

RESEARCH

A Three-Year Study of the Impact of Instructor Attitude, Enthusiasm, and Teaching Style on Student Learning in a Medicinal Chemistry Course

Naser Z. Alsharif, PharmD, PhD, and Yongyue Qi, MS

School of Pharmacy and Health Professions, Creighton University Medical Center, Omaha, Nebraska

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Objective. To determine the effect of instructor attitude, enthusiasm, and teaching style on learning for distance and campus pharmacy students.

Methods. Over a 3-year period, distance and campus students enrolled in the spring semester of a medicinal chemistry course were asked to complete a survey instrument with questions related to instructor attitude, enthusiasm, and teaching style, as well as items to measure student intrinsic motivation and vitality.

Results. More positive responses were observed among distance students and older students. Gender did not impact student perspectives on 25 of the 26 survey questions. Student-related items were significantly correlated with instructor-related items. Also, student-related items and second-year cumulative grade point average were predictive of students' final course grades. Instructor enthusiasm demonstrated the highest correlation with student intrinsic motivation and vitality.

Conclusion. While this study addresses the importance of content mastery and instructional methodologies, it focuses on issues related to instructor attitude, instructor enthusiasm, and teaching style, which all play a critical role in the learning process. Thus, instructors have a responsibility to evaluate, reevaluate, and analyze the above factors to address any related issues that impact the learning process, including their influence on professional students' intrinsic motivation and vitality, and ability to meet educational outcomes.

Keywords: instructor enthusiasm, science courses, medicinal chemistry, student learning, intrinsic motivation, vitality, teaching

INTRODUCTION

The art of teaching is a continuous journey to find the right combination of pedagogy, instructional methodologies, and more recently, technology to help students learn.¹⁻⁶ Student evaluations have always been an important tool to gauge how students perceive the classroom environment and the learning process.¹⁻⁶ Over the years, one theme that seems to be prevalent in student evaluations is how instructors' demeanor, behavior, and/or attitude in the classroom affect student learning.^{5,7} This focus is in contrast to pharmacy educators' sometimes elaborate emphasis on innovative learning theories, lecture notes, and classroom activities to bring clinical relevance to course content.

A relationship has been identified between instructor enthusiasm and students' intrinsic motivation to learn.⁸⁻¹²

Key to this relationship is having instructors who can unlock the "dormant energy" inside their students and instill vitality in how students pursue the learning process.⁹⁻¹³ The instructor has to use strategies in the classroom that are student-centered and challenging, and that put the responsibility on the student as much as on the instructor to enhance student engagement in learning.¹⁴⁻¹⁶ The Center for the Advancement of Pharmacy Education (CAPE) Educational Outcomes 2013 called for "the inclusion of an affective domain that would address personal and professional skills, attitudes, and attributes required for the delivery of patient-centered care."¹⁷

By assessing student intrinsic motivation and vitality, both of which can impact student affective domain, this study conducted at the School of Pharmacy and Health Professions, Creighton University, analyzed the implications of instructor-related factors such as attitude, enthusiasm, and teaching style on student learning. The study addresses this topic from the perspective of 2 student cohorts (campus and distance pathway students) enrolled in a required Chemical Basis of Drug Action

Corresponding Author: Naser Z. Alsharif, PharmD, PhD, School of Pharmacy and Health Professions, Department of Pharmacy Sciences, Creighton University Medical Center, 2500 California Plaza, Omaha, NE 68178. Tel: 402-280-1857. Fax: 402-280-1883. E-mail: nalshari@creighton.edu.

course in the second year of the doctor of pharmacy (PharmD) curriculum.

METHODS

A convenience sample that included distance (n=187) and campus (n=285) pathway students at Creighton University was used for the study.¹⁸ Both cohorts were registered for the required Chemical Basis of Drug Action course in the spring semester of 2011, 2012, or 2013. This 2-credit hour course, taught in the second year of the curriculum, is delivered concurrently with pharmacology and follows completion of course work in biochemistry, physiology, pathology, anatomy, pharmaceuticals, and communication skills. The campus students were required to attend class. The distance students, who were located throughout the country, followed the same course syllabus, learning objectives, lesson outline, and course activities as did the campus students.¹⁸ Distance students viewed videos of classroom lectures that were made available to them within 2 hours after each class. The course instructor was a tenured professor who had taught the course for 20 years.

A department instructor evaluation tool that had been used for more than 15 years was administered to the students at the end of the spring semester in each of the years of the study. The survey instrument also included study-specific instructor-related items that addressed the course instructor's attitude, enthusiasm, and teaching style (ie, items that were not related to instructional techniques). The survey items were adopted from several studies that addressed instructor enthusiasm, student intrinsic motivation, and student vitality.^{10,13,19} Although most of the items were rated using a 5-point Likert scale, students also were asked to provide written responses. Both the quantitative and qualitative sets of data were analyzed.

Statistical analysis included descriptive statistics and independent *t* test for comparing mean evaluation scores between pathways, age groups, and genders. Mean evaluation scores also were compared between students whose grade point average (GPA) ranked in the upper 40% of their class (approximately 70% of the students, Group 1) and those whose GPA ranked in the lower 60% (Group 2), as well as by students' first-year cumulative GPA, second-year cumulative GPA, and first- and second-year cumulative GPA. Pearson correlation analysis was conducted to address the association between instructor and student-related items. In the multiple regression model, the course score was treated as a response variable while first- and second-year cumulative GPA, age, student-related items, pathway, and gender were treated as predictor variables. All statistical analyses were conducted using SAS, version 9.3 (SAS Institute Inc, Gary, North Carolina). A *p* value

less than 0.05 was considered significant. An exempt status for the study was obtained from the Creighton University Institutional Review Board.

RESULTS

The study involved 187 (39.6%) distance students and 285 (60.4%) campus students who were admitted to the PharmD program at Creighton University in 2009, 2010, and 2011. The average age for distance students was 33.1 years, and for campus students, 24.8 years (Table 1). The response rate was approximately 100% because it was incorporated into the required end-of-class instructor evaluation. There were 180 (38.1%) male students and 292 (61.9%) female students. Distance students' average prerequisite GPA (Pre-GPA), first-year cumulative GPA, and second-year cumulative GPA were 3.5, 3.6, and 3.3, respectively, while these variables for campus students were 3.4, 3.4, and 3.2, respectively.

Almost all campus (93%) and distance students (84%) strongly agreed or agreed that the instructor related to them and other students in a manner that promoted mutual respect. In addition, 96% of the distance students and 81% of the campus students indicated that they strongly agreed or agreed that the instructor demonstrated interest in their success. Further, 94% of the distance students and 87% of the campus students indicated that they strongly agreed or agreed that the instructor demonstrated professionalism in interaction with them or other students (Table 2). An independent *t* test for comparing mean evaluation scores showed a significant difference between the distance students and the campus students ($p < 0.001$) for all the items related to instructor attitude (Table 2), with significantly higher ratings given by distance students. The majority of the distance students were older than 27 years (average age 33.1 years, Table 1), and the majority of the campus students were 27 years of age or younger (average age 24.8 years, Table 1). Overall, age was a significant factor ($p < 0.001$) in all items related to instructor attitude (Table 3).

There was a difference in the ratio of male to female students between the distance and campus students in the admitted classes of 2009, 2010, and 2011 (Table 1), with a higher ratio of female to male students in the distance classes. The *t* test analysis for gender did not demonstrate any significant difference in student responses for any of the instructor-related items except for question 19 ("provides different ways to learn the content," $p < 0.05$), or for the student-related items.

Instructor enthusiasm was measured based on responses to general questions and to questions related to verbal and nonverbal behaviors (Tables 2 and 3). With regard to the instructor enthusiasm general question

Table 1. Student Demographics

Demographics	Admitted Year			
	2009	2010	2011	Three Year Average
Age				
Campus	25.6 (N=107)	24.9 (N=77)	23.9 (N=101)	24.8 (N=285)
Distance	32.8 (N=66)	33.1 (N=55)	33.5 (N=66)	33.1 (N=187)
Gender				
Campus				
Male, %	44.9	41.6	47.5	44.9
Female, %	55.1	58.4	55.5	55.1
Distance				
Male, %	19.7	36.4	28.8	27.8
Female, %	80.3	63.6	71.2	72.2
Pre-GPA				
Campus	3.4	3.4	3.4	3.4
Distance	3.5	3.5	3.5	3.5
P^a	0.004	0.006	0.13	0.001
CGPA1				
Campus	3.5	3.3	3.4	3.4
Distance	3.7	3.5	3.6	3.6
P^a	<0.001	0.002	0.005	<0.001
CGPA2				
Campus	3.1	3.1	3.3	3.12
Distance	3.4	3.1	3.3	3.3
P^a	0.002	0.96	0.66	0.048
CGPA12				
Campus	3.3	3.2	3.4	3.3
Distance	3.5	3.3	3.5	3.4
P^a	<0.001	0.16	0.06	<0.001

Abbreviations: Pre-GPA=prerequisite grade point average; CGPA=first-year cumulative grade point average; CGPA2=second-year cumulative grade point average; CGPA12=first- and second-year cumulative grade point average.

^a p value as determined by independent t test.

items, the distance students (96%) and campus students (89%) strongly agreed or agreed with the statement that the instructor demonstrated a passionate interest in the topic. Also, 97% of the distance students and 87% of the campus students strongly agreed or agreed with the statement that the instructor demonstrated mastery of the topic. When asked about their agreement with the statement that the instructor was “full of energy” when teaching, 99% of the distance students and 94% of the campus students strongly agreed or agreed with it. Further, the distance students (80% and 77%, respectively) and the campus students (58% and 50%, respectively) strongly agreed or agreed with the statements that the instructor “enhanced my motivation for the pharmacy program” and that the instructor “enhanced my motivation for medicinal chemistry” (Table 2). Again, independent t test for comparing mean evaluation scores showed significantly higher scores among distance students than among campus students ($p<0.001$) for all items related to instructor enthusiasm (Table 2).

Distance students responded more positively to the instructor enthusiasm questions based on some of the instructors’ verbal and nonverbal signs such as vocal delivery, vocal volume, apparent emotion and level of energy. These responses were significantly different from those of campus students ($p<0.001$) (Table 2). Campus students’ perception about hand and body gesture influence on learning was slightly higher than that of distance students. However, these were not significantly different (Table 2).

Table 3 shows that age was a significant factor ($p<0.01$) in all items related to instructor enthusiasm (Table 3). However, age was not a factor in 4 of 7 verbal and nonverbal items related to instructor enthusiasm (Table 3).

In general, distance student perceptions were significantly higher ($p<0.001$) compared to those of campus students in their agreement with statements related to the instructor expecting student participation, having appropriate expectations, providing relevance for the information presented, showing genuine concern for (their) learning,

Table 2. Percent Response Frequencies, Means, and *p* values of Independent *t* Test Based on Pathway

Survey Items	Pathway (N)	Response, % ^a					Score, Mean	<i>P</i>
		SA	A	N	D	SD		
Instructor Related Items								
Instructor Attitude								
1. The instructor related to me and/or other students in a manner that promoted mutual respect.	Campus (N=283)	33	51	9	6	1	4.1	<0.001
	Distance (N=187)	61	32	6	1	1	4.5	
2. The instructor demonstrated interest in my success.	Campus (N=282)	40	41	12	6	1	4.1	<0.001
	Distance (N=187)	69	27	3	1	1	4.6	
3. The instructor demonstrated professionalism in interactions with me and/or other students.	Campus (N=282)	36	51	8	5	1	4.2	<0.001
	Distance (N=187)	63	31	5	1	1	4.6	
Instructor Enthusiasm (General Items)								
4. Demonstrates a passionate interest in his topic.	Campus (N=280)	54	35	8	2	1	4.4	<0.001
	Distance (N=185)	77	19	4	0	0	4.7	
5. Demonstrates mastery of his topic.	Campus (N=279)	48	39	11	1	0	4.3	<0.001
	Distance (N=186)	70	27	3	0	0	4.7	
6. Is full of energy when teaching.	Campus (N=278)	63	31	6	0	0	4.6	<0.001
	Distance (N=183)	76	23	1	0	0	4.7	
7. Enhanced my motivation for the pharmacy program.	Campus (N=279)	18	40	25	12	5	3.6	<0.001
	Distance (N=185)	39	41	17	4	0	4.1	
8. Enhanced my motivation for medicinal chemistry.	Campus (N=278)	16	34	27	14	9	3.3	<0.001
	Distance (N=186)	39	38	19	4	1	4.1	
Instructor Enthusiasm (verbal and non-verbal signs)								
9. Vocal delivery.	Campus (N=278)	30	44	13	10	3	3.9	<0.001
	Distance (N=186)	47	39	9	3	1	4.3	
10. Vocal volume.	Campus (N=279)	32	40	11	12	4	3.8	<0.001
	Distance (N=187)	48	37	10	2	1	4.3	
11. Facial expressions.	Campus (N=281)	30	45	18	5	3	3.9	0.39
	Distance (N=187)	33	22	44	1	1	3.9	
12. Apparent emotion.	Campus (N=279)	31	43	16	7	2	3.9	<0.001
	Distance (N=185)	49	35	13	3	1	4.3	
13. Hands and other gestures.	Campus (N=277)	29	42	17	8	3	3.9	0.60
	Distance (N=186)	32	24	38	5	1	3.8	
14. Observed body gestures.	Campus (N=274)	29	44	19	7	2	3.9	0.52
	Distance (N=185)	30	25	44	1	1	3.8	
15. High level of energy.	Campus (N=278)	42	40	14	4	1	4.1	<0.001
	Distance (N=187)	61	34	5	0	1	4.5	
Instructor Teaching Style								
16. Expects student participation.	Campus (N=277)	75	23	2	0	0	4.7	<0.001
	Distance (N=187)	86	13	1	0	0	4.9	
17. Has appropriate expectations.	Campus (N=278)	26	40	15	14	5	3.7	<0.001
	Distance (N=186)	53	33	10	3	1	4.3	
18. Provides relevance for the information presented.	Campus (N=279)	31	56	10	2	0	4.2	<0.001
	Distance (N=185)	61	35	3	1	1	4.6	
19. Shows genuine concern for my learning.	Campus (N=279)	39	46	10	4	1	4.2	<0.001
	Distance (N=185)	65	33	3	0	0	4.6	
20. Provides different ways to learn the content.	Campus (N=279)	26	44	19	8	3	3.8	<0.001
	Distance (N=185)	45	44	10	2	0	4.3	
Student Related Items								
Student Intrinsic Motivation								
21. I am intrinsically motivated to learn.	Campus (N=282)	44	46	9	1	0	4.3	<0.001
	Distance (N=184)	62	33	6	0	0	4.7	

(Continued)

Table 2. (Continued)

Survey Items	Pathway (N)	Response, % ^a					Score,	P
		SA	A	N	D	SD	Mean	
22. I am highly motivated about the pharmacy program.	Campus (N=280)	51	43	4	2	0	4.4	<0.001
	Distance (N=187)	67	30	3	0	0	4.6	
23. I am highly motivated about the Chem. Basis of Drug Action course.	Campus (N=279)	19	43	23	8	7	3.6	<0.001
	Distance (N=187)	33	43	18	4	1	4.0	
24. I have greater motivation for clinical courses compared to science courses.	Campus (N=280)	37	42	16	4	1	4.1	<0.001
	Distance (N=185)	30	28	29	13	2	3.7	
25. I would like to learn more about the content from this course.	Campus (N=280)	12	32	32	15	9	3.2	<0.001
	Distance (N=186)	21	41	31	4	2	3.8	
Student Vitality								
26. When I am in this class, I feel alive and vital.	Campus (N=281)	12	24	33	20	12	3.0	<0.001
	Distance (N=186)	18	38	34	7	3	3.6	

^aScale responses include: Strongly Disagree (SD)=1, Disagree (D)=2; Neutral (N)=3; Agree (A)=4; Strongly Agree (SA)=5.

and providing different ways to learn content (Table 3). Table 3 also shows that age was a significant factor in all items related to instructor teaching style.

Almost all distance (95%) and campus students (90%) strongly agreed or agreed that they were intrinsically motivated to learn. When asked if they were highly motivated about the pharmacy program, 97% of the distance students and 94% of the campus students strongly agreed or agreed. However, the percentages who strongly agreed or agreed were lower for distance and campus students when asked if they were highly motivated about the Chemical Basis of Drug Action course (76% and 58%, respectively) and whether they had greater motivation for clinical courses compared to science courses (62% and 79%, respectively). Another finding was that only 62% of the distance students and 44% of the campus students indicated that they strongly agreed or agreed that they would like to learn more course content (Table 2). All the comparisons between distance and campus students' responses for all of the above items (Table 2) were significant ($p < 0.001$). Table 3 shows that age was a significant factor (p values ranged from 0.022 to less than 0.001) in all items related to student intrinsic motivation.

When asked about their agreement with the statement, "when I am in this class, I feel alive and vital," 56% of the distance students and 36% of the campus students strongly agreed or agreed with the statement ($p < 0.001$) (Table 2). Age was a significant factor ($p < 0.001$) in the item related to student vitality (Table 3).

Students whose first-year cumulative GPA ranked in the upper 40% of their class GPA had significantly higher evaluation scores for instructor enthusiasm, teaching style, and student intrinsic motivation than those whose GPA ranked in the lower 60% ($p < 0.001$) (Table 4). A significant difference was also seen for the second-year cumulative

GPA with teaching style and student intrinsic motivation. When looking at cumulative GPA for the first 2 years of pharmacy school, students who ranked in the upper 40% had significantly higher evaluation scores for instructor attitude, enthusiasm, teaching style, and student intrinsic motivation items than those whose GPAs ranked in the lower 60% ($p < 0.001$) (Table 4).

Multiple regression analysis between selected predictors such as first-year cumulative GPA, second-year cumulative GPA, age, student related items, female gender, or campus pathway and student course scores revealed the significant factors of second-year cumulative GPA and student-related item scores in predicting student final course scores. The 2 factors were positively associated with course scores. The model p value was < 0.001 and the R^2 (coefficient of determination) was 0.32.

DISCUSSION

In this study, we attempted to identify the impact of instructor-related factors, including attitude, enthusiasm, and teaching style, on both campus and distance students' intrinsic motivation and vitality. Our objective was to improve on the learning experience for all students enrolled in the Chemical Basis of Drug Action course. Prior to this study, the percentage of students choosing strongly agree or agree in response to the 3 statements addressing instructor attitude (Table 2) was in the mid to upper 70% range (data not shown). These percentages have steadily increased, especially over the last 3 years during which time the percentage of students who strongly agreed or agreed improved by as much as 10%. Distance students have always scored these items higher than campus students have and this may reflect the differences in the dynamics of the "classroom" that each group experiences. In the traditional classroom, campus students are challenged to be interactive

Table 3. Percent Response Frequencies, Means and *p* values of Independent *t* Test Based on Age

Survey Items	Age (N)	Percentage					5-point Scale	<i>P</i>
		SA ^a	A	N	D	SD	Mean	
Instructor-Related Items								
Instructor Attitude								
1. The speaker related to me and/or other students in a manner that promoted mutual respect.	≤27 (N=259)	37	48	9	5	1	4.2	<0.001
	>27 (N=211)	56	34	8	2	0	4.4	
2. The speaker demonstrated interest in my success.	≤27 (N=258)	43	41	11	4	1	4.2	<0.001
	>27 (N=211)	66	27	5	2	0	4.6	
3. The speaker demonstrated professionalism in interactions with me and/or other students.	≤27 (N=259)	38	49	9	3	1	4.2	<0.001
	>27 (N=210)	60	32	5	2	0	4.5	
Instructor Enthusiasm (General Items)								
4. Demonstrates a passionate interest in his topic.	≤27 (N=258)	57	32	8	3	1	4.4	<0.001
	>27 (N=207)	73	23	4	0	0	4.7	
5. Demonstrates mastery of his topic.	≤27 (N=256)	52	35	11	1	0	4.4	0.001
	>27 (N=209)	65	30	5	0	0	4.6	
6. Is full of energy when teaching.	≤27 (N=255)	64	31	4	0	0	4.6	0.006
	>27 (N=206)	75	22	2	0	0	4.7	
7. Enhanced my motivation for the pharmacy program.	≤27 (N=255)	23	40	24	10	3	3.7	0.001
	>27 (N=209)	32	44	18	6	1	4.0	
8. Enhanced my motivation for medicinal chemistry.	≤27 (N=255)	22	34	25	13	6	3.5	<0.001
	>27 (N=209)	29	41	21	7	2	3.9	
Instructor Enthusiasm (verbal and non-verbal Signs)								
9. Vocal delivery.	≤27 (N=256)	34	43	13	8	3	4.0	0.07
	>27 (N=208)	42	38	12	6	1	4.1	
10. Vocal volume.	≤27 (N=256)	36	39	11	11	4	3.9	0.005
	>27 (N=210)	44	38	12	5	1	4.2	
11. Facial expressions.	≤27 (N=258)	31	41	22	3	2	4.0	0.20
	>27 (N=210)	31	27	38	2	1	3.8	
12. Apparent emotion.	≤27 (N=255)	35	41	16	6	2	4.0	0.03
	>27 (N=209)	44	37	14	4	1	4.2	
13. Hands and other gestures.	≤27 (N=256)	33	38	20	7	3	3.9	0.16
	>27 (N=207)	29	29	34	5	2	3.8	
14. Observed body gestures.	≤27 (N=252)	32	40	21	5	2	3.9	0.14
	>27 (N=207)	28	29	41	2	1	3.8	
15. High level of energy.	≤27 (N=257)	47	34	14	3	1	4.2	0.01
	>27 (N=208)	55	36	7	1	1	4.4	
Instructor Teaching Style								
16. Expects student participation.	≤27 (N=254)	75	22	3	0	0	4.7	0.001
	>27 (N=210)	85	15	0	0	0	4.9	
17. Has appropriate expectations.	≤27 (N=256)	30	39	15	13	4	3.8	<0.001
	>27 (N=208)	47	37	11	5	1	4.2	
18. Provides relevance for the information presented.	≤27 (N=258)	36	51	11	2	0	4.2	<0.001
	>27 (N=206)	54	39	3	2	0	4.5	
19. Shows genuine concern for my learning.	≤27 (N=256)	43	43	10	2	1	4.3	<0.001
	>27 (N=208)	61	34	4	1	0	4.5	
20. Provides different ways to learn the content.	≤27 (N=257)	30	42	17	8	2	3.9	0.003
	>27 (N=207)	39	44	12	3	1	4.2	
Student-Related Items								
Student Intrinsic Motivation								
21. I am intrinsically motivated to learn.	≤27 (N=259)	44	47	7	1	0	4.3	0.002
	>27 (N=207)	57	38	5	0	0	4.5	

(Continued)

Table 3. (Continued)

Survey Items	Age (N)	Percentage					5-point Scale	P
		SA ^a	A	N	D	SD	Mean	
22. I am highly motivated about the pharmacy program.	≤27 (N=258)	52	41	5	2	0	4.4	0.02
	>27 (N=209)	61	36	3	0	0	4.6	
23. I am highly motivated about the Chem. Basis of Drug Action course.	≤27 (N=257)	21	42	22	8	7	3.6	0.02
	>27 (N=209)	27	43	22	5	3	3.8	
24. I have greater motivation for clinical courses compared to science courses.	≤27 (N=257)	33	46	18	3	1	4.1	<0.001
	>27 (N=208)	30	28	29	12	1	3.7	
25. I would like to learn more about the content from this course.	≤27 (N=257)	13	37	31	11	8	3.4	0.02
	>27 (N=209)	16	38	36	8	2	3.6	
Student Vitality								
26. When I am in this class, I feel alive and vital.	≤27 (N=258)	12	27	32	19	9	3.1	0.001
	>27 (N=209)	14	34	39	10	3	3.5	

^aScale responses include: Strongly Disagree (SD), Disagree (D); Neutral (N); Agree (A); Strongly Agree (SA)=5.

and engaged in the class. However, it is difficult to get all of the students to appreciate this, and some are instead intimidated and negatively interpret this continuous challenge for them to be an active participant in the classroom. As one student expressed, “I have a difficult time in being put on the spot when being asked questions, so that teaching style is difficult to me.”

Distance students on the other hand, do not have that same pressure and in many cases they have shared on the end of class evaluations how they are excited about answering questions posed in the classroom as they watch the video. Also, distance students are older than campus students by an average age of 8.3 years (Table 1). In addition, our results may represent the difference between generations where the majority of campus students are mostly considered generation Y (1980-1994), who are

more comfortable with e-mail and text communication than face-to-face communication²⁰⁻²¹ while the distance students are mostly generation X (1965-1979) who can be fiercely independent, self-directed learners who enjoy question-and-answer sessions.^{20,21} Another factor that could have impacted the results is student bias related to age, with younger students preferring younger professors and older students preferring older professors.²² Overall, our data support this because age was clearly a factor that positively impacted how students perceived instructor attitude (Table 3).

Over the years in which the Chemical Basis of Drug Action course has been taught, the instructor identified and adopted several key behaviors to help students recognize that he was a partner in their learning process and interested in their success, including: (1) mastering the

Table 4. Response Comparisons Between Groups Who Ranked Upper 40% (Group 1) and Lower 60% of GPAs (Group 2)

Survey Questions	(Group 1 mean, Group 2 mean, p value for t Test)			
	^a Pre-GPA	^b CGPA1	^c CGPA2	^d CGPA12
Faculty-related items				
Faculty/instructor attitude	(13.0, 13.0, 0.82)	(12.8, 13.2, 0.09)	(12.9,13.1, 0.20)	(12.8, 13.3, 0.02)
Faculty/instructor enthusiasm	(21.2, 21.1, 0.85)	(20.9, 21.6, 0.03)	(20.9, 21.4, 0.12)	(20.8, 21.7, 0.01)
Faculty/instructor enthusiasm (verbal and non-verbal signs)	(28.2, 28.0, 0.64)	(28.1, 28.2, 0.80)	(28.1, 28.1, 0.97)	(28.1, 28.2, 0.77)
Faculty/instructor teaching	(21.5, 21.4, 0.97)	(21.2, 21.9, 0.02)	(21.2, 21.8, 0.05)	(21.1, 21.9, 0.01)
Student-related items				
Student intrinsic motivation	(20.0, 19.9, 0.70)	(19.7, 20.4, 0.01)	(19.6, 20.5, <0.001)	(19.6, 20.5, <0.001)
Student vitality	(3.3, 3.2, 0.20)	(3.2, 3.3, 0.36)	(3.2, 3.4, 0.36)	(3.2, 3.4, 0.23)

Group 1: Students who ranked upper 40% of their GPAs; Group 2: Students who ranked lower 60% of their GPAs.

^aPre-GPA: prerequisite grade point average.

^bCGPA1: first-year cumulative grade point average.

^cCGPA2: Second-year cumulative grade point average.

^dCGPA12: first and second year cumulative grade point average.

course content; (2) developing different strategies to deliver the content; (3) stating expectations clearly at the beginning of the semester; (4) being a role model in interaction with students; (5) being present in the learning environment whether it is the classroom, online, in the office, or as it happens, in the hallway; (6) ensuring prompt communications with students as logistical or academic issues arise; and (7) responding to concerns by students. These behaviors matched well with some of the principles for good teaching articulated by other authors.^{23,24} However, as shown by the study data, implementing all of the above does not ensure a successful classroom environment and learning experience. Clearly students' perceptions of the overall process are important. Thus, this 3-year study, as well as an ongoing evaluation process, end-of-course evaluations, and input from class officers during the semester are strategies that have been used and will continue to be developed and enhanced to address concerns by both student cohorts regarding these issues outside of the traditional aspects of teaching. The goal is to improve the relationship between the instructor and the students and to enhance the interactive classroom environment.

As a result of some of the concerns identified by students related to instructor attitude, several strategies have been implemented to address this. The first strategy was taking more time at the beginning of each class to review key concepts. The second strategy was implementing an instructional model^{5,25} to help transition the students to a higher level of thinking and interactivity in the class and to decrease the feeling of intimidation from the demands of the in-class time and the perceived energy of the instructor. The third strategy was exhibiting more patience with students and accuracy in gauging when the instructor needs to answer his own questions if there is no response by the students. In support of this, Monteiro and associates demonstrated that the patience, availability, and openness of the instructor had a positive correlation with student academic engagement.²⁶ An instructor answering his or her own questions also ensures that there will not be too much idle time spent waiting for an answer. The idle time resulting from waiting for an answer from the campus students was actually a concern that was shared by some students from both cohorts. Also, both student cohorts and more especially students who were struggling were encouraged to feel comfortable to approach the instructor for help and to take advantage of an open door policy or to make an appointment for a phone call (distance students). The fourth strategy was identifying any signs of frustration or perceived negative language (eg, statements such as "Are you with me?" "Does this make sense?" "I hope you recognize this is not rocket science") for the students' lack of

participation or perceived motivation. This is important so that students are not deterred by such statements or perceive them as unprofessional behavior. This is critical as instructors' perceived misbehavior, including being offensive (eg, verbally abuse, humiliate, embarrass, or insult students) is viewed negatively by students.²⁷ The latter is also important because low motivation among students has been associated with teacher discouragement.²⁸ A fifth strategy was recognizing the importance of not exhibiting any reactions that may be perceived as disappointment or ridicule when a student answers a question incorrectly, and taking time to openly and enthusiastically recognize students when they answer questions correctly or when they demonstrate the ability to connect information and concepts. Recognition is greatly valued by students, especially high achievers. It is one of the criteria they look for in an effective instructor and it serves as a positive reinforcement and motivator for them.²⁶

Gender was not a factor in how students responded on instructor-related items, including instructor attitude, or student-related items. While some studies^{22, 28,29} identified gender bias in how students evaluate instructors, other studies did not.³⁰⁻³² Also some studies found that women are more self-determined in the learning process.^{33,34} Although our gender data did not show such positive findings, it is critical to continue to evaluate gender-related factors and incorporate teaching and learning strategies that have been shown to be effective for both genders, such as use of gender-inclusive language.

The majority of both student cohorts responded positively regarding the general question items related to instructor enthusiasm (Table 2). The written responses showed similar agreement, with the theme of enthusiasm prevalent in many of the students' comments. Thus, the data (Table 2) clearly demonstrate that for the preponderance of students, the apparent enthusiastic attitude of the instructor was a positive factor in their learning. A major aspect of that is the perception by students that the instructor had mastery of the course subject matter. Mastery of the subject in combination with mastery of teaching methodologies are perceived very positively by students and considered as characteristic of the best teachers.^{23,35,36}

In regard to the questions related to instructor enthusiasm based on the verbal and nonverbal behavior of the instructor (Table 2), the difference in the significantly higher response by the distance students to how vocal delivery, apparent emotion, and level of energy influenced their learning, and how the campus students perceived the hand and body gestures slightly more favorably, is likely related to the classroom environment. Campus students may have been more distracted by the instructor's high volume than by his hand and body ges-

tures, which may have been less intimidating or more subtle. A few distance students commented that the instructor clapping his hands to emphasize certain concepts seemed disruptive to them, but the instructor's vocal delivery did not appear to bother them. Thus, student input related to the above issues was instrumental in recognizing that, for some students, verbal or nonverbal demonstrations of enthusiasm may be detrimental to the learning process. As a result, it is important for instructors to monitor their volume and not to sound or appear as if screaming into the microphone or being aggressive and to control any perceived negative emotions that may be distracting or alienating to students.²⁷ However, as suggested by student responses (Tables 2 and 3) and studies in the field of communication, immediate behavior identified by vocal expressions, communicating at a close distance, smiling, engaging in eye contact, and exhibiting body gestures is associated with reducing physical and/or psychological distance between instructor and student and have a positive effect on learning.^{37,38} On the other hand, as discussed above, instructor verbal aggressiveness has been viewed very negatively by the students.^{27,39} Thus, gauging the students is important to ensure that balance exists and that behavior and emotions are not perceived in a negative way. One aspect that has been identified in the literature to be helpful also as part of immediate behavior is humor.^{37,38} Inserting more humor in the handouts (eg, cartoons) and in vocal delivery may also contribute to a more positive experience.^{37,38}

The instructor setting high but appropriate educational expectations, setting them early, stressing such expectations continuously, reevaluating them based on student input, and helping students transition to meet those expectations is critical. Although the majority of students felt the instructor's expectations for students were appropriate, a significant percentage of campus students disagreed or were neutral. This finding may reflect the feelings of students who are not doing as well in the course as they may be concentrating on their grade for the course rather than on meeting the challenge of the instructor, which is to have a deeper understanding of the content. Senko and associates have shown that students who pursue mastery goals favor instructors who stimulate and challenge them intellectually, while those who pursue performance goals favor instructors who present the material clearly and provide clear cues about how to succeed.⁴⁰ Also, challenging assessments are favored by students who are high achievers²⁶ which may explain why the top 40% of students in this study had more favorable responses to all instructor-related items than did other students. Based on the literature that emphasizes the role of the instructor to promote student intrinsic motivation and the development

of deeper approaches to learning,^{23,24,41-43} the instructor should challenge students to a higher level of thinking but with efforts also to adapt the learning process to the needs of all students including students who are performance oriented. This can be accomplished by providing more structured presentations, taking more time to explain concepts, and offering tips for success.^{23,44,45}

Overall, the majority of both student cohorts and age groups (Tables 2 and 3, respectively) recognized the efforts done to explain the relevance of the information presented. In fact, Ismail and Hayes showed that course topics that are difficult to make relevant or fun can negatively influence motivation.⁴⁶ Some of the students mentioned including test questions based on patient cases on examinations and relating chemistry to clinical practice in lectures as helpful ways in which the instructor showed the clinical relevance of the course.

As stated above, the combination of mastery of subject and mastery of instructional methodologies are identified as key characteristics of the best instructors.^{36,41} Thus, over the years, several mechanisms were developed to help students explore new and different ways to learn the content and the effectiveness of these different mechanisms continues to be evaluated.¹⁻⁶ The importance of having different ways to learn course content is supported by the literature^{36,41} and by students' written comments, in which they mentioned the various teaching tools used such as interactive PowerPoint slides, Softchalk lessons, and short video reviews prepared by the instructor.

While over 90% of both the distance and campus students responded that they were intrinsically motivated to learn and were highly motivated about the pharmacy program, there was much less motivation for taking the Chemical Basis of Drug Action course and learning its content, especially among campus students (Table 2), 75% of whom had greater motivation for clinical courses. Similar data were observed based on age (Table 3). The lack of student motivation is always an issue with science courses taught in a health sciences professional program, especially when instructors do not try to make their courses relevant for their students.^{47,48} Instructor enthusiasm has been identified as an external catalyst for the intrinsic motivational energy that may be lying dormant within students.⁹⁻¹² It is even more critical when teaching college students as many of them are used to a system of external incentives (eg, grades). The combination of a positive student perception of instructor attitude, enthusiasm, and teaching style appears to make a difference in students' overall perception of their learning experience in the course, as is demonstrated by the high correlation of the student-related items with the instructor-related items (Fig-

ure 1). However, work still needs to be done to improve overall student interest in medicinal chemistry as a discipline and its importance in pharmacy students' overall understanding of drug action.

Science instructors in professional health sciences degree programs may need to address students' lack of interest in basic science courses more, not only in the classroom but possibly during student orientation, by giving, for example, seminars on opportunities for graduate education and by stressing the value of obtaining both a PharmD and a PhD degree. It is also important for instructors to work and communicate with other science and clinical instructors to explain the relevance of medicinal chemistry by incorporating aspects of drug structure and the science behind it into their teaching of drug action and drug clinical use. However, while establishing the clinical relevance for learning medicinal chemistry is important, science instructors should not "dilute" their discipline. Medicinal chemists must not take the chemistry out of medicinal chemistry. Doing so to placate a minority of students would be an injustice to the majority of students who enjoy chemistry and appreciate its role in pharmacy – a view that has been expressed by many students. Also, student comments related to the lack of relevance of the course or that medicinal chemistry should not be in the curriculum have decreased dramatically and more positive comments related to the importance of the knowledge gained in this course have increased.^{5,13} This is more evident in the last 2 years with a purposeful attempt by both the medicinal chemistry course instructor and the pharmacology instructors to synchronize the content of the 2 courses. This is also supported by the association between student intrinsic motivation and course score and is reinforced by the multiple regression analysis, which as discussed above, showed that the second-year cumulative

GPA and student-related item scores predicted student final course scores. This finding will certainly be shared with students in future classes to encourage them to be more open minded about the course, their experience in the course, and their overall responsibility for their learning.

Intrinsically motivated behavior is performed simply for the pleasure inherent in the activity itself,⁴⁹ occurs in the absence of rewards or reinforcements,⁵⁰ and is characterized by the experience of interest, enjoyment, and curiosity.¹¹ Intrinsic motivation is empirically linked to achievement test scores and report card grades⁵¹ and positive emotions in school.^{10,52} The literature identifies supporting self-determination/autonomy^{49,50} and promoting perceived competence^{49,50} as 2 critical components in fostering intrinsically motivated behavior in students. In contrast, research describes individuals exhibiting "amotivation" as not being able to complete or value an activity, having no sense of purpose, or exhibiting feelings of incompetence or learned helplessness.⁵³ The literature further identifies providing autonomy to the students in respect to choices and decisions about their study with high levels of intrinsic motivation.^{49,50} A summary of more specific strategies to support the above findings from the literature are also included in Appendix 1 and will be continuously evaluated.

The low percentages of students who strongly agreed or agreed with the student-related items (Tables 2 and 3, question 22) clearly indicate that much effort is needed to help both student cohorts become more energetic about being in the course and studying medicinal chemistry. However, although vitality is linked to intrinsic motivation, enthusiasm is identified as a behavioral manifestation of intrinsic motivation while vitality is a subjective one,¹¹ and many other factors may affect it; thus, it is

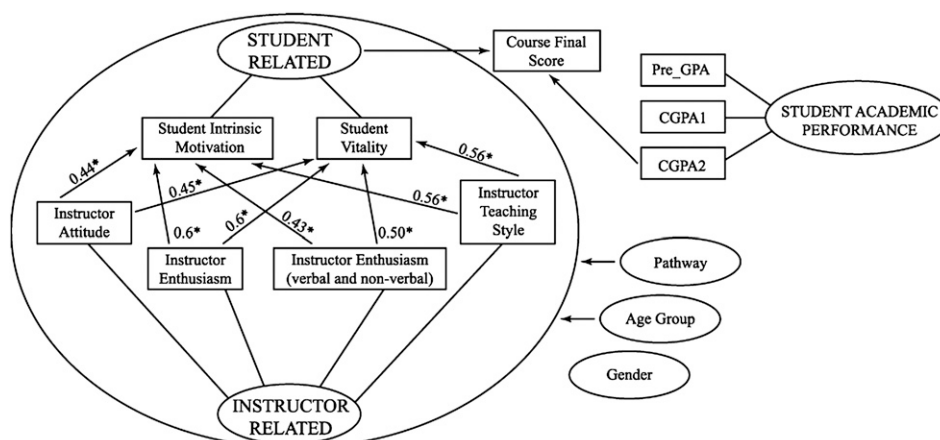


Figure 1. Schematic illustration of study findings. Values represent Pearson's r correlation coefficients (* $p < 0.001$) between faculty and student related items. Pre-GPA (Pre-requisite Grade Point Average), CGPA1 and CGPA2 (Cumulative Grade Point Average academic year 1 and academic year 2, respectively). Gender did not show correlation to any of the variables.

much more difficult to influence. For example, some students may have fear of chemistry, which they may carry with them into the professional program. However, depending on the extent of such an attitude, it is very difficult to rid students of it, and this attitude will reflect on their level of energy and enthusiasm in the classroom. Other factors that could affect students' vitality could be workload in the respective semester and personal issues. While assessing congruence between credit hours per semester and the amount of work required for each course based on its allocated credit hours and addressing any personal issues that arise is important, these efforts may be delayed and may not completely address the impact of workload and personal issues on students' vitality. Efforts to coordinate a master examination schedule, limit the number of examinations within a week, establish policies that are sensitive to legitimate personal student issues, and to evaluate courses after they are offered and make recommendations to the curriculum committee to improve on for the next offering can be helpful. Also, this emphasizes the importance of the instructor-related items since all have been shown to positively enhance student intrinsic motivation and student vitality (Figure 1).

While our study addressed many factors that affect the learning process for students, many other factors may also be in play that have not been directly addressed in this study. These include the ethnic background of the students and instructor, cultural values and beliefs of the students and the instructor, learning style of the students, and the difficulty of the course. Also, this study did not show a causal relationship between some of the variables but rather a correlational one (Figure 1). In addition, the study depended on self-reporting by the students. Further, we did not attempt to measure students' motivation and vitality at the beginning of the course or to control for any of the instructor-related factors tested in this study. Finally, our data were obtained from college students enrolled in a medicinal chemistry course in a private professional school in the United States and are specific to one course instructor; therefore, some findings may not be transferable to other instructors. Our results do not prove, for example, that an instructor who is low key, soft-spoken, and demonstrates a low level of enthusiasm is not an effective teacher. Nonetheless, our study is a 3-year study with a large sample size, and it provides unique results related to distance and campus students in a professional pharmacy program. In addition, the findings related to student factors are important in light of the new CAPE Educational Outcomes 2013, which emphasize the affective domain aspects of students' personal and professional growth.¹⁷ Further, Figure 1 data may lend support that faculty enthusiasm items (which

demonstrate the highest correlation with student intrinsic motivation and vitality) may be a catalyst for all other factors to fit in place, establish a healthy faculty-student relationship, and improve student learning.

CONCLUSION

While this study does address the importance of content mastery and instructional methodologies, it focuses on issues related to instructor attitude, instructor enthusiasm, and teaching style, which all were shown to play a critical role in the learning process. Thus, instructors have a responsibility to evaluate, re-evaluate, and analyze the above factors to address any related issues that impact the learning process, including their influence on professional students' intrinsic motivation, vitality, and ability to meet educational outcomes.

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Appendix I. Course Specific Strategies to Support Components of Intrinsic Motivation for Students

Intrinsic Motivation Component	Course Specific Strategies to Achieve
1. Supporting of self-determination	<ul style="list-style-type: none">● Conduct pre-assessment quiz to prepare for the classroom session.● Provide interactive classroom session.● Provide several active learning exercises on the course website and in the in-class interactive PowerPoint presentations.● Provide interactive Softchalk lesson handout with learning activities.● Encourage use of analogies (e.g. food analogy exercise and structure activity relationship).● Encourage students to write own innovative short story related to the content being taught (eg, The magnificent penicillins, The Town of Neurotransmitoron, The Attack on Muskelopolis, The Tale of Aminoglycosides).● Encourage students to write their own take home message.● Encourage students to find the clinical relevance of what is being taught.● Help students characterize what they are learning by utilizing strategies based on Krathwol Taxonomy.⁵³
2. Promotion of perceived competence	<ul style="list-style-type: none">● Encourage notion of faculty member as a facilitator/partner in the learning process.● Help the students transition to the higher level of thinking required in this course.<ul style="list-style-type: none">Provide a standardized lesson handout based on Bloom's and Krathwol's Taxonomy.⁵³Challenge students to answer questions in classroomChallenge students to answer their own questions in the classroom, online, and in face-to-face and virtual review sessions.Provide practice exams and case studies.Challenge the students to write an original case study for the exam.Provide student answers as key answers for questions on the exam.Provide constructive comments on assignments and exams.