HOW WE TEACH | Generalizable Education Research

Development and assessment of an academic performance enrichment program for low-performing, first-year pharmacy students

Amie J. Dirks-Naylor, Corbin Cook, and Pov Nhean
School of Pharmacy, Wingate University, Wingate, North Carolina

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Dirks-Naylor AJ, Cook C, Nhean P. Development and assessment of an academic performance enrichment program for low-performing, first-year pharmacy students. Adv Physiol Educ 43: 259–265, 2019; doi:10.1152/advan.00184.2018.—Pharmacy school applications have steadily declined over the past several years. Thus pharmacy schools are not only searching for effective means to increase enrollment of qualified candidates, but are also focusing on the development of programs to improve academic performance and retention of enrolled students. To address the needs of struggling first-year pharmacy students enrolled in an Integrated Biological Sciences (BSI) course, an academic performance enrichment program (APEP) was developed. The program was designed to improve academic success by engaging low-performing students with the aims of improving their time management skills, study skills, metacognition, and understanding of BSI course material. The APEP consisted of structured tutoring sessions twice per week, which were required for all students with a course grade ≤73.5% at any point during the semester. To assess program effectiveness, performance improvement on BSI exams by the APEP students were compared with that of non-APEP students in the same class and to those in the previous 3 yr. Student perceptions of the program were also evaluated via an online survey. The APEP was deemed effective in that a greater percentage of students were able to improve their exam scores and to a greater extent by attending the APEP sessions compared with non-APEP students in the same class and with low-performing students in previous years when the APEP did not exist. Furthermore, APEP students believed the program was effective in meeting its aims. In conclusion, the APEP was effective in improving academic performance of low-performing students in BSI.

academic skills training; biological sciences; metacognition; remediation; struggling students

INTRODUCTION

Pharmacy schools nationwide are currently experiencing a decline in admission applications and an increase in the number of academically struggling students in their programs. Between the academic years of 2011 and 2016, the number of applications decreased by >25% (19–24). Thus schools of pharmacy are not only searching for effective means to increase enrollment of qualified candidates but are also focusing on the development of programs to improve academic performance and retention of enrolled students.

Students struggle academically for a number of reasons, including: 1) personal issues, such as those involving jobs or family; 2) psychological or medical conditions, such as attention deficit disorder, anxiety, or depression; 3) lack of academic skills; 4) deficiencies in prerequisite knowledge; and/or 5) insufficient motivation and discipline to meet the requirements necessary to succeed in a rigorous professional degree program (10, 16). Some students may be helped by resolving the underlying personal or medical issues. For the others, we have developed an academic performance enrichment program (APEP) aimed to improve academic skills, metacognition, and to provide the assistance necessary to correct deficiencies in basic science knowledge and understanding with the overall goal to improve student performance.

During the first year of our Doctor of Pharmacy (PharmD) curriculum, students complete a two-semester (10-unit) Integrated Biological Sciences course sequence (BSI I and II), which integrates biochemistry, cell biology, physiology, and pathophysiology (6). BSI is the course in which the first-year pharmacy students struggle the most. BSI is a prerequisite for most other advanced courses, so it is required to pass to complete the program in 4 yr. Furthermore, a failure in BSI I is highly predictive of a student struggling throughout the program (2). Thus developing a means to improve academic performance is imperative to facilitate success. Historically, we have found that traditional one-on-one or small-group peer tutoring among the lowest performing students did not lead to significant improvements in academic performance. Anecdotal feedback from the peer tutors revealed that tutees were passive participants and did not adequately prepare for the tutoring sessions. Thus the APEP was designed as a structured program to foster active engagement in the students’ own learning process. Although all of the components of the APEP have each been shown to improve academic performance in various settings (3, 5, 9, 15, 17, 18), to our knowledge no studies have described a program that incorporates all of these strategies in a required and structured program running in parallel with a basic biological science course within a pharmacy school curriculum. Thus the aim of this study is to describe and evaluate the effectiveness of the APEP.

METHODS

Subjects. The APEP was developed in the fall semester of 2017. First-year PharmD students enrolled in the BSI I course with an average course grade ≤73.5% at any point during the semester were required to attend APEP sessions until their course grade exceeded 73.5% (<69.5% was a failing grade). There were 101 students enrolled in the BSI I course in 2017, with 73% of them female. The average age was 24.2 yr. The summative assessments in BSI I included four exams and a comprehensive final. Formative assess-
ments included worksheets and assignments, which were not submitted to the instructor, and various in-class active learning activities. All procedures and the use of human subjects were approved by the institutional Research Review Board. See Fig. 1 for an overview of the experimental design.

Description of the APEP. The APEP comprised structured group tutoring sessions, which were 1.0–1.5 h twice per week, led by graduate assistants (GAs). At the beginning of each week, the students were emailed instructions as to what to prepare and expect for the sessions that week. The basic science content discussed in the APEP sessions was material being taught in the BSI course for an upcoming exam. They were asked to create a 15-question multiple-choice quiz from the specified BSI material and to complete worksheets or assignments that coincided with each BSI course lecture note set. At each session, the students exchanged and completed the quizzes, followed by grading and discussion of wrong answers. After the quiz, the students then completed various activities, which included drawing specific diagrams, flowcharts, or pathways that were assigned to learn for the session. The students were expected to complete the drawings from memory and then work together to fill in any missing information. The GAs discussed active study methods most effective for learning the particular course content, along with the importance of continuous self-testing (3). Each session also included a question-and-answer period, in which the students could ask questions for clarification, and the GAs asked higher order questions to probe their level of understanding. The students submitted their quiz grades, completed worksheets, and drawings to the GAs to track attendance and preparedness for the sessions. Procrastination and the underutilization of active studying techniques are common among our low-performing students; the completion of the assignments in preparation for and during each session was aimed to prevent these unfavorable habits. To enhance metacognition, we incorporated two additional activities. Before each BSI exam, the APEP students were asked to write a brief statement predicting the grade they would earn based on their self-perceived preparedness and understanding of the material. After each exam, they were required to meet with the course instructor to review the questions that they missed and then to write a paragraph with his/her insight as to why they earned the grade and what they plan to do differently to improve on the next exam. These are activities, among many, that have been shown to strengthen one’s awareness about one’s learning process (18).

Attendance and engagement in the APEP were required. For those who did not meet the minimal expectations, enforcement included a meeting with the Director of the APEP and the Assistant Dean of Academic Affairs.

Graduate assistants. The GAs were second-year pharmacy students and were selected on the basis of academic performance in their first year of pharmacy school. Those who earned an overall 4.0 GPA in the first-year pharmacy curriculum and who earned an A grade on every exam in BSI I and II were approached by the Director of the APEP. The GAs were paid for their services and were expected to dedicate 4 h/wk preparing for and leading the tutoring sessions. No formal training for the GAs was provided. Both of the GAs had previous undergraduate tutoring experience. On an ongoing basis, the Director of the APEP gave the GAs directions on how to organize the tutoring sessions, what assignments and content to discuss at each session, and what to discuss concerning time management and study skills.

Evaluation of the APEP. To evaluate the effectiveness of the APEP, the percentage and number of students who improved from exam to exam by a certain degree of improvement were assessed. The APEP group (those with a course grade ≤73.5% in 2017) was compared with a group of those in the same class who had a course grade of a C, but were not required to attend the APEP (73.6–79.5%; designated as non-APEP group). The percentage and number of students who improved from exam to exam by a certain degree were also compared between the APEP group in 2017 and low-performing students who had a course grade ≤73.5% in previous years (2016, 2015, and 2014) when the APEP did not exist (designated as Low-Performer groups). It was also determined what percentage and number of APEP students were able to improve their final course grade over their exam 1 grade by a certain degree, and they were compared with the non-APEP and Low-Performer groups from previous years described above. Furthermore, the mean percent improvement in scores between each exam was compared between the APEP and non-APEP group in 2017; in addition to the mean percent improvement from exam 1 to the final course grade between the APEP group and the Low-Performer groups in 2016, 2015, and 2014. Lastly,

![Diagram](https://via.placeholder.com/150)

**Fig. 1.** Overview of the experimental design. *N,* no. of students. APEP, academic performance enrichment program; BSI, Integrated Biological Sciences.
Table 1. Percent improvement between each exam: APEP vs. non-APEP in 2017

|          | APEP          | Non-APEP      | P Value |
|----------|---------------|---------------|---------|
| Exam 1 to exam 2 | 7.03 (7.01)   | -1.65 (5.01)  | <0.0001 |
| Exam 2 to exam 3 | 6.86 (7.94)   | 1.25 (7.50)   | 0.011   |
| Exam 3 to exam 4 | 0.45 (9.99)   | -3.81 (8.82)  | 0.119   |
| Exam 4 to exam 5 | 0.76 (9.24)   | -2.14 (8.33)  | 0.255   |

Values are means (SD) of percentage of improvement. APEP, academic performance enrichment program.

A survey was distributed among the APEP participants to determine their opinions regarding the effectiveness of the program.

Survey. A survey was developed using Qualtrics and e-mailed to the APEP students after the completion of BSI I. The survey consisted of 14 Likert-scale questions and 3 open-ended questions. See Table 4 for Likert-scale questions. The open-ended questions were as follows: 1) What aspect(s) of the APEP was the most beneficial to you?; 2) What aspect(s) of the APEP did you not find beneficial?; and 3) What are your suggestions to improve the APEP that would help to improve student academic performance?

Statistical analysis. A Student’s t-test was performed to determine differences in percent improvement between APEP and non-APEP or Low-Performer groups. Data are reported as means (SD). A P value ≤ 0.05 was considered statistically significant.

RESULTS

Thirty-eight students were required to attend all or some of the APEP sessions throughout the semester due to their BSI course grade dropping ≤73.5%. According to several indexes, the APEP was deemed effective in improving academic performance of the low-performing students enrolled in BSI I. The percentage of students who failed BSI I decreased by 39% and 29% compared with the previous 2 yr, respectively. The failure rate in BSI I was 6.7% in 2017, 11.1% in 2016, and 9.4% in 2015. The failure rates in 2014 and most of the preceding 10 yr were 3.0% or less. The increase in the failure rate from 3% is not clear, but thought to be in part due to entry of more students who are less prepared for a rigorous professional degree program. For those who entered the APEP after performing poorly on an exam, attending the APEP sessions during a given exam period was deemed effective in improving performance on the associated exam, in the majority of cases. The mean improvement from exam 1 to exam 2 was 7.03% in the APEP group compared with -1.65% in the non-APEP group (P < 0.0001). Percent improvement in scores was also statistically significant between groups from exam 2 to exam 3. See Table 1. Furthermore, the percent improvement in scores from exam 1 to the final course grade was significantly greater for the APEP group in 2017 compared with the Low-Performer groups in 2016, 2015, and 2014. See Table 2. Thus attending some or all of the APEP sessions appeared to be beneficial to improve course performance compared with attending zero APEP sessions among low-performing students.

Based on the percentage of students improving by a certain amount on each exam, attending the APEP sessions appeared to be effective for enhancing academic performance. For example, 80.6% of the students who were required to join the APEP after exam 1 improved on exam 2, whereas 29.4% of the students improved in the non-APEP group. In the APEP group after exam 2, 86.2% of the students improved on exam 3, compared with 54.2% of the non-APEP group. In the APEP group after exam 3, 65.2% of the students improved on exam 4, compared with 38.7%. In the APEP group after exam 4, 56% of the students improved on exam 5, compared with 26%. See Table 3.

More students in the APEP group improved their exam grades by a greater percentage than did the non-APEP group. More students improved by >5% from exam 1 to exam 2, whereas only 11.8% of the non-APEP students improved by the same amount. In the APEP group, 68.9% improved >5% from exam 2 to exam 3, whereas 25% did so in the non-APEP group. Regarding exams 3 to 4 and exams 4 to 5, 34.7% of the APEP group improved >5% between both exams, whereas 22.6% and 9.9% of the non-APEP group improved by the same degree, respectively. See Table 3.

The percentage of students who improved from exam to exam was compared between the APEP group in 2017 and the Low-Performer groups in 2016, 2015, and 2014. In the majority of cases, a greater percentage of students improved from exam to exam when attending APEP sessions. Furthermore, a greater percentage of students in the APEP group were able to improve by >10% between most exams, compared with the Low-Performer groups in previous years. See Table 3.

Lastly, the percentage of students who were able to improve their final course grade above their exam 1 grade, among those who performed poorly on exam 1 and were required to enter the APEP, was greater in 2017 with the APEP compared with low performers on exam 1 in previous years with no APEP. In 2017, 89.7% of the APEP students were able to improve their final course grade compared with 62.5, 78.3, and 62.5% in 2016, 2015, and 2014, respectively. The percentage of students improving by a greater degree was also larger in the APEP group. In 2017, 65.5% of the APEP students were able to improve their final course grade by >5% over their exam 1 grade compared with 12.5, 30.4, and 25% in 2016, 2015, and 2014, respectively. Even more, 31% of APEP students improved by >10% compared with 0.0, 4.3, and 0.0%, respectively, in previous years with no APEP. See Table 3.

Of the 38 students who were required to attend the APEP sessions at some point during the semester, 16 were required to attend all of the APEP sessions, 4 were required to attend sessions for three exam periods, 8 students for two exam periods, and 8 students for only one exam period. An exam period is defined as the time between one exam to the next, such as between exam 1 and 2, exam 2 to 3, exam 3 to 4, and

Table 2. Percent improvement between exam 1 and the final course grade comparing the APEP group in 2017 and the Low-Performer groups in 2016, 2015, and 2014

|          | APEP 2017 | Low Performers 2016 | Low Performers 2015 | Low Performers 2014 |
|----------|-----------|---------------------|---------------------|---------------------|
| Improvement, % | 6.54 (5.66) | 1.56 (4.14) | 3.33 (3.50) | 2.39 (4.27) |
| P value | 0.014 | 0.015 | 0.039 |

Values are means (SD). The academic performance enrichment program (APEP) and Low-Performer groups included all students who scored ≤73% on exam 1.
When asked for suggestions to improve the APEP, 15 students responded, with 4 of them stating that they had no suggestions for improvement. From the remaining 11, suggestions for improvement included that the professor should be more involved in the APEP sessions, student quiz questions should be screened by the professor or GA, remove quizzes, return all work to students, decrease amount of work for each session but make it more in depth, and have GAs ask more questions.

When asked what aspect(s) of the APEP did you not find beneficial, the most common response (out of 12) pertained to making and/or taking quizzes. Some commented that making quizzes took too long, and others stated their frustration with making and/or taking quizzes. Some commented that making quizzes took too long, and others stated their frustration with their peers for not putting effort into making quality quizzes to exchange during the APEP sessions.

When asked what aspect(s) of the APEP was most beneficial, the most common response (out of 15) was making/taking quizzes (5 responses) followed by the questions asked by the GAs (4 responses). Other responses included time management/making assignments due on a scheduled basis, going over lectures, and asking questions.

DISCUSSION

The applicant pool for pharmacy schools across the nation has declined over the past several years, thus programs are focused not only on implementing innovative strategies to improve academic performance and retention of enrolled stu-

### Table 3. Percentage and number of students who improved by a certain percentage between each exam

| Course Grade | Degree of Improvement | Exam 1 to Exam 2 | Exam 2 to Exam 3 | Exam 3 to Exam 4 | Exam 4 to Exam 5 | Students Who Improved | Course Grade | Degree of Improvement | Exam 1 to Exam 2 | Exam 2 to Exam 3 | Exam 3 to Exam 4 | Exam 4 to Exam 5 | Students Who Improved | Grade from Exam 1 |
|--------------|----------------------|----------------|----------------|----------------|----------------|---------------------|--------------|----------------------|----------------|----------------|----------------|----------------|---------------------|----------------|
| ≤73.5 (APEP students) | ≤0 | 19.4 (6) | 13.8 (4) | 34.8 (8) | 43.5 (10) | 10.3 (3) | 2017 |
| | 1-4 | 16.1 (5) | 17.2 (5) | 30.4 (7) | 21.7 (5) | 24.1 (7) | 2017 |
| | 5-10 | 35.5 (11) | 31.0 (9) | 21.7 (5) | 21.7 (5) | 34.5 (10) | 2017 |
| | >10 | 29.0 (9) | 37.9 (11) | 13.0 (3) | 13.0 (3) | 31.0 (9) | 2017 |
| Total who improved | 80.6 (25) | 86.2 (25) | 65.2 (15) | 56.0 (13) | 89.7 (26) | 2017 |
| 73.6–79.5 (non-APEP students) | ≤0 | 70.6 (12) | 45.8 (11) | 61.3 (19) | 73.3 (22) | 52.9 (9) | 2017 |
| | 1-4 | 17.6 (3) | 29.2 (7) | 16.1 (5) | 16.1 (5) | 41.2 (7) | 2017 |
| | 5-10 | 11.8 (2) | 8.3 (2) | 22.6 (7) | 6.6 (2) | 5.9 (1) | 2017 |
| | >10 | 0.0 (0) | 16.7 (4) | 0.0 (0) | 3.3 (1) | 0.0 (0) | 2017 |
| Total who improved | 29.4 (5) | 54.2 (13) | 38.7 (12) | 26.0 (8) | 47.1 (8) | 2017 |
| ≤73.5 | ≤0 | 37.5 (3) | 15.4 (2) | 60.0 (6) | 46.7 (7) | 37.5 (3) | 2016 |
| | 1-4 | 12.5 (1) | 23.1 (3) | 10.0 (1) | 13.3 (2) | 50.0 (4) | 2016 |
| | 5-10 | 25.0 (2) | 38.5 (5) | 30.0 (3) | 13.3 (2) | 12.5 (1) | 2016 |
| | >10 | 25.0 (2) | 23.1 (3) | 0.0 (0) | 26.7 (4) | 0.0 (0) | 2016 |
| Total who improved | 62.5 (5) | 84.6 (11) | 40.0 (4) | 53.3 (8) | 62.5 (5) | 2016 |
| ≤73.5 | ≤0 | 12.5 (3) | 22.2 (4) | 66.7 (8) | 57.1 (8) | 21.7 (5) | 2015 |
| | 1-4 | 20.8 (5) | 16.7 (3) | 25.0 (3) | 35.7 (5) | 47.8 (11) | 2015 |
| | 5-10 | 37.5 (9) | 38.9 (7) | 8.3 (1) | 7.1 (1) | 26.1 (6) | 2015 |
| | >10 | 29.2 (7) | 22.2 (4) | 0.0 (0) | 7.1 (1) | 4.3 (1) | 2015 |
| Total who improved | 87.5 (21) | 77.8 (14) | 33.3 (4) | 50.0 (7) | 78.3 (18) | 2015 |
| ≤73.5 | ≤0 | 37.5 (3) | 42.9 (3) | 55.6 (5) | 27.3 (3) | 37.5 (3) | 2014 |
| | 1-4 | 0.0 (0) | 28.6 (2) | 22.2 (2) | 8.3 (1) | 37.5 (3) | 2014 |
| | 5-10 | 25.0 (2) | 28.6 (2) | 11.1 (1) | 54.5 (6) | 25.0 (2) | 2014 |
| | >10 | 37.5 (3) | 0.0 (0) | 11.1 (1) | 8.3 (1) | 0.0 (0) | 2014 |
| Total who improved | 62.5 (5) | 57.1 (4) | 44.4 (4) | 72.7 (8) | 62.5 (5) | 2014 |

Values are percentage of students (with n, no. of students, in parentheses). APEP, academic performance enrichment program.
Table 4. Survey questions and responses

| Survey question                                                                 | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--------------------------------------------------------------------------------|----------------|-------|---------|----------|-------------------|
| The APEP helped to improve my time management skills.                           | 16.0 (4)       | 28.0 (7) | 32.0 (8) | 24.0 (6) | 0.0 (0)           |
| The APEP helped to improve my study skills by incorporating more active studying techniques. | 24.0 (6)       | 28.0 (7) | 28.0 (7) | 20.0 (5) | 0.0 (0)           |
| The APEP helped me to study with more intent and purpose by having quizzes and assignments to complete for the APEP sessions. | 24.0 (6)       | 36 (9)  | 8.0 (2) | 20.0 (5) | 12.0 (3)          |
| Making quizzes for the APEP sessions helped me to learn BSI course content.     | 20.0 (5)       | 32.0 (8) | 20.0 (5) | 16.0 (4) | 12.0 (3)          |
| Making quizzes for the APEP sessions helped me to better identify potential exam questions. | 28.0 (7)       | 20.0 (5) | 28.0 (7) | 16.0 (4) | 8.0 (2)           |
| Taking quizzes during each APEP session helped me to learn the course content.  | 20.0 (5)       | 36.0 (9) | 20.0 (5) | 12.0 (3) | 12.0 (3)          |
| The APEP helped me to identify course content that I didn’t fully understand.  | 20.0 (5)       | 40.0 (10) | 24.0 (6) | 16.0 (4) | 0.0 (0)           |
| The APEP helped to prevent procrastination in studying for BSI exams.          | 12.0 (3)       | 44.0 (11) | 20.0 (5) | 24.0 (6) | 0.0 (0)           |
| The APEP helped to improve my understanding of the course material.            | 16.0 (4)       | 48 (12) | 24.0 (6) | 12.0 (3) | 0.0 (0)           |
| The APEP improved my confidence going into BSI exams.                          | 12.0 (3)       | 20.0 (5) | 24.0 (6) | 40.0 (10) | 4.0 (1)           |
| The APEP helped to reduce my test anxiety.                                     | 16.0 (4)       | 8.0 (2)  | 16.0 (4) | 52.0 (13) | 8.0 (2)           |
| I came to every APEP session as prepared as I should have been.                | 32.0 (8)       | 36.0 (9) | 12.0 (3) | 20.0 (5) | 0.0 (0)           |
| The APEP helped me to improve academic skills that I can use throughout the program in other courses. | 20.0 (5)       | 36.0 (9) | 24.0 (6) | 16.0 (4) | 4.0 (1)           |
| The APEP helped me to better understand what study methods work best for me.   | 20.0 (5)       | 52 (13)  | 8.0 (2)  | 20.0 (5) | 0.0 (0)           |

Values are percentage of students (with n, no. of students, in parentheses). APEP, academic performance enrichment program; BSI, Integrated Biological Sciences.

Students. For example, some schools are starting to implement bridging programs to help students with the transition from undergraduate studies to PharmD programs (14). The APEP was designed to improve academic success by engaging low-performing students with the aim of improving their academic skills and their understanding of basic science course material utilizing a structured format. According to several indexes, attending the APEP sessions was deemed effective in improving academic performance among low-performing students and in reducing the failure rate in the first-year basic science course, BSI. Furthermore, the students believed that the APEP was beneficial in fulfilling its aims.

Participation in the APEP appeared to improve performance on BSI exams. A higher percentage of those who performed poorly on an exam resulting in their course grade dropping below 73.5%, and thus required to attend the APEP sessions, was able to improve their grade on the following exam compared with the non-APEP students in the same class. Moreover, the APEP group improved by a greater percentage on the following exam. The non-APEP comparator group consisted of students whose course grade fell between 73.6 and 79.5% after each exam. This cohort was chosen as a comparator group because it was believed that this group would be the most similar in academic skills and abilities to the APEP group, rather than comparing the APEP group to all other students in the class, many of whom already exhibited strong academic skills and had much less room for improvement.

The performance improvement of the APEP group in 2017 was compared with low performers in previous years, when the APEP did not exist. In most cases, a greater percentage of APEP students was able to improve from exam to exam compared with 2016, 2015, and 2014. Furthermore, the APEP group was also able to improve by a greater percentage compared with the Low-Performer groups in previous years. Exams 4 and 5 (comprehensive final) were the two most difficult exams in the semester and may explain why the percentage of low-performing students (<73.5%) who improved from exam 3 to 4 and from exam 4 to 5 was, for the most part, lower than the percentage of students who improved from exam 1 to 2 and exam 2 to 3 in all 4 yr assessed in this study. Exams 4 and 5 are considered to be more difficult due to the increased complexity of the course material assessed on the exams (e.g., neurophysiology), the amount of material, and the timing of the exams during a busier time of the semester in regards to exams given in other concurrently enrolled courses. All students in the BSI course were enrolled in the same courses.

The data presented in Table 1 answer the question of whether or not attending the APEP sessions during a given exam period helped the students to improve their performance on the associated exam. However, it could not be determined whether attendance of APEP sessions during a previous exam period may have had an impact on the performance of a later exam if they moved to the non-APEP group. The data presented in Table 2 answer the question of whether or not attending any or all of the APEP sessions throughout the semester after performing poorly on exam 1 helped to improve course performance compared with attending zero APEP sessions. However, the impact of the number of APEP sessions attended throughout the semester was not discerned. These deficiencies are noted as limitations to the study.

The BSI course was team taught by the same two professors utilizing the same course notes and exams, with only minor changes, for the 4 yr included in this study (and several
previous years). Also of note, although the students in the non-APEP and Low-Performer groups did not attend APEP sessions, they did receive consistent messaging in the BSI class from the professors about the importance of time management and active study techniques. Tips on these topics were often given throughout the BSI course. Furthermore, a voluntary review session was offered by the professors outside of class before each course exam. All students were highly encouraged to visit the professors during office hours for one-on-one help sessions and/or to review their exams. All of the above were fairly consistent for all years included in the study. Therefore, in essence, all students in the BSI course had access to the same opportunity for help. Thus the findings may suggest that the APEP was effective, at least in part, by being a structured and required program that forced the students to utilize the time management and active study skills discussed in BSI and to get the help they needed to better understand the course material. The APEP forced the students to study on a more consistent basis, preventing procrastination, and held the students accountable for being disciplined in their academic efforts.

The APEP was received well by the majority of students who were required to participate. The majority believed that the program helped to improve their understanding of the course material, improve academic skills, and improve some aspects of metacognition, such as the ability to identify course content that they did not understand and to better understand what study methods work best for them. The majority of students did not agree that the APEP helped to reduce test anxiety or improve their confidence going into BSI exams. No survey questions were asked to obtain insight to this response, however, anecdotally, low-performing students tend to express nervousness or unpreparedness for application-style questions, which traditionally are more difficult to prepare for compared with knowledge-based questions. They tend to be nervous for these questions, despite their level of perceived preparedness going into the exams. Furthermore, once a student’s course grade drops to near failing or below, the student may feel overwhelming pressure to perform well, knowing that a course failure will set them back in the curriculum. Instilling confidence and reducing test anxiety are areas in which the APEP could improve in the future.

It was expected that the APEP would be most effective for those students who prepared for the APEP sessions and fully engaged in the program. Although the majority of APEP students did agree that they came to the sessions as prepared as they should have been, 32% did not agree. Lack of adequate preparation for the APEP sessions may be a contributing factor as to why the implementation of the program was unable to return the failure rate down to “baseline” levels of ≤3%. It may also help to explain why some students were required to attend the APEP sessions for longer periods of time, as 16 students were required to attend throughout the entire semester and were never able to improve their course grade above 73.5%. It is not a surprise that 100% of students who failed BSI (n = 7) were those who were required to attend the APEP sessions for all exam periods beginning after exam 1. Since the survey was anonymous, it could not be determined if those who fall in the above categories are also those who did not adequately prepare for the APEP sessions. Even so, evolution of the program will include finding effective strategies to motivate more students to prepare and more fully engage in APEP sessions.

Students were told that APEP sessions were “required” to attend. Students who did not attend or did not complete specific assignments were asked to meet with the Director of the APEP and the Assistant Dean of Student Affairs. There were no additional consequences. However, after such a meeting, the attendance issues were typically rectified. Although this meeting seemed to motivate students to comply with the minimal requirements (attendance and completion of assignments), this did not necessarily translate into improved quality of effort. For example, students may have completed an assignment for the sake of having a document to submit, but did not put in effort to ensure the answers were correct or to adequately learn the information associated with the assignment. Sufficiently motivating this subgroup of students had proven difficult. Fortunately, this subgroup was the minority.

According to a recently published review of learning support interventions for first-year medical students, learning support interventions vary tremendously regarding the intervention approach, content of intervention, intervention strategies, and duration of the intervention (12). None of the interventions evaluated in the review targeted all of the components of basic science content knowledge, academic/learning skills, personal skills (time management), and metacognition. However, several interventions did target basic science content knowledge in addition to some aspect of academic/learning skills, although, the interventions did not appear to be as holistic as the APEP and/or did not run in parallel to a basic science course for the length of the semester (1, 4, 7, 8, 11). There have been no published literature describing a holistic intervention program within a pharmacy curriculum, such as the APEP. It has been recognized that few comparative studies on remediation have been published by colleges and schools of pharmacy, making it difficult to implement effective and validated approaches to help struggling pharmacy students (13).

An APEP such as the one described would be most suitable to implement in a professional degree program, where all students have the same course and academic schedules, making it easier to institute required attendance. An APEP could be implemented in undergraduate programs; however, logistically it would be more complicated to enforce required attendance with the heterogeneity of the student population. We believe the required component was an important piece for the program’s effectiveness. The program may be difficult to implement without resources to pay for GAs. However, it is feasible that existing staff and faculty could assume the additional workload, although it would be the equivalent of teaching three unit course.

Conclusion. The APEP was developed to actively engage low-performing pharmacy students in a BSI course with the aim of improving academic skills, metacognition, and comprehension of the basic science course material. Various indexes indicated that the APEP was successful in helping students improve their academic performance in BSI and agreed that the APEP helped to improve study skills that can be used throughout their academic career. The program was perceived well by the APEP participants. Some areas of needed improvement within the APEP were identified, which will be a central focus during the evolution of this program.
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