Inventory	52 True/False questions help students focus on their own metacognitive	Schraw, G. & Dennison, R.S. (1994). Assessing metacognitive awareness.

	awareness	Contemporary Educational Psychology, 19, 460-475
Metacognitive Activities Inventory (MCAI)	This inventory may be used as a diagnostic tool to inform the implementation of interventions, as well as to evaluate the effect of changes in instruction.	Cooper, M., Sandi-Urena, S. (2009), Design and Validation of an Instrument to Assess Metacognitive Skillfulness in Chemistry Problem Solving. *Journal of Chemical Education*, (86) 2 p240-245
Coopersmith Self-Esteem Inventory Adult Form (CSEI)	The **Coopersmith Self-Esteem Inventory (CSEI)** measures attitudes toward self in the context of pre-post evaluation, individual diagnosis, or classroom screening	Roberson, T. G. (1986). The Coopersmith Self-Esteem Inventory: A Factor Analytic Study. *Educational* and *Psychological Measurement, 46(1),* 269-273. DOI: 10.1177/0013164486461033.

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