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RESEARCH ARTICLES

Perceptions of PharmD Students Towards a Cumulative Examination: The Milemarker Process

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Objectives. To examine the perceptions of third-year PharmD students towards a cumulative examination, the Milemarker, administered at the College of Pharmacy, University of Houston.
Methods. A self-administered questionnaire was used to measure student responses on attitudes toward the cumulative examination. Responses on academic competence, test competence, study strategies, time management, and general perceptions toward the Milemarker process were obtained using a 30-item, previously validated and reliable scale.
Results. Participants (153 students, response rate 72.5%) had slightly negative attitudes towards the Milemarker process in general. Students were found to be competent with respect to course content, but were not confident regarding their preparation for the Milemarker.
Conclusions. Adequate interventions need to be developed to improve student attitudes and behaviors towards comprehensive cumulative examinations. Student perceptions regarding the Milemarker examinations may improve with time and once students have accepted it as a norm.
Keywords: Cumulative examinations, competency, study strategies, time management

INTRODUCTION

Educational institutions have recognized the importance of evaluating academic curricula and setting standards for desired academic outcomes to keep up with dynamic changes in the pharmacy professions. The American Association of Colleges of Pharmacy (AACP) has acknowledged this trend and recommended continuous assessment of students and programs as a means of delivering a higher-quality education in pharmacy schools.[1] Consequently, numerous pharmacy schools have adopted some form of assessment method in order to monitor their curriculum. The vast majority of pharmacy schools that responded to a survey conducted by the AACP in 2000 indicated they had some form of assessment method in place.[1] In order to perform an assessment of their curriculum, pharmacy schools have adopted various methods.[2] One such method that is currently being used to assess the quality of education delivered at the University of Houston is a cumulative examination called the Milemarker. The objective of this study was to examine attitudes of third-year PharmD students towards the cumulative examination.

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Cumulative Examinations

Professional organizations in various fields currently make use of annual cumulative and comprehensive examinations to assess the quality and level of education imparted to students. A few pharmacy schools have also established their own annual cumulative examinations that cater to programmatic goals in order to gauge student learning, student knowledge, and student preparedness for progressing into different stages of the academic curricula.[3] In a study conducted in 1998, 9 out of the 46 responding pharmacy schools indicated that they administered cumulative examinations. Additionally, 5 schools did not administer cumulative assessments at that time, but were considering establishing them.[3] Cumulative examinations are used in medical and other health-related professions to assess clinical expertise and student knowledge. Studies have examined and reported significant relationships among scores on these examinations, academic competence, and clinical competence.[4,5]

Milemarker Examinations

The University of Houston's College of Pharmacy instituted the Milemarker examination, a cumulative assessment tool, in the year 2000 to examine curricular outcomes with its PharmD students. The Milemarker process involves 3 examinations, each administered after the first, second, and third year of the didactic curriculum at the College of Pharmacy. These assessments are

comprehensive and aim to assess knowledge and retention of information from all course work covered during previous academic years. The information assessed by the Milemarker examinations includes all the information from courses the student has taken in previous years, with an emphasis on the material covered during the current year. For example, the Milemarker III examination includes information covered during the first 3 PharmD years, with 70% of the questions from information covered only during the third year. The examinations are developed using a case-based format similar to the one followed by the NAPLEX. The Milemarker I and II examinations each uses 5 cases, while the third Milemarker uses 6 cases. Also, while the Milemarker I and II examinations are formative and useful to students in identifying areas of deficiency, Milemarker III is summative and used to determine progression into the experiential year of the curriculum.

The process of developing the Milemarker assessments was identical for all 3 examinations. A team of faculty members was formed to develop specific cases for each examination and to supervise the process of implementing and administering the Milemarker examinations. These cases were forwarded to the faculty member responsible for each course during that year. The faculty member was then requested to submit questions for the respective Milemarker examinations. The number of questions collected for each course was proportional to the number of credit hours devoted to that course during the academic year. Additional questions (50% more) were solicited in order to develop a question bank for each Milemarker examination. A team of faculty members then evaluated these questions to avoid redundancy between courses and to improve the clarity of questions. Finally, an Angoffing process was used to set the passing requirement for each examination.[6] This process required a team of faculty members to individually rate each question on the Milemarker based on their expertise and indicate the difficulty level of each question. On average, the team of faculty members was composed of 5 members, including the faculty members who wrote the questions as well as faculty members who had knowledge in a specific topic area. Each faculty member on this panel of experts was asked to look at each question and give his or her best guess of the proportion of students within a hypothetical group of borderline, "minimally acceptable" students that he or she would expect to answer the question correctly.[6] Judgments from this first round were then discussed among the panelists, and participants could then revise their original estimation of the question's level of difficulty. Faculty members' opinions were then averaged to obtain a minimum passing score for each question. The average scores for each of the questions were then averaged to develop an expected passing score for the Milemarker examination. Each year, new questions for the Milemarker are drawn from the question bank and the average Angoffed score for each examination was used to determine the passing score (minimum competency) on a particular Milemarker examination. The Milemarker III examination given to third-year students consisted of 200 questions, and was given over a 2-day period, with 100 questions administered each day. Students were allocated 3 hours to complete 100 questions and the examination focused on the following 3 areas: Therapeutics (70%), pharmacy practice (15%) and management (15%). The questions were all multiple-choice questions, each with 4 or 5 options. The Milemarker III examination covers subject matter taught to the students in all 3 PharmD years and is administered in April before the commencement of the experiential rotations. Those who fail to make the minimum passing grade are kept back from starting clinical rotations until they have passed the Milemarker III. Students who do not pass on their first attempt (Milemarker IIIa) can retake the examination (Milemarker IIIb) prior to the start of their rotations. If they pass in their second attempt, their education is not interrupted. However, if they do not pass, then they have to miss their first advanced practice experience rotation and their graduation may be delayed. They then have to take Milemarker IIIc, which is administered within 6 weeks, and if necessary, Milemarker IIId administered 6 weeks later. If the student does not pass the Milemarker IIId, he or she has to wait one semester before attempting it again. In the 2 years that the examination has been administered, all students have passed after a maximum of 3 attempts.

Performance Factors Affecting Cumulative Examinations

There is not much research that provides evidence regarding which type of assessment affects student performance the most. However, it has been shown that the type of assessment affects students to a greater degree than the quality of teaching.[7,8] Student perceptions of the learning environment also influence academic outcomes.[9] Furthermore, student perception of assessments can significantly predict study strategies adopted by students and their approaches toward studying.[7-9] Study strategies used by students are positively correlated with academic competence.[10-12] Additionally, academic competence, test competence, study strategies, and time management are reported to be significant predictors of

academic performance across multiple disciplines.[13] A previous study comparing PharmD students' perceptions of learning strategies and motivation indicated that third-year PharmD students were more motivated to study than first-year PharmD students.[14] The same study reported that third-year PharmD students frequently used self-regulated learning strategies.[14] However, studies that focused exclusively on comprehensive cumulative examinations, and specifically those conducted in pharmacy programs, have not been reported. Cumulative comprehensive examinations have only recently been administered at the University of Houston. Hence, measuring student perception was important in validating the examination and in forming intervention strategies to improve academic curriculum.

The objective of this study was to evaluate the attitude of third-year PharmD students toward the Milemarker examination. In addition, the study examined students' academic competence, test competence, time management, and study strategies while preparing for the Milemarker examination and the relationship between these factors and their attitudes toward the examination.

METHODS

Study Design

A longitudinal study was conducted over a 2-year period with 2 cohorts (Class of 2003 and 2004) enrolled in their third-year of a PharmD program to obtain a sufficient sample size to test the research objectives. A questionnaire was distributed to students after they took the third Milemarker examination. Participation was voluntary and the study was approved by the University's Committee for the Protection of Human Subjects.

Survey Design

The instrument used was a 2-page questionnaire consisting of questions related to 5 domains: attitude, academic competency, test competency, time management, and study strategies with respect to the Milemarker III examination. Scales were developed based on previously validated and reliable instruments reported in the literature.[13] A total of 30 items were measured using a 4-point scale with choices ranging from 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. In order to force the students to make a choice, a neutral-point option was not provided for any of the domains used in this study. This decision to eliminate a neutral-point was based on the administrators' interest in judging whether students actually prepared for the examination and whether their attitude towards the Milemarker process was positive or negative. The items included in the questionnaire can be viewed in Appendix 1.

The attitude domain contained 10 questions and measured student perceptions toward the Milemarker examination on aspects such as knowledge, case-based format, clarification of concepts, representation, integration of information, need for such an examination, studying for the examination, ability to perform, difficulty level, and knowledge regarding pharmaceutical care covered by the Milemarker examination. Academic competency, test competency, time management, and study strategy domains were developed by modifying a previously validated and reliable scale that was shown to significantly correlate with academic performace.[13] Modifications to this scale included adjusting items to specifically refer to the Milemarker examination. The academic competency domain measured competence with respect to the information taught in courses during the past academic year and the ability to understand the course material. Test competency evaluated students' preparation for the Milemarker examination and their thoughts on the difficulty level of the examination. The time management domain contained questions that judged how well the students could juggle study/leisure time and whether students studied regularly for the Milemarker examination. The study strategy domain measured techniques used by the students in reviewing course material such as practicing with mock tests.

Data Collection and Analysis

Data were collected in April 2002 and April 2003. A questionnaire was administered within 2 days after the Milemarker examination was administered and before the students received their results. Data were collected using Scantrons with a unique blinded identifier for the closed-ended questions. In addition, a blank sheet was provided for students to write comments regarding the Milemarker examinations as well as any comments with respect to the questionnaire. Data collected were coded, combined with administrative databases to extract demographic information, and analyzed using the SAS statistical package version 9, at an a priori set significance level of 0.05.

Demographic data such as age, gender, ethnicity, and marital status were obtained using administrative databases. In addition, cumulative GPA as well as Milemarker scores were obtained and matched with the survey results. Since there were no major changes in the curriculum or in the Milemarker assessment process, data from the 2 years were pooled together when conducting the analysis. Reliability analysis was performed on each of the 5 domains by obtaining the Cronbach's coefficient alpha. Descriptive analysis and comparative analysis were performed using *t* tests and Spearman correlation analysis to evaluate the study objectives.

Table 1. Demographic Characteristics (N = 153)

Variable	Measure	Result
Age	Mean (± SD)	27.1 (± 3.84)
Sex	Male	29.0%
	Female	71.0%
Ethnicity	African American	11.6%
	Caucasian	26.6%
	Hispanic	7.5%
	Asian/ Pacific Islander	52.6%
	Other	1.7%
Marital Status	Single	87.6%
	Married	12.4%
Highest Previous Degree	High School	61.9%
	Associate	8.7%
	BS/BA	27.6%
	Masters	1.8%
Mean Milemarker III scores	Mean (± SD)	67.6 (± 5.9)
Cumulative GPA	Mean (± SD)	2.9 (± 0.4)

RESULTS

A total of 153 completed surveys were obtained from 211 surveys distributed, resulting in a response rate of 72.5%. The demographic characteristics and descriptive analyses are summarized in Table 1. The mean age of the participants was 27.1 years (± 3.8 years). Most the respondents were female (71.1%), Asian/Pacific Islander (52.6%), and single (87.6%). The mean cumulative GPA was 2.9 (± 0.4) on a scale of 0–4, and the mean Milemarker examination score was 67.6 (± 5.9) on a scale of 0–100. Comparative analysis indicated that there was no significant effect of age, ethnicity, marital status, or highest previous degree earned for the variables measured. However, *t* tests on the data using aggregated mean scores for each domain revealed significant differences in attitudes, academic competency, test competency, time management, study strategies, and Milemarker scores between male and female students ($p<0.0001$).

Attitude Towards the Milemarker Examination

The attitude domain indicated sufficient inter-item correlation with total when reliability analysis was performed. The Cronbach's coefficient alpha of 0.78 indicated high reliability for this scale, which measures attitude towards the Milemarker examination in general. In behavioral research, an alpha of 0.6 or higher is acceptable and indicates reliability of the scale used.[15] Detailed information about the mean scores in addition to the frequency distribution for each item on students' attitudes toward the Milemarker examination can be viewed in Table 2. The mean score for attitude towards the Milemarker III was 2.2 ± 0.5, indicating that students had, on average, a slightly negative perception toward the Milemarker examination. The most significant result obtained with respect to attitude toward the Milemarker was that most students (70.6%) indicated they did not understand the need for the Milemarker examination. Furthermore, an overwhelming majority of students (94.0%) thought that the examination was difficult.

Factors Affecting the Milemarker Examinations

The scale included 4 domains: academic competency, test competency, study strategies, and time manage-

Table 2. Students Perceptions regarding Milemarker Examination

		Percent Distribution			
Items on Attitude Scale*	Mean (SD)	Strongly Disagree	Disagree	Agree	Strongly Agree
Knowledge	2.4 (0.8)	16.3	35.3	43.1	5.3
Case-based format	2.3 (0.9)	21.0	35.0	37.5	6.5
Clarification of concepts	2.2 (0.9)	25.0	33.5	37.5	4.0
Representation	2.3 (0.9)	22.9	28.1	43.8	5.2
Integration of information	2.4 (0.8)	15.2	33.1	47.0	4.7
Need for the exam†	1.9 (0.9)	41.2	29.4	24.2	5.2
Studying for the exam	2.5 (1.0)	16.3	30.0	36.0	17.7
Ability to perform†	2.4 (0.8)	15.1	33.6	44.7	6.6
Difficulty level	1.4 (0.7)	69.7	24.3	4.0	2.0
Knowledge regarding pharmaceutical care	2.2 (0.8)	21.5	39.2	35.3	4.0
Mean Attitude Score	2.2 (0.5)				

*refer to Appendix 1

†reverse coded during statistical analysis

Cronbach coefficient alpha = 0.78

Table 3. Academic Competency, Test Competency, Time Management, Study Strategies

		Percent Distribution			
Items*(Cronbach's coefficient alpha)	**Mean (SD)**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
Interesting courses	3.2 (0.7)	2.0	9.0	57.5	31.5
Enjoyed courses	3.1 (0.7)	2.0	11.8	57.2	29.0
Understand information	3.4 (0.6)	0.0	4.0	50.0	46.0
Manage studies	3.1 (0.7)	1.3	15.1	59.2	24.4
Understand material	2.7 (0.7)	1.3	34.9	52.0	11.8
Academic competency (0.71)	3.1 (0.5)				
Confidence in preparation†	3.3 (0.9)	21.7	36.2	32.9	9.2
Ease in preparation†	1.8 (0.8)	42.8	38.8	17.8	0.7
Difficult questions‡	1.8 (0.9)	47.7	32.7	15.7	3.9
Tension	2.4 (0.8)	13.8	44.8	34.2	7.2
Test preparation‡	1.7 (0.8)	47.4	36.2	11.8	4.6
Test competency (0.64)†	2.0 (0.7)				
Cramming‡	2.1 (1.0)	35.5	32.2	22.4	9.9
Combine studies/leisure‡	1.8 (0.8)	45.4	38.1	12.5	4.0
Studying regularly‡	1.6 (0.7)	52.6	36.8	8.6	2.0
Organize study/leisure time	2.1 (0.8)	23.5	49.0	22.2	5.2
Advance preparation	2.1 (0.9)	28.7	39.9	22.9	8.5
Time management (0.74)	1.9 (0.6)				
Type of questions	2.6 (0.9)	15.0	23.5	47.7	13.8
Advance planning	2.6 (0.8)	9.9	30.3	50.7	9.2
Group study	2.5 (1.0)	20.4	29.0	31.6	19.0
Mock tests	2.2 (1.0)	24.9	39.2	24.2	11.7
Summarize material	2.9 (0.8)	7.8	17.6	55.0	19.6
Study strategies (0.75)	2.6 (0.6)				

*Refer to Appendix 1.
† collapsed to form the new test competency domain
‡ reverse coded during statistical analysis

ment. Information regarding the mean scores and the frequency distribution for each item in this scale can be viewed in Table 3.

Academic Competency

The Cronbach's coefficient alpha for the academic competency domain was 0.71 and also indicated sufficient inter-item correlation with total for each of the items. The mean score for academic competence was 3.1 (± 0.5), indicating that students were comfortable with the course content. An overwhelming number of students (83.6%) answered that they were able to manage their course materials.

Test Competency

Reliability analysis with respect to items in the test competency domain indicated a low Cronbach's alpha. Hence, item reduction was conducted to include only 2 items that improved the reliability to an acceptable level. These items were, "I had confidence in my preparation before taking the Milemarker exam," and "I did not find it difficult to prepare for the Milemarker exam." The new test competence domain demonstrated a relatively acceptable[15] Cronbach's coefficient alpha of 0.64. The mean score of 2.0 (± 0.7) for the new test competency domain was similar to that of the old domain and demonstrated that the students had difficulty in dealing with and preparing for the Milemarker examination. Around 57.9% of the students disagreed that they were confident about their preparation for the examination. Moreover, an overwhelming proportion (81.6%) of students indicated that they had difficulty in preparing for the examination. With respect to the item relating to how well the students coped with tension associated with the Milemarker III, a mean of 2.4 ± 0.8 was obtained, indicating that students were somewhat anxious about the examination process.

Table 4. Spearman Correlation Analysis for Attitude, Academic Competency, Test Competency, Time Management, Study Strategies, Milemarker Scores and Cumulative GPA

Variables	Attitude	Academic Competency	Test Competency	Time Management	Study Strategy	Milemarker Score	Cumulative GPA
Attitude	1.00						
Academic competency	0.09	1.00					
Test competency	0.43*	0.14	1.00				
Time management	0.37*	0.05	0.47*	1.00			
Study strategy	0.26*	0.27*	0.31*	0.27*	1.00		
Milemarker score	0.030	0.03	0.07	0.09	0.01	1.00	
Cumulative GPA	-0.02	0.12	-0.14	0.01	-0.02	0.46*	1.00

*$P < 0.05$

Time Management

Cronbach's coefficient alpha for the time management domain was 0.74 and indicated sufficient inter-item correlation with the total for each of the items. The mean score for time management was 1.9 (± 0.6), indicating that students were not able to manage their time with regard to studying for the Milemarker examination. Most of the students (83.5%) indicated having difficulty in combining studies and leisure time, and a vast majority of the students (89.4%) found it difficult to study regularly.

Study Strategies

The study strategies domain had a Cronbach's coefficient alpha of 0.75 and demonstrated sufficient inter-item correlation with total for each of the 5 items. The mean score for the study strategies domain was 2.6 (± 0.6), indicating that a few students may have used some strategies. Around three fourths (74.6%) of the students reported that they summarized course material when they studied.

Relationship between Attitude, Preparation, and Performance

Spearman correlation analysis was performed to evaluate the relationship between students' attitudes toward the Milemarker examination and their preparation with respect to academic competency, test competency, time management, and study strategies used. The results of these analyses are summarized in Table 4. There was a significant correlation between the attitude domain and test competence (r=0.43, $p<0.0001$), time management (r=0.37, $p<0.001$) and study strategies (r=0.26, $p<0.005$). Further, significant correlation was found between study strategies with academic competency (r=0.27, $p<0.0008$), test competency (r=0.31, $p<0.0001$) and time management (r=0.27, $p<0.0006$). Significant correlation between time management and test competence (r=0.47, $p<0.0001$) was seen. Although the Milemarker examination scores were significantly correlated with cumulative GPA (r=0.46, $p<0.0001$), there was no correlation between Milemarker examination scores and any of the 5 domains of attitude, academic competence, test competence, study strategies, and time management (Table 4).

DISCUSSION

The Milemarker assessment process is a tool adopted to implement programmatic assessment and to monitor the quality of education imparted at the college. Students in general had a slightly negative attitude towards the Milemarker III examination. This slightly negative attitude toward the examination indicates that the students may not be convinced regarding the necessity of conducting such an examination and were not at ease with such a comprehensive assessment. Similar opinons were indicated by students in the comments section, where students questioned the use of such an examination. Attitudes, in general, were found to be significantly correlated with test competence, time management, and study strategies. However, attitude toward the Milemarker III examination was not significantly correlated with the actual score received on the examination.

The Milemarker III examination is truly comprehensive and a "high stakes" examination since it includes all material covered in the didactic portion of the pharmacy curriculum and could limit a student's progression. Student acceptance of such a comprehensive examination may take some time and may be the key to its success. One aim of the Milemarker process is to inculcate in students the habits of life-long learners. This may require some time to accomplish since the Milemarker process is just beginning and each new class of students will be encountering the examination for the first time. As more students take these examinations and as information is passed along from one pharmacy class to the next, taking the Milemarker will soon be the expected norm and that may change student attitudes and expectations.

For the purpose of this study, academic competency, measured proficiency with course material, and test

competency dealt specifically with how competent students felt with respect to preparing for the Milemarker examination. Although students indicated they were comfortable with the course material, their test competency with respect to the Milemarker assessment was negative. Academic competence did not have any relationship with attitude towards the Milemarker; however, test competence was significantly correlated with attitude towards the Milemarker examinations. This may indicate that attitude towards the cumulative examination may not be related to how well the students know their course material, but how competent they may feel with respect to the examination.

Inability to manage time effectively is an issue that students had to deal with in studying for the Milemarker examination. Since time management is positively correlated with academic achievement, providing information to students on time management strategies could profoundly impact scores on the Milemarker examination.[8-14] Although analysis of the data showed correlation between attitude and time management, no significant relationship between Milemarker examination scores and time management was found in the study. This is surprising given the plethora of studies that indicate a relation between time management and performance exists.[8-14] Students also found it difficult to cope with the tension associated with the examination. This could be a consequence of when the Milemarker III examination is administered. The Milemarker III is administered in April, at the end of the spring semester, and students had to manage a heavy course load as well as study for the examination. This could be the reason why students were a little anxious and could possibly also be the reason why students were not able to manage their time effectively with respect to preparing for the Milemarker III examination. One suggestion would be to schedule the examination so that students have adequate time to prepare for it.

Correlationships between the attitude domain and test competence, time management, and study strategies suggest that student perceptions of the assessment process play an important, if not the most critical role, in how confident students feel about the examination and the kind of strategies they adopt in studying for the examination. Since students did adopt some study strategies, negative perceptions towards the Milemarker could have been slightly mitigated by this finding. Providing students with an understanding of the Milemarker process, along with suggesting possible study strategies to prepare for it, could be useful in improving students' attitudes as well as their future study habits. Although, Milemarker *I* and *II* are a source for the student to practice such examinations, students may not take these examinations seriously until the time comes to take the Milemarker III examination. This is mainly because no accountability has been attached to Milemarker I and II; they have been used as formative examinations.

Milemarker examination scores were correlated with cumulative GPA and thus can be used as one of the predictors of academic performance. There is evidence of the interrelationships between perceptions towards assessments, study strategies, self-regulated learning, time management skills, and performance on the assessments.[6-12] Since student perception of the assessment has a direct impact on the outcome of the assessment, examining student attitudes is of prime importance. The lack of relationships in the study between student performance and the domains measured could be partially explained by the fact that most the responses for most of the items lay in the center of the scale and might reflect the lack of a neutral response option rather than students' true perceptions. Further validating this theory, in their comments about the questionnaire design, an overwhelming number of students expressed their concern that a neutral response had not been included as one of the response options and requested that this be added to future questionnaires.

Since this study suggested that inter-relationships existed between attitudes toward the assessment and both how competent students felt and whether strategies were adopted by students in studying for the examination, modifying attitudes and perceptions may prove beneficial for students. The Milemarker assessment process is a relatively new and evolving process. Student perceptions and views are equally important to the success of and buy in for these Milemarker examinations. Therefore, these results could play an important and pivotal role in repositioning the importance of Milemarker assessments with students. Many of the students' suggestions discussed in this article have been implemented, including constant interaction with students by administrators of the Milemarker examinations at regular intervals to update students on the process itself and the examination's potential benefits to the students. Many students have seen the benefits of such an examination as they felt more confident in their knowledge and well prepared before starting clinical rotations, and have indicated so in their comments on subsequent questionnaires administered.

Limitations

Since the Milemarker assessment is a relatively new process, its novelty could have factored into the prevalence of negative perceptions towards it. Consequently, the negative attitude of students could be a result of their

resistance to change in the assessment criterion and not necessarily reflect of negative attitudes toward the Milemarker examination per se. Another limitation of the study could be that the responses were measured on a 4-point scale, and thus results obtained about students' perceptions might be due to the forced choice and not necessarily reflect what the students actually think about the Milemarker examination. This study was only conducted in 2 cohorts, and this limited population size affects the generalizability of the study. With time, students' attitudes and acceptance of the Milemarker process may change.

CONCLUSIONS

The Milemarker cumulative examinations, an important tool in programmatic evaluation, is gaining importance at the College. Students had a slight negative attitude toward the Milemarker examination. Further evaluation of the strategies used by the students in preparing for this assessment demonstrated that, although the students were comfortable about their knowledge of course content and did use some study strategies, their time management skills were lacking. It is thus imperative for faculty members to examine the cause behind the negative attitudes and form effective intervention strategies in order to generate a positive attitude among students toward the Milemarker examinations. This would strengthen the assessment process and make it a more valid indicator of student competence.

REFERENCES

1. *A Guide for Doctor of Pharmacy Program Assessment*. AACP (2000). http://www.aacp.org/Docs/MainNavigation/Resources/5416_pharmacyprogramassessment_forweb.pdf. Accessed October 22, 2003.

2. Bouldin AS, Wilkin NE. Programmatic assessment in US schools and colleges of pharmacy: a snapshot. *Am J Pharm Educ*. 2000;64:380-387.

3. Ryan GJ, Nykamp D. Use of cumulative examinations at US schools of pharmacy. *Am J Pharm Educ*. 2000;64:409-413.

4. Balogun JA. Predictors of academic and clinical performance in a baccalaureate physical therapy program. *Phys Ther*. 1998;68:238-242.

5. Friedman CP, Krams DS, Mattern WD. Improving the curriculum through continuous evaluation. *Acad Med*. 1991;66:257-258.

6. Angoff WH. Scales, norms, and equivalent scores. *Educational Measurement*. 2nd ed. Washington, DC: American Council on Education; 1971.

7. Brown E, Gibbs C, Glover C. *Evaluation Tools for Investigating the Impact of Assessment Regimes on Student Learning*. Bioscience Education E-Journal. 2003; Available at: http://bio.ltsn.ac.uk/journal/vol2/beej-2-5.htm.

8. Ross ME, Salisbury-Glennon JD, Guarino A, Reed CJ, Marshall M. Situated Self-Regulation: Modeling the Interrelationships Among Instruction, Assessment, Learning Strategies and Academic Performance. *Educ Res Eval*. 2003;9:189-209.

9. Lizzio A, Wilson K, Simons R. University Students' Perceptions of the Learning Environment and Academic Outcomes: implications for theory and practice. *Stud High Educ*. 2002;27:29-52.

10. Gettinger M, Seiber JK. Contributions of Study Skills to Academic Competence. *School Psychol Rev*. 2002;31:350-365.

11. Fleming VM. Improving students' exam performance by introducing study strategies and goal setting. *Teach Psychol*. 2002;29:115-119.

12. Paris SG, Roth JL, Turner JC. Developing Disillusionment: Students' Perceptions of Academic Achievement Tests. *Issues Educ*. 2000;6:17-46.

13. Kleijn WC, Van Der Ploeg HM, Topman RM. Cognition, study habits, test anxiety and academic performance. *Psychol Rep*. 1994;75:1219-1226.

14. Garavalia LS, Scheuer DA, Carroll CA. Comparative analysis of first and third-year pharmacy students' perceptions of student-regulated learning strategies and motivation. *Am J Pharm Educ*. 2002;66:219-223.

15. Kerlinger FN, Lee HB. *Foundations of Behavioral Research*, 4th ed. USA: Wadsworth Thompson Learning; 2000:662-3.

Appendix 1. Statements used in the Questionnaire

Attitude Towards Milemarker Exams

1. Knowledge: I believe that studying for the Milemarker exam has greatly improved my knowledge regarding the subject matter.
2. Case based format: I like the case based format of the Milemarker examination.
3. Clarification of concepts: Taking the Milemarker exam helped me clarify some of the concepts that I learned in the class.
4. Representativeness: The questions in the Milemarker exam were representative of the information taught in the courses.
5. Integration of information: The Milemarker exam helped me integrate information from different subjects.
6. Need for the exam: I don't understand the need for taking the Milemarker examination.
7. Studying for the exam: I studied very hard for the Milemarker examination.
8. Ability to perform: My activities limited my ability to perform well on the Milemarker examination.
9. Difficulty level: The Milemarker exam was very easy.
10. Knowledge regarding Pharmaceutical Care: I believe that studying for the Milemarker exam has greatly improved my knowledge regarding the concept of pharmaceutical care.

Academic Competence:

1. Interesting courses: I found the courses taught during the last year interesting.
2. Enjoyed courses: I enjoyed the courses that I took during the last year.
3. Understand information: I did my best to understand the information taught in these courses.
4. Manage studies: I was able to manage my studies for the courses taught during the last year.
5. Understand material: I could easily understand the course material taught during the last year.

Test Competence

1. Confidence in preparation: I had confidence in my preparation before taking the Milemarker examination.
2. Ease in preparation: I did not find it difficult to prepare for the Milemarker examination.
3. Difficult questions: I had not expected such difficult questions on the Milemarker examination.
4. Tension: I easily coped with tension associated with taking the Milemarker examination.
5. Test preparation: I had great difficulty managing the amount of course material while preparing for the Milemarker examination.

Time Management

1. Cramming: I ended up “cramming” for the Milemarker examination.
2. Combining studies/leisure: I found it very difficult to combine my studies and leisure time while studying for the Milemarker examination.
3. Studying regularly: I found it difficult to study regularly for the Milemarker examination.
4. Organize study/leisure time: I was able to organize my study and leisure time easily.
5. Advance preparation: I started preparing for the exam well in advance.

Study Strategies

1. Type of questions: While I was studying, I regularly thought about what questions professors may ask and how they may ask exam questions.
2. Advance planning: I planed in advance for the best way of handling a study subject.
3. Group study: I reviewed course material with my colleagues while studying for the Milemarker examination.
4. Mock tests: I tested my knowledge before taking the exam by means of mock examinations, tests, asking questions, etc.
5. Summarize material: While studying, I regularly summarized the course material in my own words.