RESEARCH ARTICLES

Factors Contributing to the Academic Achievement of Pharmacy Students: Use of the Goal-Efficacy Framework

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Objective. To examine the value of various predictors of achievement such as the contribution of ability, self-efficacy, goal orientation, and learning strategy use/-regulation to variation in academic performance.

Methods. Students in the first 3 years of a professional pharmacy program completed measures of self-efficacy, goal orientation, and learning strategy use-regulation. Aptitude and achievement data were obtained from the University’s records. Analysis of variance was used to determine group differences.

Results. High-achieving students can be differentiated from their low-achieving counterparts through ability measures such as chemistry PCAT and science/math grade point average, as well as self-efficacy via achievement calibration and recall ability.

Conclusions. Given these findings, early monitoring of students' self-efficacy and their use of learning strategies after admission is recommended with the goal of developing early intervention programs for students whose achievement difficulties might be attributed to these factors.

Keywords: goal-efficacy framework, academic performance, Motivated Strategies for Learning Questionnaire (MSLQ), Self-Efficacy for Self-Regulated Learning (SESRL)

INTRODUCTION

For the past several decades, scholars external to the profession of pharmacy have attempted to identify and isolate factors associated with academic achievement in student populations. Much of the initial work advanced sociocognitive theories and the development of performance models based on these theories. Subsequent work sought to differentiate and measure the influence of sociocognitive and other factors on academic achievement through an analytical process known as path analysis. Over time the evidence garnered through this collective body of research illuminated the importance of self-efficacy, and assigned and self-set goals on academic achievement as well as student aptitude. In addition, it became increasingly clear that interactions existed across many of the factors evaluated.

One model (Figure 1) schematically represents the factors believed to be significant contributors to student performance within the sociocognitive framework. This model, portrayed as a goal efficacy model by Latham and Locke, was reported to have superior statistical properties relative to other models of student performance advanced by other investigators in the field of educational psychology.1,2

The goal efficacy model identifies 4 key factors influencing student performance, either directly or indirectly: self-efficacy, assigned goals such as those provided through instruction, self-set goals, and ability. In the Latham and Locke model, student ability exerts both a direct and indirect effect on performance. The indirect effect of students' ability on performance is sustained through its influence on self-efficacy and personal goals. Self-efficacy reflects the student's judgments of their capability to accomplish specific tasks.3 Self-efficacy is believed to be an important determinant of a student's goal orientation, behaviors and ultimately performance.4-7 The direct influence of self-efficacy on performance is believed to affect the student's choice of activities,
amount of effort expended, and level of persistence in times of difficulty.7

Self-efficacy develops in response to the information acquired from past performances, observational experiences, forms of persuasion, and physiological indices. Some researchers have observed that by the end of elementary school, children's ability perceptions are fairly reliable predictors of achievement behavior, independent of any objective measure of ability.7,8 However, discrepancies can occur between the student's perception of their ability and their actual performance as measured by achievement indicators, such as final course grade or cumulative grade-point average. This difference is sometimes referred to as achievement calibration in the education literature. Formally defined, achievement calibration reflects the difference between students' judgments of their own cognitive competence and their actual competence. In some cases, students may be overly optimistic about their perceived performance relative to their actual performance. This optimism may either foster positive mood and productivity or may reflect a defensive denial of true capabilities.9 In either case, identifying students who accurately overestimate their academic ability because it has been linked with poor educational outcomes is important.

In the Latham and Locke goal efficacy model, assigned goals also play a role in performance. Assigned goals reflect goals placed upon the student by others. One example of an assigned goal would be the grading criteria provided to students at the beginning of each course. However, as noted by Latham and Locke, assigned goals do not have a direct influence on performance; rather they provide an indirect influence on performance through other variables considered in the model. This indirect effect is most likely not a surprise to most academicians who may have observed that students often do not adopt the high academic aspirations imposed upon them.10

The last factor posited to directly influence students' performance is self-set goals. In this model, self-set goals are believed to exert a direct effect on performance because goals are hypothesized to motivate action, given that the person has the requisite ability. According to Bandura, the link between goals and motivation may result from the "discrepancy-inducing process."11 Actions that fall short of a described goal level result in a negative performance evaluation that leads to problem solving and subsequent action plans for eliminating the source of the dissatisfaction, such as improving subsequent performance.12 Self-set goals may also influence performance directly because goals can influence students' choice of achievement tasks and selection of learning or problem-solving strategies.8 Stated another way, self-set goals influence not only student motivation but also student behaviors. However, goals only facilitate successful academic performance when they are accompanied by useful learning and motivational strategies.13 Therefore, a student may have well-established goals, but if the student does not use the appropriate learning strategy, their goals may not be realized.

Two different types of achievement goals have been identified in the literature. One type of achievement goal is defined as "mastery oriented" or "intrinsic." Mastery orientation is characterized by the use of effective task strategies, a belief in one's ability to improve, a preference for challenging tasks, and feelings of satisfaction when effort is applied to difficult tasks and when effort leads to personal success.14 As with the concept of self-efficacy, research has demonstrated that goal orientations are developed early in childhood and children who perceive themselves as being academically competent generally develop a mastery or intrinsic goal orientation.8 In contrast, children with low-perceived ability are likely to develop an extrinsic orientation focused on social approval and reinforcement.8 "Extrinsic" goal orientation, then, represents the second type of achievement goal.

Although 2 general classifications of achievement goals have been identified, variations in achievement goal orientations may be observed across individuals and within individuals as situational demands vary.14 Students pursue different achievement goals depending on their individual needs and competencies or on the demands of the situation.8 For example, a student may exhibit an intrinsic goal orientation for most of their professional pharmacy training but, on occasion, exhibit tendencies of an extrinsic orientation. This may occur secondary to fatigue or in response to structural components of a given class or requirement.

In the previous sections of the paper, much attention has been given to the description of the Latham and Locke goal efficacy model. This attention is warranted given that the model provides an important theoretical framework for better understanding the influence of multiple factors on student performance. Furthermore, the utilization of this framework provides another context in which to better understand the current body of evidence related to the academic achievement of professional pharmacy students. Most of the research within the professional pharmacy literature has focused on measuring the influence of student ability directly on first-year performance. Yet student ability is only one of many factors known to contribute to student academic achievement. In light of the sparse treatment of other variables, there
appears to be an obvious need for research into the other factors considered within the goal-efficacy framework to inform the professional pharmacy literature. Therefore, additional research on such variables will contribute to a more comprehensive understanding of pharmacy student success. We propose that the goal efficacy model may provide an appropriate context for this future work.

In the present study, we investigated 2 primary research questions:

1. What is the relationship between self-efficacy, ability, and achievement with students enrolled in a professional pharmacy program?
2. Are goal orientation, perceived use of learning strategies, and achievement calibration additional predictors of achievement that are not explicitly discussed in the Latham and Locke model?

Through the completion of this work, enhancements can be made to the current body of knowledge beyond the link between student ability and first-year performance. In addition, insight will be gained regarding the linkage between factors defined within the sociocognitive framework and performance in a single pharmacy student population. Lastly, the findings of this research will provide better insight into whether the goal-efficacy framework as advanced by Latham and Locke model, either in its current form or through modification, is an appropriate framework for continued assessment of factors believed to contribute to the achievement of professional pharmacy student populations.

METHODS

Sample

Study participants included 148 students from the University of Missouri-Kansas City School of Pharmacy. Most (40%) of the participants were first-year students in the professional pharmacy program, 37% were second-year students, and 23% were third-year students. Students completed the survey instruments in class and participation was voluntary, although students could earn extra credit for completing the surveys. Approximately 90% of students in each class chose to participate. All participants were full-time students. Demographic characteristics of the sample are provided in Table 1. Data were collected during spring semester 2002 after obtaining approval from the University Institutional Review Board.

Table 1. Demographic Characteristics of Study Population (N=148)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52 (36%)</td>
</tr>
<tr>
<td>Female</td>
<td>96 (64%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>108 (73%)</td>
</tr>
<tr>
<td>Non-caucasian</td>
<td>40 (27%)</td>
</tr>
<tr>
<td>Age</td>
<td>Mean 23.62 (SD 5.56)</td>
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</tbody>
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Procedures And Measures

Data collection procedures focused on the measurement of student ability, self-efficacy, and goal orientation. We also measured students' perceived use of learning strategies. This addition allowed the investigative team to explicitly evaluate the link between learning behaviors and achievement, a link that was only implicitly considered in the Latham and Locke model. No measurement of assigned goals was included in this analysis because of the indirect effect that assigned goals have on academic achievement. In addition, data collection and subsequent analyses focused on measuring only the direct influence of the above variables on achievement. Therefore, interactions across study variables were not considered in the study.

Measurement of ability included admission data (PCAT scores, Science/Math GPA) acquired from institutional databases. The formula to compute the Science/Math GPA (SMGPA) is the total number of grade points for all science and math classes taken at the college level and divided by the total number of science/math hours taken prior to admission to the professional pharmacy program. The data were obtained after receiving informed consent from each respondent and approval from the institutional review board.

Expected grades were used as an indicator of self-efficacy. In the study, students were asked to predict their final course grade in the tenth week of the semester as a measure of their perceived self-efficacy. We measured self-efficacy at this point in the semester to allow students time to develop informed expectations for performance in the course. Data were collected in pharmacy administration courses and expected grades were reported for the courses in which the student completed the survey. The final measure of achievement calibration was calculated as the difference between the expected grade and actual final course grade. Final course grade served as the measure of achievement.

Responses to specific, independently validated subscales of the Motivated Strategies for Learning Questionnaire (MSLQ) were requested from each study respondent to measure goal orientation. Items are listed in Appendix 1. Students rated “how true of me” each statement was on a scale of 1 (“not at all true of me”) to 7 (“very true of me”). Components of this instrument, originally developed by Pintrich and colleagues provided
insight into whether the student was intrinsically or extrinsically motivated. In addition to the measurement of goal orientation, student perceptions of learning strategy use were assessed through the Self-Efficacy for Self-Regulated Learning (SESRL) Scale developed by Gredler and Garavalia. The SESRL measures student's perceptions about the frequency and effectiveness of their use of various learning strategies. These learning strategies include general organization and planning, external regulation, typical study strategy use, environmental restructuring, and recall ability. The questions used for the present analysis are presented in Appendix 1.

Statistics
Multivariate analysis of variance was used to compare achievement groups on measures of 3 demographic variables, ability, and goal orientation. Univariate analyses of variance were used to compare groups on the accuracy with which they predicted course grades and students' expected grades in the course. All analyses were conducted with SPSS, version 11.0. The alpha level was established a priori at 0.05.

RESULTS
The primary objective of the study was to evaluate the relationships among various factors believed to be associated with student success in a single professional pharmacy program. A summary of the research findings relevant to achievement groups is provided in Table 2. Additional information specific to the measure of the relationship of ability, self-efficacy, goal orientation, and learning behaviors to achievement is provided in Tables 3, 4, and 5. Table 6 presents results related to observable factors differentiating enrollment cohorts.

The first analysis focused on differentiating factors influencing student achievement across 3 cohorts of students: low, intermediate, and high achievers. Low and high achievers were defined as those students whose final course grade was in the lower- and upper-third decile of the grade distribution, respectively. The remaining students were classified as intermediate achievers. As a measure of ability, the study attempted to obtain data sufficient to evaluate the influence of demographic variables on student success. Demographic data included gender, age, and race. None of these demographic variables accounted for a significant amount of the variance in student achievement.
Four variables were identified as statistically significant factors differentiating the performance of lower- and higher-achieving students (see Table 2). The first variable, science/math GPA prior to admission, differentiated performance, with low-achieving students having lower science/math GPA on admission relative to their higher-achieving classmates. Low achievers also had significantly lower chemistry scores on the PCAT examination than their higher-achieving classmates. Higher-achieving students appear to have greater self-efficacy as indicated by expected grade. Lower-achieving students reported lower expected grades and also exhibited worse achievement calibration. No differences in goal orientation were observed between the lower- and higher-achieving students. Assessment of differences in learning strategy use revealed differences only with respect to recall ability, with higher-achieving students reporting greater recall ability than lower-achieving students.

Two factors were observed to differentiate the performance of low and intermediate achievers. These 2 factors were self-efficacy and perceived learning strategy use and effectiveness. Lower-achieving students exhibited lower levels of self-efficacy and were more extrinsically oriented than intermediate achieving colleagues.

Additional investigation of variations across enrollment cohorts revealed interesting findings. These findings may corroborate or substantiate comments expressed by faculty members that one class may be different from the other. The most prominent factors found to vary across enrollment cohorts included variations in self-efficacy and goal orientations, with students in certain classes exhibiting more extrinsic goal orientation than others. Reading comprehension as measured by the PCAT examination also differed significantly between 2 cohorts of students with different enrollment years. This, however, may simply reflect differences in demographic characteristics of the 2 groups of student. As noted in prior work by the current authors, variations in demographic variables may not necessarily translate into variation in achievement success.18

### DISCUSSION

Most assessments of determinants of student success within the professional pharmacy literature have focused on the direct influence of student ability on performance.19-28 More specifically, the dominant theme of the current body of evidence focuses on the ability of the PCAT to accurately predict first-year professional pharmacy student performance, and much of this research was completed over 2 decades ago. Certainly this research has provided some insights into the ability of the PCAT to predict success and whether any one study can be gener-
In contrast to the findings advanced through the goal-efficacy framework, goal orientation was not observed to influence student performance within a single professional pharmacy curriculum. The lack of a direct influence of goal orientation may be secondary to the high admission standards advanced by the School of Pharmacy at the University of Missouri–Kansas City. Prior performance is most likely a result of prior commitments to excellence and intrinsic motivation. This observation suggests that a modified version of the goal-efficacy framework as advanced by Latham and Locke may be applicable to professional pharmacy student performance. The modification should also reflect the findings that learning behaviors, most notably, can be explicitly linked to pharmacy student performance.

**CONCLUSIONS**

Although the goal-efficacy model has been widely applied in other settings, it has not been utilized in the pharmacy school setting. Given the findings of the present study, the goal efficacy model could be a useful beginning point for identifying additional predictive information for pharmacy student achievement. However, the model in its present form may be too restrictive in its components. Therefore, we recommend early monitoring and measuring of student ability, self-efficacy, and use of learning strategies to assist with early detection and remediation of achievement difficulties. As described in the Latham and Locke model, a focus on goal orientation may not be warranted with the pharmacy student population and in the context of admission decisions.

Future research should investigate the predictive value of prior degree for pharmacy student achievement. In the present study, we sought this information; however, the response rate for this item was extremely low, with only 48 participants responding. This low response rate precluded a thorough analysis of the influence of prior degree on student performance. This is particularly unfortunate given the preliminary evidence by Chisholm and colleagues that prior degree appears to be associated with greater student performance.29 However, in a preliminary analysis, the available data did support trends toward significance (p < 0.055), with possessing a prior degree differentiating being one differentiating factor between intermediate achievement groups and lower achievement groups. Prior degree did not appear, however, to differentiate lower-achieving students from higher-achieving students, or intermediate achievers from high achievers. Obviously, the validity of these results is suspect given the small number of respondents for this variable.
REFERENCES

Appendix 1. Domains Measured by MSLQ and SESRL

**MSLQ Subscales**

**Intrinsic motivation**
- In a class like this, I prefer course material that really challenges me so I can learn new things.
- In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
- The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
- When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

**Extrinsic motivation**
- Getting a good grade in this class is the most satisfying thing for me right now.
- The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
- If I can, I want to get better grades in this class than most of the other students.
- I want to do well in this class because it is important to show my ability to my family, friends, employer, or other.

**SESRL Subscales**

**General Organizing and Planning Strategies**
- How well can you finish assignments by deadlines?
- How well can you prepare for courses when there are other interesting things to do?
- How well can you concentrate on school subjects?
- How well can you use appropriate resources to get information for class assignments?
- How well can you plan your class work?
- How well can you organize your class work?
- How well can you motivate yourself to do your assignments?
- How well can you set and honor priorities?
- How well can you prioritize your time to complete your work for your classes?
- How often do you re-read the textbook when preparing for a test?
- How often do you fail to plan what you are going to do before beginning a class project?

**External Regulation**
- How often do you consider the instructor's introductions, objectives, and instructions as essential for your studies?
- How often do you decide you have a command of the subject matter based on completion of all course assignments?
- How often do you study all the subject matter in the same order as addressed in class?
- How often do you study according to the instructor's instructions?
- How often do you rely on the learning goals set by instructors?

**Typical Study Strategies**
- How well can you summarize course content in your own words?
- How often do you reread your summaries of course material when preparing for a test?
- How often do you reread the notes you took in class when preparing for a test?

**Environmental Restructuring**
- How well can you arrange a place to study without distractions?
- How often do you fail to turn off the TV/Radio so you can concentrate on what you are doing?
- How often do you fail to isolate yourself from anything that distracts you?
- How often do you study for your courses in a quiet room or area?

**Recall Ability**
- How well can you remember information presented in class?
- How well can you remember information presented in textbooks?
- How often do you remember the facts and ideas presented in your courses?
- How often do you remember the facts and ideas presented in your courses after the course is completed?