Evaluating Pharmacy Student’s Ability-Based Educational Outcomes Using an Assessment Center Approach\textsuperscript{1,2}

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This project focused on the assessment of four of the ability-based educational outcomes identified in Background Paper II of the American Association of Colleges of Pharmacy Commission to Implement Change in Pharmaceutical Education: group interaction, problem-solving, written communication skills and interpersonal communication skills. The objectives were to: (i) develop one assessment exercise to facilitate measurement of each selected outcome; (ii) develop four complementary assessment instruments; (iii) collect baseline data on student performance of these outcomes using a sample of second-professional year students; (iv) provide mentoring feedback to students on their performance; and (v) determine attitudes of student participants toward the ability outcomes, assessment exercises and the feedback process. An important concept operationalized in this study to achieve its objectives was that of an assessment center. An assessment center is not necessarily a “where,” but more of a “who” and a “what” to facilitate assessments. Assessment exercises and instruments were developed and pretested using an expert panel approach. Explicit evaluation criteria were designed to ensure reliability among assessors. Cronbach’s Alpha for the internal reliability of the instruments ranged from 0.81 to 0.91. Pearson’s Correlation Coefficients between raters were significant at the 0.01 level for three of the four instruments. Eight groups of four students were assessed during separate three-hour sessions. Students self-assessed their performances and each was evaluated by two assessors on all four exercises. Students later met individually with an assessor to receive mentoring feedback on their performance. Results showed that students performed well on the exercises and believed their participation in the project worthwhile. This study provides a foundation for expanded efforts to assess these outcome abilities both in and out of the classroom.

INTRODUCTION

Pharmaceutical education needs to evolve to meet future professional demands and challenges. It has been proposed that current and future practitioners need to be able to provide pharmaceutical care, a concept involving “the process through which a pharmacist cooperates with patients and other professionals in designing, implementing, and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient”\textsuperscript{(1)}. To operationalize this concept effectively, pharmacy school graduates need to possess a substantial scientific knowledge base as well as exhibit general outcomes or abilities that underlie the education of a professional person and citizen\textsuperscript{(2)}. More specifically, the American Association of Colleges of Pharmacy’s (AACP) Commission to Implement Change in Pharmaceutical Education Background Paper IT classified these outcomes, referred to as general ability-based outcomes, into six categories: (i) thinking abilities; (ii) communication abilities; (iii) facility with values and ethical principles; (iv) personal awareness and social responsibility; (v) self-learning abilities and habits; and (vi) social interaction and citizenship\textsuperscript{(3)}. The AACP Focus Group on Liberalization of the Professional Curriculum further delineated these outcomes by providing examples of expected student behaviors at three progressive levels. Much of the Focus Group’s work was modeled after the conceptual framework used by Alverno College\textsuperscript{(4,5)}.

An important concept operationalized in this study to achieve its objectives was that of an assessment center. An assessment center is not necessarily a “where,” but more of a “who” and a “what.” Assessment centers function to identify and serve as a repository for processes and procedures to conduct assessments, and also serve as a medium to collect data. As most schools cannot afford to hire special staff to serve as assessors, assessment center personnel are usually school faculty and professional volunteers from the local business community. This “staff” also facilitates and conducts training of other assessors.

In higher education, assessment centers provide an environment to coordinate assessments across courses in the curriculum. They also serve to measure and document student progress and achievement of desired outcomes. The assessment center concept allows for exercises to be integrated, meaning that more than one ability-based outcome can be assessed in the same exercise. This integration of abilities approach is an attempt to simulate real life activities and scenarios. The assessment center concept can be a practical, efficient model for profiling students’ growth throughout their undergraduate careers.

Another key concept guiding this project was that of student assessment-as-learning\textsuperscript{(5)}. This concept, adapted

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from Alverno College, is defined as a process integral to learning that involves observation and judgement of each student’s performance on the basis of explicit criteria, with resulting systematic feedback to the student. The mentoring feedback process enables students to learn more about the ability(s) being assessed. They can determine where their strengths and weaknesses lie with regard to a particular ability and how to improve subsequent development and performance.

This study integrated these two important concepts, the assessment center and assessment-as-learning. The overall goal of this project was to operationalize assessment of four of the six ability-based outcomes presented in Background Paper II as further defined by the Focus Group.

**Movement Toward Outcome-Based Education and Assessment in Pharmacy Education**

AACP Argus Commission reports of 1986, 1987, and 1988 recognized the need for major revision in present pharmacy school curricula, especially to address thinking abilities, liberal education in professional programs, and assessment of educational outcomes(6-8). The 1988-89 AACP Academic Affairs Committee was charged to continue this work with guidance from previous Academic Affairs Committee reports, the Argus Commission reports, and several other sources. This 1988-89 Committee endorsed the four specific professional competencies and ten outcomes in common with liberal education from the University of Michigan Professional Preparation Network Project(2). In its final report, the 1988-89 Committee calls for colleges of pharmacy to develop and implement a long-term commitment for the renewal of pharmacy education and “… consider adopting a generic set of outcome abilities, characteristics, and habits which reflect important goals for a well-educated professional” (9). It also outlined barriers to an educational renewal, delineated respective roles of faculty, administrators, and AACP in this process, and described several components of prototype strategies of educational renewal.

In July 1989, AACP President William A. Miller appointed a Commission to Implement Change in Pharmaceutical Education. The Commission’s task was to “develop a strategic planning process to foster educational change to assure that future pharmacy practitioners and scientists are prepared to maintain pharmacy as a vital and unique health sciences profession in the twenty-first Century”(10). This Commission authored four papers that have served as a call to action for pharmacy educators. Background Paper I focused on the missions of the profession of pharmacy, pharmacy practice, and pharmaceutical education(11). Having laid the groundwork, the Commission then fleshed out details concerning entry level (as defined in pharmaceutical education), curricular outcomes, curricular content, and the educational process for pharmaceutical education in Background Paper II(3). This document has served to guide pharmacy school faculty in the process of curriculum revision at their respective institutions.

Another task force, to work in concert with the Commission, was appointed in 1990 by AACP President John A. Biles. The AACP Focus Group on Liberalization of the Professional Curriculum was charged “to implement a plan for the Association to address recommendations and implement policy related to liberalization of the professional curriculum and effective use of outcome measures in designing curricula and assessing student learning”(12). In its most recent report, the Focus Group defined and described general ability-based outcome goals and component performance abilities as a set of expectations at three successive developmental levels. The levels are meant to help students and faculty visualize students’ progress in the development and achievement of the outcome abilities(13). This provides schools of pharmacy a framework by which their own curriculum and student assessment methods can be designed.

More recently, the American Council on Pharmaceutical Education’s (ACPE) Proposed Revision of Accreditation Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree suggests that pharmacy curricula should embody:

- “Pharmaceutical care, as a part of the mission statement of a College or School of Pharmacy, and as an organizing principle for curricular development.
- Delineation of new professional competencies and outcome expectations for producing a generalist pharmacy practitioner, which should be used as the basis for curricular construction and outcomes assessments.
- Expectations not only for content, but also for how it is taught and learned, with emphasis on the development of problem-solving, decision-making, critical-thinking, and communication skills.
- Encouragement for the development of innovative methods for student evaluation which measure learning at a variety of levels beyond the memorization of facts.”

These emphases echo recommendations from previous pharmacy education-generated reports.

**Assessment Centers in Education**

Different methods hold promise to use in the assessment of students’ performances of specific abilities. One of these is the operationalization of an “Assessment Center,” as mentioned in the introduction. Adapted from the business world, the assessment center approach is a method devised by social science researchers and management practitioners as a means to obtain information about management behavior. William C. Byham and George C. Thornton III define an assessment center as “a comprehensive, standardized procedure in which multiple assessment techniques such as situational exercises and job simulations (e.g., business games, discussion groups, reports, and presentations) are used to evaluate individual employees for various purposes”(14). Trained evaluators conduct the assessment and make recommendations regarding participants’ management potential and developmental needs. Results are communicated to the participants, forming the basis for developmental planning and self-insight(15).

With movement in higher education toward learning-outcomes assessment, many academic institutions are modeling assessment programs after the business prototype. Assessment center models exist in higher education but are just beginning to be used in pharmacy education(16). A goal of the Purdue School of Pharmacy and Pharmacal Sciences

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is to implement similar assessment strategies through an incremental process, of which this study was a part. In 1978, Grussing and Cyrs proposed a rationale for competency-based assessment using an assessment center approach. The authors describe their vision of an assessment center as, "not a physical entity . . . (but) a methodology whereby varied data about student ability and performance can be collected, reviewed, and integrated in such a way as to make judgments about the students' competency levels." Although their method was explicitly defined and explained, evidence of implemented assessment center programs was not found in the published pharmacy literature.

Significance of This Study

Instruments to evaluate students’ ability-based outcomes are not yet widely used in pharmacy curricula. Knowledge-based assessments, however, have a long history of use. Examinations, presentations, projects, papers, laboratories, etc., have been widely employed as assessment techniques to measure students’ knowledge. Clearly, there is a need to develop ability-based assessment instruments and the processes by which to use them so that schools of pharmacy can evaluate whether their curricula are adequately addressing ability-based outcomes. Background Paper II challenges schools of pharmacy to revamp curricula to implement ability-based outcomes that effectively address the future needs of the profession. This curricular reform would also provide a basis for converting bachelor of science programs into doctor of pharmacy (PharmD) programs. Thus, the timeliness of addressing this need is quite appropriate.

The current project is unique in that it: (i) served as an early trial to operationalize the outcome abilities proposed in Background Paper II and the report from the AACP Focus Group on Liberalization of the Professional Curriculum; (ii) developed instruments and processes to assess multiple outcomes which have been made available for further refinement, adaptation and use by other schools; (iii) generated baseline data which may be utilized to identify students’ strengths and deficiencies; and (iv) facilitated further evolution of ability-based education through efficiencies of the assessment center concept.

OBJECTIVES

The purpose of this study was to develop a process to assess four of the outcome abilities identified in Background Paper II of the AACP Commission to Implement Change in Pharmaceutical Education: group interaction, problem-solving, written communication skills, and interpersonal communication skills (in Background Paper II, group interaction is referred to as social interaction and problem-solving is a component of thinking abilities). Specific objectives for this project were as follows:

1. develop one assessment exercise to facilitate measurement of each selected outcome;
2. develop four corresponding assessment instruments;
3. generate baseline data on performance of these outcome abilities from a sample of second-professional year pharmacy students;
4. develop a process to provide mentoring feedback to students on their performance;
5. determine attitudes of student participants toward the outcome abilities assessment exercises and the feedback process.

METHODS

The project was exploratory in nature and served as a pilot study for a continuing larger project being undertaken at Purdue University School of Pharmacy. Therefore, the project served as a process-validation study rather than a hypothesis-testing study.

Study Sample

Second-professional year Purdue University pharmacy students (enrolled in the third year of a five-year baccalaureate or six-year Pharm.D. program) were recruited as volunteer subjects. This particular group was at a point which represented the second stage of assessments that Purdue planned to conduct in the future (i.e., entry into the program, mid-way, and graduation). They were also early enough in the curriculum to allow for later reassessment in the students' fourth professional year. A total of thirty-two students participated in the study.

Assessment Session Procedural Development

Development of the assessment session format considered the availability of students and assessors, the amount of time needed for each exercise to adequately assess students' performances, and the time needed for adequate student self-assessment and feedback from an assessor. The students' schedules provided for an open time block of three hours on Thursday mornings to conduct the assessment sessions. Although only one ability was assessed per exercise, the four exercises each involved use of more than one ability (e.g., a group interaction exercise involved problem-solving by the group). In addition, the exercises were integrated by drawing the group interaction and written communication exercises from the same scenario, and the interpersonal communication exercise embedded in the problem-solving exercise.

The assessment center was operationalized by having a faculty advisory panel serve as assessment center personnel. The panel’s role was to help the investigator develop assessment exercises, instruments, and processes. Each member also served as an assessor and helped train additional assessors.

The faculty advisory panel decided that at least two assessors would be needed for each assessment session to establish reliability. Plans called for the investigator to assess all subjects, and the four faculty members of the panel to participate in assessing groups of subjects on a rotational basis. The investigator would also provide mentoring feedback to each student, incorporating comments from other assessors.

Assessment Exercises

The investigator, with the assistance of an expert faculty advisory panel, developed four exercises that would require demonstration of each of the abilities to be assessed. Because some students might not have had much knowledge of nor experience in pharmacy practice, designed exercises avoided a significant amount of pharmacy-specific content. These four exercises are described below.

Group Interaction. Students were provided with a problem to stimulate conversation among group members. Because
issues about community/public health are pertinent to students studying a health profession, the investigator created a scenario in which a group of students were to act as citizen (not necessarily pharmacist) members of the County Community Health Board. The County Commissioners charged the Board with raising the number of DTP immunized children in the county up to Center for Disease Control and Prevention standards. Selected background information was provided and written questions were posed to the “Board” to help guide its discussion. The students were given 30 minutes to discuss the issue and were encouraged to take brief notes for their own benefit if they desired (see Written Communication, below). The session was videotaped to allow for viewing by the assessors at a later time.

**Written Communication.** A writing assignment was given to assess each student’s extemporaneous writing ability as evidenced without the opportunity for revision. The “Board members” were given 30 minutes to write individual informal reports to the County Commissioners that described the plan the group had developed. They were also asked to comment about the process by which the “Board” worked together as a group. Although not directly assessed in this exercise, this was done to enhance the subjects’ awareness of the importance of effective group interaction skills.

**Problem-Solving.** One method to assess problem-solving ability is the “in-basket” exercise, frequently used by corporate assessment centers and educational institutions. In this simulation, the subject being assessed assumes the role of a member of an organization who must handle a full “in-basket” (e.g., memos, telephone messages, letters, and projects) on a day when no one else is in the office. Because telephone lines are unavailable, the subject must handle all tasks in writing and put the completed work in the “out-basket” within a specified time.

For this project, each student was to assume the role of manager of a busy independent community pharmacy. This manager had just returned from a week-long national meeting and stopped by the pharmacy on a Sunday afternoon to preview work for the upcoming week. The students were given background information on the scenario and on tasks that were not self-explanatory. They had one hour to read through each of the 10 tasks in their in-basket and decide how they were going to handle them. In this time frame, students were instructed to fill out task planning forms on which they described the following for each task: how and when they plan to handle the task; why they chose to handle the task in that way; and, what additional information they would need and how they plan to retrieve that information. In addition, they were to complete a calendar grid on which they would schedule the tasks and briefly describe their overall strategy for completing the in-basket exercise.

**Interpersonal Communication.** A pharmacist/patient counseling scenario was role-played by each student and one of the assessors to assess interpersonal communication abilities. This scenario reflected an enactment of one of the problem-solving tasks from the in-basket exercise which involved a pharmacist-patient encounter. The patient (assessor) presented him/herself as an elderly, somewhat confused patient with a brown bag of simulated prescription medicines from several different pharmacies. An informal script was created for the assessors to follow when playing the role of this noncompliant patient, therein ensuring greater consistency among the assessors’ role play. The goal for the “pharmacist” (student) was to help the “patient” become more compliant. This interaction allowed for a sampling of the students’ interpersonal communication ability. After 10-15 minutes, the assessor ended the role play. This session was also videotaped to allow for viewing by a second assessor at a later time.

**Assessment Instruments**

After the exercises had been developed, the next step was to specify the ability attributes and the rating criteria that would most appropriately assess performance in these exercises. Instrument development began with an evaluation of instruments and criteria already in use in courses at the School and other institutions. The investigator then adapted and refined these instruments and criteria to correspond to the assessment exercises. She incorporated some original design elements to keep the instruments simple yet comprehensive. She also made them versatile for transferability to other assessment purposes beyond this study. It was important to ensure that the assessment instruments were designed to adequately assess students at the developing level, or Level II as identified by the AACP Focus Group on Liberalization of the Professional Curriculum(4).

The behavioral attributes included on each assessment instrument reflected what the expert faculty advisory panel felt should be demonstrated by the students for each outcome ability, as guided by the Focus Group descriptions. The rating descriptors for each instrument were modified BARS-type (Behaviorally Anchored Rating Scales) scales:

- **5** = Student was consistently effective and demonstrated excellent skills in this area (could serve as a model).
- **3** = Student was generally effective and demonstrated satisfactory skills in this area (appropriate for this level).
- **1** = Student was inconsistent or demonstrated deficient skills in this area.
- **N** = No opportunity to observe.

The instruments and rating descriptors went through several iterations. These instruments were intended to tap the key separate dimensions within the domain represented by the outcome ability. To guide the content, wording was examined against definitions provided by the Focus Group. All instruments developed had the same format with exception of the problem-solving assessment form. The first five attributes of the problem-solving instrument referred to overall performance on the exercise, and the remaining ten attributes were specific to the individual tasks from the in-basket exercise. The group interaction and interpersonal communication skills instruments each contained ten criteria, while the written communication skills instrument had eight. A sample of the Group Interaction assessment instrument is found in Appendix A.6

In addition to the four assessment instruments, two 12-question reflective surveys were designed to determine attitudes of student participants toward the outcome abilities assessment exercises and feedback process. Subjects were asked to respond to Likert-type statements regarding the assessment session (first survey) and feedback process (second survey). Lines for comments below each statement and a general comment section were included.

**Assessor Training**

As the expert faculty advisory panel and assessors were one and the same, consistency among their assessments was
assumed. All revisions and details of the exercises and instruments had come from agreement of this group. Thus, further training on “how to assess” was not deemed necessary. This would be a future consideration, however, when the project was scaled up for an entire class, necessitating recruitment of additional assessors. The panel completed the final version of the in-basket exercise on their own time to determine the variability among their methods of handling the tasks. No single correct approach for each problem-solving task was determined, which helped the panel to recognize that there is more than one way to handle each task successfully.

Testing of Exercises, Instruments and Assessment Session Format

Prior to using the exercises and assessment instruments with the students, a pilot assessment session was conducted. The objectives of this initial test were to determine: (i) if the overall assessment session time frame was appropriate and how much time should be allotted to each exercise; (ii) if the assessment instruments were content valid and user-friendly; and (iii) what suggestions the pilot subjects and assessors had to improve the instruments and procedures. Five graduate students from the Department of Pharmacy Practice, an undergraduate research assistant, and one affiliate faculty member (a practicing pharmacist) were recruited as subjects for the pilot assessment session.

These seven subjects were presented with individual packets of materials at the beginning of the session and the investigator briefly discussed the procedures for the session. The subjects then split up into two pre-selected groups (i.e., to ensure a mix in background, experience, and personalities) of three and four members, respectively. To conserve time, both groups worked on the exercises simultaneously, but in separate rooms.

The pilot study session simulated the proposed format of the real assessment sessions, except that pilot subjects were not asked to complete the written communication exercise. The reasons for this were a lack of time (as the session did not start on time) and the expected appropriateness of this exercise for the actual study (based upon its simplicity). The pilot participants did not receive feedback on their individual performances. Upon conclusion of the session, a debriefing session followed. Based on participants’ and assessors’ comments, minor revisions were made in the session format, exercises, and assessment instruments used.

Assessment Sessions

After revisions from the pilot session had been made, the “real” assessment sessions could take place. All student volunteers in the project sample were brought together by the investigator for a one-hour session to brief them about the study, collect demographic information, and determine potential scheduling conflicts. The following week, the thirty-two subjects were divided into eight groups of four students each. Students were assigned to groups in a fashion similar to that of the pilot study. To achieve balanced groups, assignments were made by the investigator based on gender, age, and experience. Seven Thursday morning sessions, and one evening session (to accommodate those students and assessors who could not meet on a Thursday morning) were scheduled. An additional evening session was added to the schedule (for a total of nine sessions) to ensure all 32 subjects could participate completely. The four faculty assessors each assessed seven, eight, or nine students.

Each session was kept to three hours; the investigator introduced the session using standardized wording. To ensure continuous flow of activity, logistical planning was necessary. For example, the interpersonal communication exercise was handled somewhat differently than the other three exercises because not all four group members could be assessed concurrently. Those role-play sessions where two assessors were not available simultaneously (one to act as the patient and the other to observe) were videotaped. This ensured that two assessors could assess these particular subjects, and remain consistent with the double assessment of the other exercises. Because no time was available during the feedback session to view the videotape, immediate feedback was given to the students following the role-play exercise. While the first two students role-played, the other two completed self-assessment forms on all exercises except the interpersonal communication. When the first two subjects completed the role-play, the other two began the role-play and the first two completed all self-assessments and the post-assessment session survey. The final two completed the interpersonal communication self-assessment and post-assessment session survey upon completion of the role-play. Students used the same forms as the assessors to conduct their self-assessments. Appendix B shows the format of typical assessment session.

At the conclusion of the session, students handed in all materials to the investigator and made individual appointments for the following week for their mentoring feedback sessions. During the course of the next week, the investigator and one other assessor reviewed and assessed all materials on an individual basis. The videotapes of the group interaction and interpersonal communication exercises were viewed by the assessors during this time so they could complete their assessments of the students. Assessors also read and assessed the written materials from the writing and problem-solving exercises. The assessors were encouraged to provide specific, constructive, written comments to the students so the investigator could share them during the individual mentoring feedback sessions. The investigator then compiled the returned assessment forms and made copies so the students could keep them after the feedback session. During the subsequent 15-20 minute mentoring feedback sessions, the investigator provided the student with positive comments, constructive criticism, and encouragement. The students were then asked to complete the post-feedback survey before leaving.

Data Analysis

The Statistical Package for the Social Sciences (SPSS-X) program was used for all data analysis. To obtain descriptive statistics, frequencies were run on the data. A probability level of $P \leq 0.05$ was used for all statistical tests. To establish inter-rater reliability, Pearson’s correlation coefficients were determined for each instrument for each assessor (including students’ self-assessments) and all combinations thereof. Cronbach’s alphas were calculated for each instrument for each assessor to determine the internal reliability of each instrument. For each subject and each instrument, the two assessors’ total scores were averaged and $t$-tests were run against subjects’ demographic variables.
RESULTS AND DISCUSSION

As mentioned previously, this study was exploratory in nature and focused on establishing efficiency of the assessment session format, reliability of the instruments, and consistency among assessors. Although data were analyzed for differences among students’ scores against demographic characteristics, few significant differences were found as the sample size (N = 32) was not statistically robust.

Table I presents a summary of the students’ average point totals on each exercise. The assessors’ average score represents the investigator’s plus the faculty assessors’ scores for all students averaged together. The self-assessment score is the average of all student’s self-assessment values. The second column shows the percentage of students that scored an average rating of “3” or better on each exercise, the predetermined level of satisfactory performance.

To appropriately use new instruments for the purpose of assessments, internal reliability of each instrument must be established. Cronbach’s alpha coefficients were calculated for each instrument for all self-assessments. The reliability of the investigator’s and faculty assessors’ forms were combined to get an assessors’ average reliability score. This information is presented in Table II. All of the reliability coefficients of the instruments fall within the optimal range of 0.75 to 1.00 (18).

Consistency in the assessors’ assessments of a given performance also had to be established. Pearson’s correlation coefficients between ratings were calculated for each assessment instrument to establish inter-rater correlations. Correlations were calculated between the investigator and the faculty assessors’ average (keeping in mind that each student was assessed by the investigator and one faculty assessor). With the exception of the interpersonal communication instrument, all correlations were significant at the P 0.01 level (Table III). This lack of significance for the interpersonal communication skills instrument was probably due to very high scores students received on this exercise; assessors gave ratings of 4’s and 5’s for most criteria, thereby decreasing the variability among the scores.

It also was important to determine if students perceived the value of the assessment exercises and feedback process. Their attitudes, as measured by responses to scale items, are shown in Tables IV and V as frequencies and mean responses to each of the attitude survey items. A Likert-type scale was used to analyze subjects’ responses where 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, and 1 = strongly disagree.

Subjects agreed (means range from 4.16 to 4.55) that each of the exercises increased their awareness of the need to possess effective skills in the outcome abilities (Table IV). They felt most strongly about the problem-solving and interpersonal communication exercises in this regard. These two exercises were based on pharmacy practice scenarios, whereas the other two were based on a general community health problem. Students may perceive pharmacy-related activities as more relevant at this point in their education.

For the most part, students agreed or were undecided regarding whether the writing exercise was an appropriate exercise for the purpose of writing. Comments indicated that most students felt that their true writing ability would be better assessed with a longer essay that they could plan, write, edit and then hand in. These feelings could stem from
themselves on their writing ability. They were least sure about assessing in a prior course: they did not have experience self-assessing experience with self-assessment of patient counseling skills interpersonal communication exercise. These students had agreed that they could accurately assess themselves on the responses (means of 3.78 to 4.10). Subjects most strongly day practice is of this extemporaneous nature.

The role-playing exercise was appropriate to help me understand how I really act in this kind of group activity.

The writing exercise is an appropriate indicator of my true writing ability.

The problem-solving exercise provided an appropriate means to assess my ability to solve problems in those kind of situations.

The role-playing exercise provided an appropriate means to assess my ability to communicate in similar situations.

I felt I was able to accurately assess my group interaction skills using the appropriate assessment form.

I felt I was able to accurately assess my written communication skills using the appropriate assessment form.

I felt I was able to accurately assess my problem-solving skills using the appropriate assessment form.

I felt I was able to accurately assess my interpersonal communication skills using the appropriate assessment form.

Survey item | Mean (SD)\(^a\)
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The group interaction exercise increased my awareness of the need to possess effective interaction skills. | 4.22 (0.66)
The writing exercise increased my awareness of the need to possess effective written communication skills. | 4.16 (0.68)
The problem-solving exercise increased my awareness of the need to possess effective problem-solving skills. | 4.34 (0.83)
The role-playing exercise increased my awareness of the need to possess effective interpersonal communication skills. | 4.55 (0.51)\(^c\)
The group interaction exercise was appropriate to help me understand how I really act in this kind of group activity. | 3.88 (0.87)
The writing exercise is an appropriate indicator of my true writing ability. | 3.09 (0.93)
The problem-solving exercise provided an appropriate means to assess my ability to solve problems in those kind of situations. | 3.94 (0.80)
The role-playing exercise provided an appropriate means to assess my ability to communicate in similar situations. | 4.37 (0.56)\(^d\)
I felt I was able to accurately assess my group interaction skills using the appropriate assessment form. | 4.03 (0.65)
I felt I was able to accurately assess my written communication skills using the appropriate assessment form. | 3.78 (0.66)
I felt I was able to accurately assess my problem-solving skills using the appropriate assessment form. | 3.97 (0.82)
I felt I was able to accurately assess my interpersonal communication skills using the appropriate assessment form. | 4.10 (0.54)\(^d\)

\(^a\) 5 = strongly agree; 4 = agree; 3 = undecided; 2 = disagree; 1 = strongly disagree.
\(^b\) N = 32
\(^c\) N = 31; one missing value.
\(^d\) N = 30; two missing values.

The survey statement regarding the perceived accuracy of students’ self-assessments had the smallest range of responses (means of 3.78 to 4.10). Subjects most strongly agreed that they could accurately assess themselves on the interpersonal communication exercise. These students had experience with self-assessment of patient counseling skills in a prior course: they did not have experience self-assessing the other abilities. They were least sure about assessing themselves on their writing ability.

Table V shows that subjects’ responses on the Post-Feedback Attitude Survey were in agreement (means range from 4.06 to 4.91) on all statements but one. Subjects were not sure if they understood how they could integrate the development and use of these abilities with their concurrent acquisition of knowledge from pharmacy school coursework (mean = 4.69). This could be in part because students were not clearly aware of curricular methodologies and innovations that would develop these outcome abilities. The statement receiving the next lowest level of agreement was about assessors’ accuracy of assessing the student’s writing ability from the extemporaneous writing exercise. This reaction would be expected after noting the results of the Post-Assessment Session Attitude Survey. Of importance to the investigator and assessors was that subjects most strongly affirmed that they understood how the outcome abilities are important in their development as health care professionals (mean = 4.69). This may be due to the increased emphasis on outcome abilities that this level of students received in early

Table V. Mean responses on post-feedback session attitude survey items\(^a\)

| Survey item | Mean (SD)\(^b\) |
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The assessors were accurate in their assessment of my group interaction skills. | 4.31 (0.54)
The assessors were accurate in their assessment of my writing skills. | 4.06 (0.67)
The assessors were accurate in their assessment of my problem-solving skills. | 4.22 (0.49)
The assessors were accurate in their assessment of my interpersonal communication skills. | 4.25 (0.57)
I understand how these abilities (group interaction, problem-solving, written and interpersonal communication skills) are important in my development as a health care professional. | 4.91 (0.30)
This study has helped illustrate the important interrelationship of these abilities in my overall development as a health care professional. | 4.56 (0.50)
I am now more aware of my own levels of the skills that were assessed. | 4.19 (0.64)
I know my weakness(es) as it (they) relates to these skills. | 4.28 (0.58)
I believe development and improvement of the skills assessed is important for me to work on to become an effective health care professional. | 4.69 (0.47)
I understand how the abilities assessed relate to each other in the overall performance of a health care professional. | 4.47 (0.51)
I understand how I can integrate the development and use of these skills in my concurrent acquisition of knowledge from pharmacy school classes. | 3.69 (0.51)
I feel that participating in this project was a worthwhile experience. | 4.78 (0.49)

\(^a\) 5 = strongly agree; 4 = agree; 3 = undecided; 2 = disagree; 1 = strongly disagree.
\(^b\) N = 32

the lack of extemporaneous writing experience they have had thus far in their education. What students may not have realized yet is that most writing a pharmacist does in day-to-day practice is of this extemporaneous nature.

The survey statement regarding the perceived accuracy of students’ self-assessments had the smallest range of responses (means of 3.78 to 4.10). Subjects most strongly agreed that they could accurately assess themselves on the interpersonal communication exercise. These students had experience with self-assessment of patient counseling skills in a prior course: they did not have experience self-assessing the other abilities. They were least sure about assessing themselves on their writing ability.

Table V shows that subjects’ responses on the Post-Feedback Attitude Survey were in agreement (means range from 4.06 to 4.91) on all statements but one. Subjects were not sure if they understood how they could integrate the development and use of these abilities with their concurrent acquisition of knowledge from pharmacy school coursework (mean = 4.69). This could be in part because students were not clearly aware of curricular methodologies and innovations that would develop these outcome abilities. The statement receiving the next lowest level of agreement was about assessors’ accuracy of assessing the student’s writing ability from the extemporaneous writing exercise. This reaction would be expected after noting the results of the Post-Assessment Session Attitude Survey. Of importance to the investigator and assessors was that subjects most strongly affirmed that they understood how the outcome abilities are important in their development as health care professionals (mean = 4.69). This may be due to the increased emphasis on outcome abilities that this level of students received in early
pharmacy practice courses. The subjects agreed to strongly agreed that participating in this project was a worthwhile experience (mean = 4.78).

OBSERVATIONS and REFLECTIONS

The assessment center faculty felt that this project was a success and approved its implementation for the entire second-professional-year class the following year. This plan, however, was contingent upon making modifications and revisions of the session format, exercises and instruments, and training of assessors. An optimal assessment process would possess several characteristics: (i) a 1:1 ratio of students to assessors so that an assessor may focus on only one student to provide an increased level of feedback specificity and comprehensiveness; (ii) enough physical space so that students may work in a private environment on an individual basis when necessary, with or without their assessors present; (iii) appropriate environments for the assessments to take place to create more “real life” settings and increase the study’s external validity; and (iv) adequate time to conduct thorough assessments and feedback sessions (i.e., immediate feedback as opposed to a week after) within the assessment session timeframe. These thoughts guided critique of this project.

Logistics

The format and timeframe used for this study generally accomplished its intended purpose, although several improvements could be made. In retrospect, it would have been better to have all students perform the interpersonal communication exercise concurrently, on an individual basis, so there would not be a backlog of students waiting for their turn. In addition, a longer period of time for mentoring feedback would allow for more thorough discussion between the student and assessor. Specific behavioral examples from the videotapes could also be shown during this time to enhance the student’s learning experience. Procedurally, students’ self-assessments would probably be more accurate if they would have completed them immediately after each exercise. Also, the mentoring feedback may have been more meaningful for the students if they had received it prior to leaving the assessment session, rather than waiting a week.

Teaching Students and Assessors How to Assess

As previously mentioned, the assessment center faculty in the study assisted in the development of each exercise and instrument. Each assessor was familiar with each instruments’ attributes and how to use the rating descriptors. What was not done with the assessors, however, was to discuss each attribute explicitly and decide what specific behaviors for a given attribute would rate a “5,” “3,” and so on. This should have been done and may have further improved reliability of ratings.

More thorough instruction before the session should have been given to the students on how to interpret the criterion scale for their self-assessments. For this study, the students were told to briefly read over each assessment form before performing the exercise. Some students might not have had a sufficient amount of time to do so. For students to be more discriminate assessing themselves, they should have also been provided with specific behavioral examples for some of the attributes and what those behaviors would rate according to that instrument’s rating descriptors. The students tended to rate themselves similar to a traditional grading scale, where 5 = A, 4 = B, 3 = C, etc., as opposed to being discriminate and rating themselves on their performance on each of the behavioral attributes.

Performance of Instruments

Statistically, the instruments performed very well overall. The “N” rating (no opportunity to observe) was included in the project, however, needs clarification. Assessors were somewhat inconsistent when using this rating for some of the criteria. For example, some assessors rated students a “1” if a behavior was not observed, whereas others scored the same attribute with an “N.” The “N” values were substituted with mean values over the other attributes on that instrument (for statistical analysis purposes). This may not have been a very accurate method to assess subjects’ abilities when “N’s” appeared on their assessments.

For the problem-solving assessment instrument, the attributes that assessed a student’s performance on the exercise overall should have been placed after the ratings for the individual tasks. Another modification would be to split up those tasks that were paired into one attribute into separate attributes. Although the paired tasks were related, subjects were asked to handle each on a separate basis, so they should be assessed as such.

Differences Among Subjects’ Performances

Study participants performed at a level equal to or greater than expected. There was some initial concern whether the exercises represented ability level II as they were intended. The pilot study had helped to minimize some of this concern, although subjects in the pilot study were graduate students and not second-professional year pharmacy students. The graduate students could only provide their opinion for revisions of the instruments and exercises based on how they thought second-professional year students would perform. The study demonstrated that the exercises were designed at an appropriate level for these students and fulfilled the intended purpose of eliciting specific outcome abilities information/data. These conclusions are supported by subjects’ scores on the exercises and agreements with statements on the attitude surveys.

The relatively few significant differences between groups of subjects’ performance scores seen in this study can be explained by sample characteristics. First of all, the small sample size was not very robust for statistical analyses. Secondly, the sample of students was fairly homogenous. Most students were between the ages of 19-22 and had similar experiential backgrounds. In addition, the demographic survey was not very discriminatory to separate out the variances in these experiences. Lastly, the students’ relative lack of experience with ability-based exercises and self-assessment would account for unsophisticated discrimination in self-assessing some behavioral attributes.

Mentoring Feedback

According to the Post-Feedback Attitude Survey, over half the subjects claimed that they learned a great deal about their performances on the outcome abilities and valued the one-on-one feedback received from an assessor about their individual strengths and weaknesses. Although the feedback given to the students was often of a more general
nature than specific, the students were appreciative of the individual attention received (possibly due to the lack of personal feedback of this type received in the traditional large lecture courses).

Limitations
This study is limited in the generalizability of its statistical results due, in part, to the small and very selective sample. Because the investigator recruited volunteer study subjects rather than selecting a random sample of the second-professional year students, generalization of the results of this study are limited to the study subjects only. Data from this study are thought to reflect the abilities of those students who have a greater propensity to volunteer for activities outside of their course work. Data are also biased somewhat because of the slight variations in procedures that occurred between some of the sessions. These variations were due to: (i) the number of students in the group; (ii) the date of the session in relation to progression of the semester and coursework demands; (iii) whether the session was held in the morning or evening; and, (iv) the order of activities (i.e., one session began with the problem-solving activity instead of the group interaction exercise). Self-assessments and lack of familiarity with rating forms by students and faculty also suggest caution in interpreting and extrapolating the data.

SUMMARY AND CONCLUSIONS
This study’s main purpose was to develop and initially evaluate a process to assess four specific student ability-based outcomes. Although obtaining statistically meaningful results was important, the main focus of the project was to ensure that the process worked and could be refined to become an ongoing activity to enhance and document student growth in selected outcome abilities. Another focus was the establishment of internal and inter-rater reliability, content validity, and perceived educational value of the exercises and assessment instruments. Data from the performance of the instruments support this. Further, survey statement responses showed that subjects enjoyed participating in the assessment and feedback sessions. This project was also important in that it was the first attempt to operationalize assessment of student outcomes from Background Paper II and the report of the Focus Group.

Implications for Pharmacy Education
Using an assessment center method to evaluate students’ growth of professional abilities presents a wealth of potential for use in pharmacy education. It provides a process by which students can be assessed and held accountable for progress in a pharmacy curriculum outside of the classroom. It also provides an environment for faculty from various pharmaceutical science disciplines to work together in designing and implementing assessments. In addition, this method can incorporate the expertise of practicing pharmacists to assist with assessment of students. This feature, as well as scale-up to an entire class of students, will be described in a future paper.

The exercises and instruments used in this project can be used as classroom assessments as well. The content of the exercises can be modified to incorporate course content from the various pharmaceutical science disciplines. In this fashion, the exercises could also be used to assess students’ knowledge of a particular subject. To increase sophistication of the exercises, students could be asked to provide a greater level of detail in a shortened time frame, for example. The in-basket exercise presents the greatest potential for variation. Any particular task could be expanded to emphasize that particular content area. A version of this exercise outlining potential modifications has been published elsewhere.

Perhaps the greatest value of this project is its attempt to evaluate students’ abilities, as opposed to their knowledge. Emphasis on development of these abilities in pharmacy curricula and assessment of this development should help schools and colleges of pharmacy to better prepare graduates who are more able to render pharmaceutical care or succeed in whatever career path they choose.

Recommendations
Experience gleaned from using this study’s processes, exercises, and assessment instruments has provided a valuable foundation for future research in assessment. Multiple assessment processes should be implemented at institutions to strengthen curricula and to help nurture development of performance-based abilities in students. The exercises and instruments were designed so that they could be used for other assessment purposes outside of this study. This project team hopes that other programs can benefit from the findings of this study.

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References
APPENDIX A. GROUP INTERACTION ASSESSMENT FORM

ID# _____- _____- _____  Group# ____  Date __ / __ / _ _
Assessor__________________

READ EACH STATEMENT CAREFULLY AND CIRCLE ONE RESPONSE FOR EACH, AS YOU FEEL THE STUDENT PERFORMED IN THE GROUP INTERACTION ACTIVITY.

Rating descriptor guides:
5 = Student was consistently effective with excellent contributions in this area (could serve as a model).
3 = Student was generally effective with satisfactory contributions in this area (appropriate for a student at this level).
1 = Student was inconsistent or provided inappropriate contributions in this area.
N = No opportunity to observe.

1. Student actively participated/contributed in 5 4 3 2 1 N (to) group discussion (e.g., provided ideas used examples, shared insights).
2. Student appeared to actively listen to the contributions of others (e.g., was not distracted by other non-group activities, showed attention to speakers with eye contact and non-verbals).
3. Student was willing to alter his/her opinion if 5 4 3 2 1 N faulty points in his/her reasoning or use of facts were pointed out by other members (e.g., was not stubborn or defensive about personal opinion).
4. Student allowed others in group the opportunity to freely voice their opinion (e.g., did not dominate discussion, put others down) and encouraged their contributions.
5. Student helped to redirect discussion if/when 5 4 3 2 1 N the group went “off track” with the task.
6. Student positively contributed to the overall 5 4 3 2 1 N effectiveness of the group (e.g., did not get “off track”; comments were appropriate to the task).
7. Student used a logical thought process when 5 4 3 2 1 N explaining opinions or providing insights.
8. Student provided leadership at times by pro- 5 4 3 2 1 N posing goals or strategies, but did not monopolize group discussion.
9. Student helped bring group to closure on (a) 5 4 3 2 1 N particular point(s) by summarizing or comparing plans with task goal.
10. Student challenged others in a positive manner when holding a differing opinion than the offerer (e.g., asks for justification or evidence).

General comments: Total Score: Average score:

APPENDIX B. TIMELINE FOR ASSESSMENT SESSION

9:30 AM Overview of schedule, activities, and assessment forms; clarify any info on questionnaire; treats
9:45 AM Begin Group Interaction Exercise
10:15 AM End Group Interaction Exercise, begin Written Communication Skills Exercise
10:45 AM Written Communication Skills Exercise completed
**BREAK**
10:55 AM Introduction to second half of session
11:00 AM Begin Problem-Solving Exercise
12:00 PM Problem-Solving Exercise completed; role-play 2 students, while other two complete self-assessments (except on Interpersonal Communication Skills)
12:15 PM Switch students; other two role-play while first two complete all self-assessment forms
12:30 PM Session ends; students just completing role-play self-assess Interpersonal Communication Skills. All students make individual appointments for 15-minute feedback sessions the following week.