EVALUATION, ASSESSMENT, AND OUTCOMES IN PHARMACY EDUCATION: THE 2007 AACP INSTITUTE

Finding and Using Readily Available Sources of Assessment Data

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This paper provides the rationale for, examples of, and the collection and general uses of currently available, potentially underutilized academic program assessment data. Academic program assessment is essential for program improvement and accreditation, but commonly used assessment methods may not fully meet these needs. General assessment references, pharmacy education literature, and prior experiences were used to identify and discuss sources of potentially underutilized assessment data. Pre-course assessments, graded assignments, examinations, pharmacy experience evaluations, scoring rubrics, portfolios, progress testing, self-assessments, and classroom assessment techniques are potential sources of assessment data. Course evaluations and grades may also be useful. Selection should be based on need, availability, strength, and concerns. Challenges in data management may be best met through a centralized, integrated database. Careful selection of specific embedded and other assessments can be utilized to complete the development of a comprehensive, meaningful, and efficient program assessment plan.

Keywords: embedded assessment, performance, formative, assessment, evaluation

INTRODUCTION

The continued development and maturation of assessment methods has been driven by programmatic and institutional needs to provide data for improvement and more effective decision-making as well as requirements in regional and specialty accreditation standards.[1] The fundamental principles of assessment include the need for ongoing, systematic collection of meaningful data from a variety of sources. The challenge of creating a comprehensive assessment plan can be met by using valuable and efficient sources of meaningful assessment data within academic programs that are not routinely used for academic program assessment purposes. The goals of this paper are to enhance academic program assessment and the ability of faculty members to fulfill their responsibilities in program assessment[2] by providing the rationale for and examples of currently available, potentially underutilized academic program assessment data.

FUNDAMENTAL PRINCIPLES OF ASSESSMENT

Many publications have addressed the fundamental principles of assessment and the development of an assessment plan.[3-12] After determining the goals of the assessment plan and the outcomes to be assessed based on importance and relevance, an environmental scan is needed to determine what is or is not available or in use. It is then important to determine the most appropriate methods for the collection, management, analysis, dissemination, and use of reliable and valid assessment data.[6] A final step would be to assess the assessment program and make needed adjustments.

Assessments need to be fair, meaningful, and important.[13] Academic course and program assessments should be based on course learning objectives and curricular outcomes.[2,4,8,11] An assessment of a specific outcome should include a variety of types of assessment data collected from different sources, including from standardized and locally developed methods.[3,8] The various types of data to be considered include formative and summative; qualitative and quantitative; direct and indirect; and performance-based, perceptual, and demographic. The assessment of student learning should be assessed during the course or the curriculum (formative assessments) as well as at the end of the course or curriculum (summative assessments).[2]

Performance assessments may be in real life or simulated settings. If possible, academic program assessment should include assessment of the 3 major domains of abilities: (1) cognitive domain (knowledge, thinking); (2) psychomotor domain (skills, performing a mental or physical task); and (3) affective domain (attitudes, behaviors,

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emotions, feelings).[14-16] It is also important to consider data classified as input (eg, student demographics, prior performance, etc); environment (eg, curriculum, faculty members members, educational setting, course delivery, etc); and output (eg, curricular outcomes, grades, graduation, licensing examination score, etc).[5] This may seem overwhelming, but a careful evaluation of each assessment method used will provide direction on which types of assessments may be missing.

Finally, the 3 additional major points to be made with respect to assessment data are that (1) aggregated individualized student data are a valuable, rich source of program assessment data; (2) longitudinal data collection and analyses are needed to determine the existence of trends rather than sporadic occurrences; and (3) assessments are by nature inexact.[4,5,9] This second set of assessment principles will also serve as the impetus for considering these potentially underutilized sources of program assessment data through the aggregation of individual student data.

POTENTIAL SOURCES OF ASSESSMENT DATA

Most academic programs have multiple sources of assessment data, many of which are integral components of existing and processes. These potential sources of assessment data can be divided into 3 main categories based on recognition and availability: (1) well recognized and routinely available sources; (2) well recognized but not routinely available sources; [17] and (3) routinely available but not widely recognized sources of assessment data. This third group of assessment data sources includes a number of embedded assessments that are routine components of the curriculum, a course, and/or other program components, mostly involving individual student evaluation or assessment.[4]

There are a number of commonly recognized sources of data that are used in academic program assessment.[18,19] Preadmission and admission data include student demographics, prior educational history and performance, performance on standardized tests, prior employment and volunteer activities, interview scores, etc. Once in the program, assessment data include course grades, cumulative and semester grade point averages, retention and progression, honors and awards, probations and disqualification, time to graduation, etc. Course evaluations, graduating senior surveys, performance on licensing examinations, and alumni surveys are other common sources of program-based assessment data.

A more comprehensive assessment program would include the use of commonly recognized, but less well-used sources of assessment data. Examples include the use of learning and personality assessment instruments, critical thinking tests, ongoing curricular mapping programs, progress testing, focus groups (students, employers, etc), satisfaction and engagement surveys, etc. The offices of institutional research and/or the registrar can also provide reports on aggregate semester and course grade point averages and course grades that may be useful in determining or confirming stress points in the curriculum. These value-added assessments can markedly enhance the assessment program and may result in a more integrated and comprehensive assessment program.

Potentially useful sources of program assessment data that are embedded within the curriculum and courses include, but are not limited to, precourse assessments, graded course assignments, quizzes and examinations, portfolios, scoring rubrics, self-assessment tools, and introductory and advanced pharmacy practice experience grading forms.[4] An institution-wide focus on teaching- and learning-embedded assessments[3] may provide and encourage the use of classroom assessment techniques in addition to midpoint assessments of student abilities through the use of portfolios, reflection, papers, standardized examinations, interviews, etc, and a senior project that integrates the student's general education and discipline-specific abilities.[20] The primary purpose of these assessments is to enhance student learning, but these data are also useful in teaching and academic program assessment. The strengths and concerns of using embedded assessments and classroom assessment techniques[21] are described below.

The final step in the maturation of an academic program assessment plan may well be the full integration of assessment throughout the curriculum or within individual courses, which have been described as assessment-as-learning or assessment for development models. Examples include an institution-wide approach,[22,23] a teacher education program,[3] and a computer science course.[3] The assessment as learning model creates an environment that enables student, faculty members, and program development in a continual manner based on well-defined outcomes and assessments.[22]

The examples provided in this paper were collected from the *American Journal of Pharmaceutical Education*, *Journal of Pharmacy Teaching*, select books and other resources on assessment, anecdotal reports from faculty members at colleges and schools of pharmacy, and personal experiences. This is not intended to be a comprehensive list of assessments, but rather to provide potential methods and stimuli to develop additional assessment methods to meet specific program needs.

PRECOURSE AND POSTCOURSE ASSESSMENTS

Precourse assessments are used by many faculty members to better understand student perceptions, characteristics, and/or abilities at the beginning of a course, to enable student self-assessment, and to begin to focus students on course materials and objectives. Aggregated data from precourse assessments can also provide useful data on the retention of prior learning. For example, a precourse assessment to determine students' knowledge of the specific pharmacologic classification and common adverse effects of prototype drugs at the beginning of the therapeutics course sequence (Table 1) was employed and revealed that students could not consistently name the specific pharmacologic classification and were able to identify only one common adverse effect for the drugs. As a result, faculty members increased efforts to enhance student knowledge of drugs in the pharmacology and the therapeutics courses. Affective and psychomotor domains can also be assessed using precourse or early course assessments. For example, students could be asked to create a SOAP (subjective, objective, assessment, and plan) note on a patient during the first few days of an advanced pharmacy practice experience without guidance from the instructor. The SOAP note could then be reviewed and assessed by the instructor, followed by discussion for improvement and provision of guidelines for writing a SOAP note. In a similar manner, students could be asked to perform a simulated patient counseling session on an introductory or advanced pharmacy practice experience early in the rotation without guidance, followed by an assessment and provision of

Table 1. Linking Selected Curricular Outcomes, Embedded Program Assessments, and potential Uses

Curricular Outcomes	Embedded Assessments	Potential Use
Communication abilities – writing	Writing assignments in select courses across the curriculum. Writing components in quizzes, examinations, portfolios, and/or progress tests. Evaluation of writing skills in advanced pharmacy practice experiences. Self-assessment at select points in the curriculum.	Assess the development of writing skills during the curriculum. Consider and assess revisions in admissions standards, curricular design and delivery, and remediation that pertains to writing skills.
Communication abilities – oral communication	Evaluation of oral communication skills in select courses or portfolios using scoring rubrics. Evaluation of oral communication skills in progress tests and/or advanced pharmacy practice experiences. Self-assessment at select points in the curriculum.	Assess the development of oral communication skills during the curriculum. Consider and assess revisions in admissions standards, curricular design and delivery, and remediation that pertains to oral communication skills.
Provide pharmaceutical care	Pre- and post-course assessments on drug and therapeutics knowledge. Examination questions covering prerequisite or prior material on drug and therapeutics knowledge. Documentation of care plans in portfolios. Evaluation of care plan development in progress tests and/or advanced pharmacy practice experiences. Self-assessment at select points in the curriculum. Classroom assessment techniques to assess knowledge and its application in various courses.	Assess the retention of knowledge. Assess the development of abilities within a course. Consider and assess revisions curricular design and delivery to enhance deep learning.

guidelines. Results from each of these types of assessments could be aggregated to determine students' strengths and weaknesses in performing these tasks and the need for curricular revision.

Experts have also promoted the use of precourse and post course (or pre-learning and post-learning) tests as a means of assessing learning within a course.[2,8] These tests are generally carefully aligned with the course learning objectives. The postcourse tests are generally very similar to the precourse tests. This type of assessment has value, but it may not fully assess long-term retention and application. Precourse test results may be low and postcourse test results may be elevated due to training or question-answer recall.[8] There are numerous examples in pharmacy education, including the use of precourse and postcourse tests to determine the knowledge development of medication error reduction skills,[24] effectiveness of cooperative learning groups on learning in a pharmaceutics course,[25] and the overall learning seen in an introductory pharmaceutical care course and advanced pharmacy practice experiences (Table 1).[26,27] Precourse and postcourse surveys have also been used to assess service learning and experiential courses.[28,29] A unique postcourse method involved the assessment of retained learning for management of thyroid disease by administration of a case study 3 months following the pharmacotherapy course on thyroid diseases.[30] These data were used in revising the pharmacotherapy course.

Precourse and postcourse assessment data can be very useful for program assessment, but some potential problems may be encountered. First, in designing precourse assessments it may be best to involve faculty members from those prerequisite courses in order to enhance validity. Second, students should understand the importance of performing as well as they can. Precourse and postcourse assessments are generally not graded, so other incentives or rationale may need to be provided. Precourse and postcourse assessments can be revised, if needed, to enhance their usefulness for program assessment purposes, but such revisions should not interfere with the major purposes of those assessments.

GRADED COURSE ASSIGNMENTS

Graded course assignments, such as projects and papers, are commonly used to enhance and evaluate student abilities, but may also prove useful in program assessment if those components are consistent with targeted or important curricular outcomes.[4] If writing skills were a targeted area for program assessment, then any writing-based, graded course assignments could provide useful assessment data, including formative data to follow the development of the skill across the curriculum (Table 1). Students

could be required to reflect on a service-learning activity in the first year, respond to a drug information question in the second and fourth years, and write a paper on cultural competence in the third year as graded course exercises. A scoring rubric should be created to standardize the evaluation and collection of data on writing skills across the curriculum. Each instructor would then assign and grade the papers, including the extra step of forwarding the writing skills component grades from the writing skills scoring rubric to the office responsible for collecting program assessment data.

Other graded course activities have also been used for academic program assessment. The ability of pharmacy students to manually measure blood pressure was assessed at the end of a physical evaluation course, resulting in the findings that student had not developed expertise and would need additional psychomotor development in subsequent course work.[31] In a social work program, faculty members revised the course work to enhance the development of abilities when students did not meet the desired level of performance during course testing on statistics.[3] A business school developed a capstone course for conducting assessments of program-specific and general abilities (interaction, communication, etc.).[3]

The strengths of using data from graded course assessments for program assessment purposes is based on the provision of formative data, incentives for students to perform well, and focus on targeted curricular outcomes. Take-home graded assignments and graded group assignments may be less useful or reliable. Overall, however, graded course assignments can be very valuable sources of program assessment data.

EXAMINATIONS AND QUIZZES

Examinations and quizzes can be useful sources of program assessment data,[4] with some limitations. Student performance on content-based examinations and quizzes may not be useful for an assessment of deep learning due to the methods many students use in preparing for these evaluations, but problem-solving or critical thinking-based examinations or quizzes may be useful for program assessment. Additionally, examinations and quizzes may include assessments of prior knowledge or skill, such as writing (Table 1). Examples include the testing of cardiovascular drug knowledge in a course on therapeutics where that drug knowledge was expected on a prior examination or a prerequisite course (Table 1). These types of questions should be based on major concepts or highly important specifics, rather than on minor details. The results of this assessment could be used for a number of purposes including an assessment of course sequencing, course design, need for remediation, and/or need for reinforcement of prior material.

The major strengths of this approach are the focus on program assessment targets, student performance, and the potential use of psychometrics to evaluate the reliability of the questions. Student performance may be reliable, but may be low depending upon the length of time since the material was covered, student expectations, and examination fatigue.

PHARMACY PRACTICE EXPERIENCE EVALUATIONS AND ACTIVITIES

The evaluation of student performance in introductory and advanced pharmacy practice experiences occurs in essentially every pharmacy program as a means of providing formative and summative information to students. These evaluation instruments are designed by faculty members and used by preceptors as a means to evaluate students' abilities to meet course and curricular competencies. Preceptors should be encouraged to provide formative assessments of students during the pharmacy practice experiences and summative assessments at the end of the experience. The summative assessments become the basis for the student's grade in the course and can also be used to guide their development in future experiences.

The evaluations from advanced pharmacy practice experiences[32] may be among the best readily available sources of program assessment data on student abilities to meet curricular outcomes since these evaluations (1) evaluate performance in real-life situations; (2) are performed by "experts"; (3) are conducted at the end of the program; and (4) generally cover important cognitive, psychomotor, and affective domains. However, these evaluations must be based on an adequate number of observations by preceptors.[6] The items on these evaluation forms should be strongly aligned with course learning objectives and curricular outcomes and therefore easily mapped to a curricular outcomes domain. These evaluations should be collected in a centralized location and in an electronic format. The aggregated student evaluations are analyzed to determine overall student performance by domain (Table 1).

There are additional assessment data sources within pharmacy practice experiences. Many doctor of pharmacy programs require students to document clinical interventions during advanced pharmacy practice experiences.[32,33] Analyses of these data will enable faculty members to evaluate the types of interventions, determine the quality of those interventions, and provide additional documentation of student abilities.[34] In another example, the assessment of reflective logs written during a geriatric advanced pharmacy practice experience were used to assess and enhance the experience.[35] Additionally, an evaluation of drug information questions answered during community advanced pharmacy practice experiences were evaluated to determine the types of questions asked and the resources students used to answer those questions.[36] These data were used to enhance curricular development of the needed skills earlier in the curriculum and to determine the availability of the resources needed to answer the questions posed by patients and health care professionals.

Reliability and validity are the major concerns about the use of these data including lack of consistency of grading among preceptors, lack of discrimination, etc. Some of these issues can be addressed through preceptor training and student education. The use of a competency-based assessment process may also enhance these evaluations and their use in program assessment.[37] The pharmacy colleges and schools in Florida have developed and implemented the System of Universal Clinical Competency Evaluation in the Sunshine State (SUCCESS) to provide individual student and program assessments for advanced pharmacy practice experiences in a standardized, competency-based manner.[38] This System has remarkable potential for student and program assessment.

OTHER SCORING RUBRICS

There are a number of other scoring rubrics used in courses to evaluate student performance on cognitive, psychomotor, and affective domains that may prove useful in program assessment.[39-41] For example, scoring rubrics are commonly used across the curriculum to grade students' communication and interaction abilities in one-on-one, small group, and large group venues.[39,40] Scoring rubrics should contain items that are consistent with course learning objectives and curricular outcomes and can be used to provide formative and summative (grade, end of course) assessments to students. Additionally, data from scoring rubrics can be very useful sources of academic program assessment data as they generally contain formative and summative, performance-based assessments and quantitative data (Table 1). The usefulness of scoring rubrics can be enhanced if faculty members have developed a consistent and progressive method of assessing these abilities across the curriculum and linked the rubric to important curricular outcomes. As with the use of other embedded assessments, the collection of these data in an electronic format and storage in a centralized database will markedly enhance their use in program assessment.

PORTFOLIOS

Portfolios are commonly used in many undergraduate and professional academic programs to document student

accomplishments and performance and can be effective sources of individual student and program assessment data based on the design of the portfolio program.[3-6,11,42] The 2007 ACPE Standards and Guidelines indicate that portfolios should be used in doctor of pharmacy programs.[1] The challenges in the use of portfolios are the efforts required to review the portfolios and provide feedback to students in a sustained, consistent manner. Some pharmacy programs have overcome these challenges through the use of electronic portfolios and integrating portfolios into advanced pharmacy practice experiences.[3,42] Portfolios can also assist in determining if students were provided sufficient opportunities to develop pharmaceutical care abilities.[42]

Portfolios can also be used as high-stakes, summative assessments. In teacher education programs, for example, certification or licensure requirements have included specific portfolio requirements for content and documentation of performance.[3] Analyses of which components commonly receive a passing or failing grade as well as association of those performance data with admissions data and performance in other courses may be useful for program assessment purposes.

PROGRESS TESTING, PRACTICUMS, ETC

The use of progress tests, annual and cumulative examinations, and practicums have been reported in a number of doctor of pharmacy and other academic programs.[3,6,19,43-47] These evaluations of student abilities include knowledge and simulated skills-based performance evaluations (such as objective structured clinical examinations)[48] that are based on course and curricular outcomes at specified points in the curriculum. The assessment methods used in the progress test should be consistent with curricular and course outcomes, objectives, delivery, and assessment. Additionally, psychometric testing should be performed to assure reliability and validity. In general, progress tests and practicums should be used to assess a relatively comprehensive set of high priority abilities. These evaluations can be used for high stakes purposes in which students may not be allowed to progress if they do not demonstrate a certain performance level, or for developmental purposes in which students are provided feedback for improvement. Additionally, critical thinking inventories have been administered at the beginning of a doctor of pharmacy program and then periodically to assess student development and curricular design.[49]

Progress testing and practicums are also highly valuable sources of program assessment data and can provide evidence of performance on general and specific outcomes.[47] Analyses of these data, along with other supporting data, can be useful in determining the need for revisions in curricular and course design and delivery. For example, progress testing can be used to assess students' knowledge and skills in nonprescription drug therapy and self-care throughout the program. By using a standard set of questions, problems or scenarios for all 4 years, faculty members could determine the extent and time course of the development of these abilities and then compare those results to the design, delivery, and placement of didactic and experiential course work in nonprescription drug therapy and self-care. Further analyses may determine whether performance levels are linked to work experience, admissions data, or prior coursework. Such information may be useful in determining admissions criteria and selection. Additionally, these results may also provide insights into the impact of courses and work on student success and create a focus for additional inquiry into how to enhance student success.

STUDENT SELF-ASSESSMENTS

Student self-assessment can be incorporated into courses and assessment activities in a number of ways. Self-assessments have not correlated well with performance. Students commonly rate themselves higher than they are able to perform,[50] particularly those with lower performance or when assessing select patient communication and interaction abilities.[51] However, self-assessments can be useful and reasonably valid and reliable if students understand the purpose and the criteria for self-assessment.[3] Self-assessment data are generally perceptual and formative, and may also include qualitative data.

Self-assessment data may be used for program assessment. For example, pharmacy and social work programs have asked students to self-assess their ability to meet curricular outcomes during and at the end of the academic program.[3,52,53] These self-assessments will assist the student, but can also be aggregated to determine which curricular outcomes are perceived to be met or not met and where these curricular outcomes are developed.[52,53] Self-assessments may be used to assess target outcomes (writing and oral communication skills, pharmaceutical care abilities) in key places in the curriculum, including before and after didactic and experiential courses or phases of the curriculum (Table 1).[52,53] Self-assessments have been used to assess student development in a service-learning course.[29] Pre- and post-experience self-assessments during a drug information advanced pharmacy practice experience documented the further development of drug information abilities, association of those abilities with prior course work, and the need for revisions in the experiential and didactic components of the curriculum.[54]

CLASSROOM ASSESSMENT TECHNIQUES

Faculty members can use any of a large number of classroom assessment techniques as a means to assess learning during the delivery of the course.[1] These techniques are generally ungraded, anonymous, formative methods that provide valuable information to assist faculty members in revising the course in order to enhance student learning and outcomes.[21,55] The process for designing and using classroom assessment techniques involves essentially the same process as academic program assessments. Faculty members determine the purpose, priorities, methods, and uses of classroom assessment.[21] The major purpose of these techniques is to collect formative data during a course, so the measured student abilities are not fully developed within that course. These activities are generally not graded, so students may or may not perform to the best of their ability. However, select classroom assessment techniques may be useful as sources of program assessment data, but only if the limitations are recognized and addressed.

COURSE EVALUATIONS

Course evaluations are performed by students and by faculty members in a number of ways. Traditionally, students provide summative evaluations of courses and instructors at the end of the academic term using standardized surveys,[2,3,19] but formative assessments during the course are also commonly used.[19] Faculty members generally perform informal course evaluations on a yearly basis as they prepare to deliver the course by assessing how the course went the last time it was offered and what changes may be needed. Some programs also conduct scheduled formal course evaluations using focus groups, comprehensive reviews by the faculty members or curriculum committee, peer assessments, etc.

Course evaluations provide useful information for improving courses and for academic program assessment. These data are generally perceptual, but performance-based assessments may be utilized in comprehensive course reviews. Mapping how each course meets student development of curricular outcomes is very pertinent in curricular assessment. Additional analyses may indicate the perceived effectiveness of teaching methods utilized and the appropriate placement and sequencing of the course in the curriculum. For example, a formative assessment was used to determine the acceptability of interactive videoconferencing in providing therapeutics and clinical pharmacokinetics lectures, indicating that students preferred live lectures but that therapeutics lectures were more amenable to interactive videoconferencing than were clinical pharmacokinetics lectures.[56]

GRADES AND ACADEMIC STATUS

Course grades, grade distributions, grade point averages, and academic progression and status can be very useful in a number of assessment data analyses.[19] These data and analyses may be available through institutional research offices or the registrar. Cumulative student grade point averages,[57-60] academic or disciplinary probation, progression to graduation or program disqualification, and other measures of academic performance or difficulty can be used with admissions data to determine factors that may be associated with success or difficulty. Analyses of specific course grades or performance with prior academic performance, specific abilities, class attendance, and learning habits may be useful in course and program assessment.[61,62] Results of these analyses can be used to assess admissions criteria, academic standards, curricular design, and remediation activities, including a comparison of on-campus to distance-learning models.[63,64] Additionally, others have used pharmacy school grade point averages in determining predictive factors for passing pharmacy licensing examinations.[65] From another perspective, the office of institutional research at our institution provides annual analyses of aggregated course grades as well as course and semester grade point averages. These data are useful in determining academically challenging courses or semesters for use in the assessment of courses, curriculum, admissions criteria, and academic standards.

ADMINISTRATIVE AND LOGISTIC ISSUES

The overall design of the assessment plan is determined by the institution's assessment goals, academic priorities, curricular outcomes, and curriculum design and delivery. These embedded and other assessment data sources need to be fully described within the assessment plan, including prospective planning, implementation, and use. Such planning would hopefully alleviate potential problems in faculty-wide acceptance and participation; access to and collection of data in a usable format; and lack of use of the data collected. A culture of assessment and improvement fully engages faculty members in program development, delivery, evaluation, and improvement. Since many of the data sets that are created from embedded assessments will come from individual faculty members or course coordinators, structures and processes must be in place to facilitate and support the transfer and management of these data. Obtaining access to and transfer of institutional electronic data from the registrar and the director of institutional research can also be enhanced by presenting an assessment plan that was developed by and has the support and approval of faculty members.

A centralized database can be very useful and should include, if possible, all pertinent data sets that will be useful for program assessment, including input, environment, and output information.[5] Commercially available assessment data management packages may be useful to enhance data entry, access, and analysis, including the ability to link to learning outcomes from the individual program, ACPE Standards and Guidelines, and/or the CAPE Educational Outcomes document. Alternatively, a relational database program can be used to develop a centralized integrated database that would include and link student data (admissions, academic performance, etc) with program data (outcomes, courses, etc). Other assessment data on faculty members, facilities, mission and goals, etc, could be added as well.

A defined administrative structure is needed to effectively develop, manage, and enhance an assessment program. This author's preference is to utilize a centralized office to be responsible for database management. This centralized office should be managed by professional staff (associate dean, assistant dean, director, etc) and supported by administrative staff members. There should also be clearly defined lines of responsibility, authority, and collaboration involving students, staff members, faculty members, administrators, alumni, and administrative and faculty committees. For example, the centralized database may be a repository for data, but individual committees (the admissions or curriculum committee, for example) could create routine and ad hoc analyses to be run and then use the results of those analyses in their decisions (eg, revisions in admissions standards or the curriculum). The major goal is to enhance evidence-based decision making.

RECOMMENDATIONS

Assessments embedded into the curriculum are an efficient, meaningful, and useful means of collecting and using individual student evaluation data for academic program assessment data. In the development of a comprehensive program assessment plan, these embedded assessments complement basic program assessments (licensing examination results, etc) and dedicated program assessments (curricular mapping, AACP surveys, etc). The power of embedded assessments in program assessment involves the enhanced collection of data that are performance based and perceptual, formative and summative, qualitative and quantitative, and real-life and simulated. Additionally, embedded assessments provide assessments from a number of perspectives, so that the resulting decisions are based on information from a number of viewpoints.

The major challenge associated with using embedded assessment data is assuring that the measures used to obtain it were reliable and valid. These data must be closely linked to the doctor of pharmacy program's curricular outcomes. Additionally, these data must be available in a manner that allows aggregation of individual student data so that the data can be used to evaluate associations (with admissions data and other performance measures) as well as overall student performance on curricular outcomes.

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