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Research

An Examination of Mandatory Class Attendance and Academic Performance in a PharmD Program

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ABSTRACT

Objective: This study examined the relationship between a mandatory attendance policy (MAP) and grade point average (GPA), grade distribution, and course failures in a PharmD program. Student adherence to the MAP was also analyzed.

Methods: A MAP was implemented in the 2021-2022 academic year. Pre- and post-MAP course grades were collected retrospectively, along with post-MAP attendance records and violations for MAP nonadherence. Due to curricular revisions, grade analyses were restricted to the first and third years.

Results: Analysis of covariance revealed significant main and interaction effects of MAP and curriculum on unweighted GPA. Specifically, unweighted third-year GPA increased by 0.21 points post-MAP, while unweighted first-year GPA increased by 0.11 points. The MAP had a greater impact in the third year than in the first, as indicated by the significant interaction effect. For weighted GPA, analysis of covariance revealed a significant main effect for MAP but no significant main effect for curriculum or interaction effect. Specifically, the aggregate first- and third-year weighted GPA increased significantly by 0.14 GPA post-MAP. For final grades in third-year courses, the failure rate decreased significantly from 1.04% pre-MAP to 0.31% post-MAP, and likewise for first-year courses, from 3.14% pre-MAP to 1.73% post-MAP. Grade distributions improved at both the upper and lower ends post-MAP. Student adherence to the MAP in the 2 academic years following its implementation ranged from 93.2% in fall 2021 to 79.6% in spring 2023.

Conclusion: The implementation of a MAP warrants consideration by schools and colleges of pharmacy seeking to improve students' academic performance.

1. Introduction

Today's pharmacy schools are challenged to educate students whose academic backgrounds are less robust than those of past matriculants.[1] The decline in students' academic skills has been attributed to grade inflation at the high school and college levels, exacerbated by the COVID-19 pandemic.[2–4] Adding to the challenge, many students are unaware that they are ill-prepared.[5] As a result, many schools of pharmacy have implemented academic assistance strategies, such as bridging courses for entering students and peer tutoring programs.[6,7] The study describes the use and evaluation of a mandatory attendance policy (MAP) for student pharmacists to enhance their academic performance, defined as final course grades. Final course grades provide a more comprehensive assessment of learning and achievement than a single examination score. While a single examination is just one aspect of academic performance, prior research in pharmacy education has predominantly focused on the relationship between class attendance and performance on such examinations.[8,9]

In response to the COVID-19 pandemic and uncertainties regarding associated health risks, universities transitioned to online course delivery in spring 2020. Mercer University moved to online instruction from March 2020 to May 2020 (ie, one-half of the spring 2020 semester). Many institutions of higher education faced the difficult decision of whether to return to traditional in-person course delivery, continue online instruction, or adopt a hybrid format for fall 2020 and the full academic year (AY) 2020–2021.

Consistent with Mercer University's decision to resume in-person instruction after May 2020, the Mercer University College of Pharmacy

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(MUCOP) maintained its in-person format for all required courses in the PharmD program while implementing safeguards, including socially distanced seating and masking. Courses were live-streamed for students who tested positive for COVID-19 and required isolation or were awaiting test results. Audio and video recordings of all class sessions—a long-standing study aid at MUCOP—remained available to all students during this period.

During AY 2020–2021, as in prior years, the MUCOP Student Handbook defined attendance as a student's professional responsibility. However, class attendance was not formally monitored, nor was it a component of a student's course grade. Faculty observed a significant decline in overall class attendance with many students—despite having no COVID-related issues—choosing to access courses via live-stream rather than attending in person. Anecdotal reports indicated that in-person attendance in didactic required courses dropped as low as 15% to 20% of total enrollment, with the most significant declines occurring in the second and third professional years. Faculty also noted declining course performance, which they attributed to decreased class attendance. As a result, interest in the implementation of a MAP grew among faculty members.

A meta-analysis conducted by Credé and colleagues[10] demonstrated a strong positive relationship between college class attendance and academic performance, including course grades and grade point average (GPA). Additionally, Credé and colleagues'[10] meta-analysis of studies with mandatory attendance policies found that course grades increased when a MAP was in place.

Studies in the health professions have examined the relationship between attendance and academic performance, primarily in medicine, nursing, and pharmacy.[8,9,11–16] Studies in medicine, conducted by Laird-Fick and colleagues[11] and Salzman and colleagues,[12] demonstrated a positive association between class attendance and examination grades. In nursing, studies by Doggrell,[13] Mackintosh-Franklin,[14] and Branson and colleagues[15] demonstrated a positive association between class attendance and examination grades, course activities, and final course grades, respectively.

A study by Ta and colleagues[8] noted that student pharmacists who regularly attended class in an active-learning-based pharmacotherapy curriculum had better examination outcomes compared to those who did not regularly attend class. Persky and colleagues[16] measured faculty and student perceptions of classroom attendance at 6 schools of pharmacy. Both faculty and students agreed that the more classes students attended, the higher their grades would be. In schools without attendance policies, more faculty than students felt that an attendance policy was needed.[16]

Schnee and colleagues[9] examined student use of online video recordings in relation to class attendance and exam performance. Specifically, student pharmacists who attended class performed significantly better than those who did not attend and instead relied on recorded lectures as their primary method of content delivery. In addition, the research revealed no significant difference in exam performance between class attenders who did and did not view the video recordings.[9]

Effective AY 2021–2022, MUCOP implemented an in-person MAP for required courses in the PharmD program. The key components of the MAP included: (1) Students were required to attend at least 80% of learning activities associated with required courses, including scheduled classes, laboratories, examinations, and practice experiences. (2) Attendance was tracked using student identification card reader technology. (3) Students missing 20% or more of all learning activities in a course, regardless of the reason, were considered in violation of MUCOP's Student Code of Professional Conduct. The 20% threshold provided an allowance for unforeseeable events that could cause delays or absences. (4) Absences from any course activity with a point value had to be excused by the course coordinator in order to be made up. (5) MUCOP continued to provide audio and video recordings of all learning activities as a study tool, provided that class cohort attendance remained at 80% or higher. If class cohort attendance fell below 80% for any learning activity, the corresponding lecture-captured video recording was withheld from the cohort until attendance returned to 80%; however, audio recordings remained available. Given that the audio recordings lacked visual resources (eg, slideshows and document camera images), they were considered less desirable.

The objectives of this study were to determine (1) whether there was an association between the MAP and course grades in required courses of the PharmD program, (2) whether the percentage of course failures changed after the implementation of the MAP, (3) the overall distribution of course grades before and after the implementation of the MAP, and (4) student adherence to the MAP.

2. Methods

We conducted retrospective data collection of course grades in required didactic courses, pre and post-implementation of the MAP. The didactic courses followed an approximate 80% lecture and 20% active learning format, consisting of team-based learning. Experiential and laboratory courses were not included because they did not have the observed attendance problems. Students had to be present in experiential and laboratory class sessions to complete hands-on activities in order to receive credit. Elective courses were also excluded because the MAP pertained only to required courses.

Course grade comparisons were limited to the first and third professional years because MUCOP was in the process of phasing out a legacy curriculum and implementing a renewed curriculum. In the first and third professional years, the curriculums taught were replicated pre- and post-MAP. Second professional year courses were excluded from the course grade analyses because the legacy curriculum was introduced pre-MAP and the renewed curriculum was taught post-MAP.

In the third professional year, the legacy curriculum was taught pre-MAP and for 1-year post-MAP (AY 2021–2022). Analyses of third professional year course grades included 1 year of pre-MAP grades (AY 2020–2021) from 134 students and 1 year of post-MAP grades from 122 students (AY 2021–2022). Grades from 9 third-year courses totaling 30 credit hours were included in the analyses. (The legacy curriculum prior to AY 2020–2021 differed slightly from that of the comparison years and was therefore not included in the analyses.).

In the first professional year, the renewed curriculum was taught for 1 year pre-MAP (AY 2020–2021) and, at the time of data collection, for 2 years post-MAP (AY 2021–2022 and AY 2022–2023). Analyses of first professional year course grades included 1 year of pre-MAP data from 117 students and 2 years of post-MAP data from 152 students, which were combined to increase statistical power and improve the precision of effect size estimate. Grades from 10 first-year courses totaling 34 credit hours were included in the analyses.

Using the University-published quality point values for interpreting letter grades, grades of A were assigned a value of 4; B+ was 3.5; B was 3; C+ was 2.5; C was 2; and F was 0. The MUCOP grading scale did not include a grade of D. For both professional years examined—first and third—weighted and unweighted GPAs were computed pre- and post-MAP for grades earned by all students collectively in the cohort. In addition, aggregate GPAs were computed using grades from both the first and third years, pre- and post-MAP.

The following analyses were conducted for both weighted and unweighted GPAs. Analysis of covariance (ANCOVA) was used to test for an interaction between curriculum year and MAP using aggregate GPA (ie, combined first- and third-year data). Within each curriculum year, independent samples *t*-tests were used to compare the mean GPAs pre- and post-MAP, and effect sizes were reported in terms of differences in GPAs as well as Cohen's *d* (ie, SD units).

The χ^2 tests were used to compare the number of failing grades (ie, Fs) pre- and post-MAP. Frequency counts were used to generate bar graphs illustrating the overall distribution of grades.

Course grade data compared pre- and post-MAP for a professional year came from different cohorts of students. The χ^2 and independent

samples *t*-tests were used to test for significant differences in demographic characteristics between the comparison cohorts.

Data from the first, second, and third professional year students and courses were used to examine student adherence to the MAP over 2 years. These analyses included 630 students enrolled in 30 courses in AY 2021–2022 and 564 students enrolled in 32 courses in AY 2022–2023. Chi-square and Fisher's exact tests were used to examine significant changes across semesters and AYs in the number of student MAP violations and in the number of courses where attendance dropped below 80%.

Analyses were conducted using STATISTIX 10.[17] Statistical significance was set at $p < .05$ for all tests. The Mercer University Institutional Review Board approved the study, indicating it was exempt from further review.

3. Results

3.1. Demographic Characteristics

Demographic data examined included undergraduate GPA, age at matriculation, possession of a four-year degree at matriculation, gender, and race/ethnicity. The demographics did not differ significantly between the comparison cohorts of third-year students or between the comparison cohorts of first-year students (Table S).

3.2. Unweighted GPA

An ANCOVA performed on unweighted GPAs revealed significant main effects and interaction effects of the MAP and curriculum year (Table 1). For the unweighted third-year GPA, there was an increase of +0.21 GPA points ($p < .001$) after the implementation of mandatory attendance, which corresponds to one-third of a SD improvement (Cohen's $d = 0.33$) (Table 2). The unweighted first-year GPA increased by 0.11 GPA points ($p < .001$) from pre- to post-MAP, amounting to approximately one-eighth of a SD improvement ($d = 0.13$) (Table 2). The effect of the MAP in the third-year curriculum was significantly greater than in the first-year curriculum, as indicated by a significant interaction in the ANCOVA. In summary, the MAP led to a significant improvement in unweighted GPA in both the first and third years of the curriculum, with a greater impact in the third year.

3.3. Weighted GPA

An ANCOVA performed on weighted GPAs revealed a significant main effect of the MAP (Table 1). The weighted overall GPA for both the first-year and third-year curriculums increased by 0.14 GPA points post-MAP ($p < .001$), corresponding to a one-ninth SD improvement ($d = 0.11$) (Table 2). The interaction effect between the MAP and curriculum year fell short of statistical significance ($p = .06$) (Table 1). Thus, the effects of MAP on weighted GPA across the first and third curriculum years were not statistically different; however, for completeness, estimates of the effect within each group are provided (Table 2). The weighted third-year GPA increased by 0.24 GPA points post-MAP ($p < .001$), representing approximately one-fifth of a SD improvement ($d = 0.21$). In the first year, while not statistically significant, the weighted GPA increased numerically from 3.12 pre-MAP to 3.20 post-MAP ($d = 0.06$, $p = .14$).

3.4. Course Grades

Course failures were significantly fewer post-MAP. For final grades in all third-year courses, the number of failures decreased significantly from 12 (1.04%) pre-MAP ($n_{grades} = 1154$) to 3 (0.31%) post-MAP ($n_{grades} = 977$), ($x^2 = 4.06$, $df = 1$, $p = .04$). For final grades in all first-year courses, the number of failures decreased significantly from 35 (3.14%) pre-MAP ($n_{grades} = 1114$) to 26 (1.73%) post-MAP ($n_{grades} = 1507$), ($x^2 = 5.65$, $df = 1$, $p = .02$).

The Figure illustrates the grade distribution for third- and first-year courses pre- and post-MAP. Changes in 1 grade category can obscure or amplify movements in other grade categories, so overall trends are more informative. The grade distribution for both third- and first-year courses post-MAP improved at both the upper and lower ends, as reflected in higher percentages of A and B+ grades and lower percentages of F grades.

3.5. Adherence to the MAP

Overall adherence to the MAP among first-, second-, and third-year students in the 2 AYs post-MAP was high, ranging from 93.2% in the fall semester of 2021 to 79.6% in the spring semester of 2023 (Table 3). Within each AY, the percentages of MAP violators increased significantly from fall to spring semesters, but overall adherence remained high. For the first AY post-MAP (AY 2021–2022), the percentage of students committing MAP violations increased significantly from 6.8% in the fall semester to 12.6% in the spring semester ($x^2 = 6.40$, $df = 1$, $p = .01$), with adherence dropping from 93.2% to 87.4%. Similarly, in the second AY post-MAP (AY 2022–2023), the percentage of students committing MAP violations increased significantly from 8.0% in the fall semester to 20.4% in the spring semester ($x^2 = 17.66$, $df = 1$, $p < .001$), with adherence declining from 92.0% to 79.6%. The percentage of students committing MAP violations did not differ significantly between the fall semester 2021 and fall semester 2022 ($x^2 = 0.32$, $df = 1$, $p = .57$), and adherence remained high at 93.2% and 92.0%, respectively. However, comparing spring semesters 2022 and 2023, the percentage of students committing MAP violations increased significantly by 7.8% ($x^2 = 7.01$, $df = 1$, $p = .008$), though adherence remained relatively high 87.4% and 79.6%, respectively.

The number of times video recordings were withheld in the 2 AYs post-MAP due to overall cohort nonadherence to the MAP, as well as the percentage of courses affected remained stable. Video recordings

Table 1
Analysis of Covariance to Measure the Effect of MPA, Curriculum Year, and their Interaction on Grade Point Average.

XXX		Unweighted grade point average[a]			Weighted grade point average[b]		
Source	*df*	MS	*F*	*p*	MS	*F*	*p*
MAP	1	30.97	54.19[c]	< .001	328.64	17.17[c]	< .001
Curriculum year[d]	1	5.29	9.25[c]	.002	1.19	0.06	.80
MAP x Curriculum year[d]	1	2.47	4.31[c]	.04	65.93	3.44	.06
Within	4748	0.57			19.15		
Total	4751						

Abbreviations: MAP, mandatory attendance policy; MS, Mean Square.
[a]Unweighted grade point averages are based on grades only.
[b]Weighted grade point averages are based on course grades and course credit hours.
[c]Significance at the *p* value indicated.
[d]Two curriculum years were included in the analysis, the third professional year and the first professional year of the PharmD program.

Table 2
Comparison of Mean GPA Before and After Implementation of Mandatory Attendance.

Curriculum year[a]	GPA calculation[b]	Pre-MAP N_{grades}[c]	Mean (SD) GPA	Post-MAP N_{grades}[c]	Mean (SD) GPA	*df*	*t*-value	*p*	Cohen's *d*
Third	Unweighted	1154	3.13 (0.68)	977	3.34 (0.59)	2127.7	7.64[d]	< .001	0.33
First	Unweighted	1114	3.11 (0.88)	1507	3.22 (0.81)	2248.4	3.50[d]	< .001	0.13
Third and first	Unweighted	2268	3.12 (0.78)	2484	3.27 (0.73)	4636.6	6.86[d]	< .001	0.20
Third	Weighted	1154	3.09 (1.15)	977	3.33 (1.21)	2129	4.59[d]	< .001	0.21
First	Weighted	1114	3.12 (1.24)	1507	3.20 (1.34)	2486	1.46	.14	0.06
Third and first	Weighted	2268	3.11 (1.31)	2484	3.25 (1.29)	4750	4.04[d]	< .001	0.11

Abbreviations: GPA, grade point average; MAP, mandatory attendance policy.
[a]The third year curriculum included 9 courses totaling 30 credit hours. The first-year curriculum included 10 courses totaling 34 credit hours.
[b]Unweighted GPAs are based on course grades only. Weighted GPAs are based on course grades and course credit hours.
[c]*N* refers to the number of grades used to compute a mean GPA for the entire cohort enrolled in the curriculum year indicated
[d]Significance at the *p* value indicated.

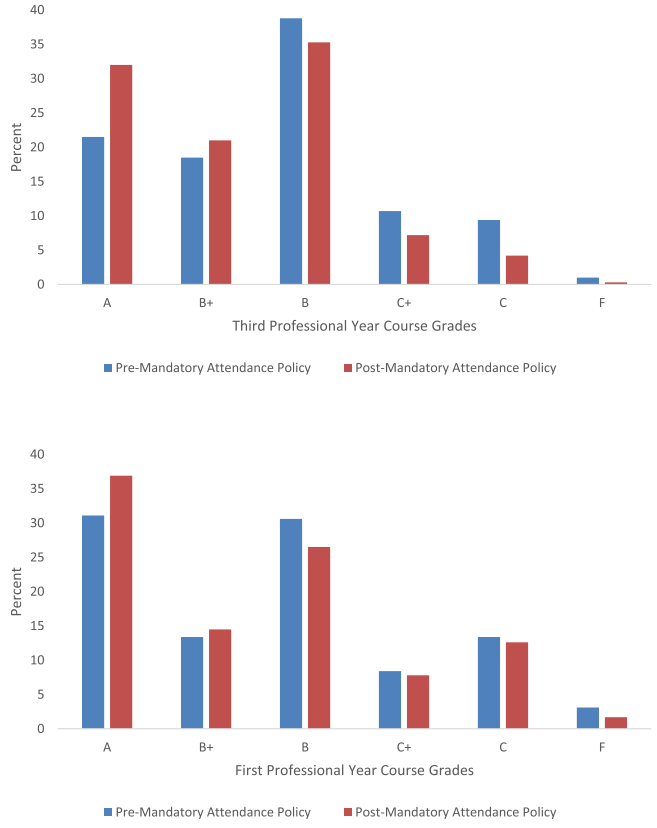

Figure. Percentage of course grades pre and post-mandatory attendance policy.

were withheld 13 times in the fall semester of 2021, 7 times in the fall semester of 2022, and 10 times in each spring semester (2022 and 2023). The percentage of courses affected ranged from 37.5% in the spring semester of 2022 to 17.6% in the spring semester of 2023. The percentage of courses affected did not increase significantly from the fall to spring semesters within each AY and did not increase significantly across the 2 AYs in either the fall or spring semesters (Table 4).

4. Discussion

The reduction in course failures post-MAP, the overall improvement in grade distributions post-MAP, and the increase in GPAs post-MAP provide support for the implementation of the MAP. Our findings were consistent with those of Credé and colleagues,[10] whose meta-analysis found that MAPs had a positive impact on average grades. The significant improvements in GPAs demonstrated in our study should be appreciated within the given research context—education.[18] Effect sizes of this magnitude can have practical significance for students and educators, particularly in terms of retention rates, scholarships, postgraduate residencies, honor society memberships, and other opportunities that include GPA as a criterion.

MUCOP first-year student pharmacists display fairly good class attendance, which tends to decline as students progress through the didactic curriculum. This attendance pattern was observed in our program pre-MAP and has also been documented by Gardner and colleagues[19] in their study of in-person lecture attendance among medical students. The first year of our curriculum is primarily foundational to the second- and third-year courses. These later courses are more complex and integrate medicinal chemistry, pharmacology, and therapeutics around organ systems and disease states. Simply put, the third-year curriculum is more challenging than the first-year

Table 3
Number of Pharmacy Students[a] Who Violated[b] the MAP.

Semester	First academic year Post-MAP 2021–2022			Second academic year Post-MAP 2022–2023			XXX
	N	Students violating MAP *n* (%)	Students adhering to MAP *n* (%)	*N*	Students violating MAP *n* (%)	Students adhering to MAP *n* (%)	Comparison of first and second academic years
Fall	338	23 (6.8)	315 (93.2)	275	22 (8.0)	253 (92.0)	$x^2 = 0.32$, $df = 1$, $p = .57$
Spring	292	42 (12.6)	292 (87.4)	289	59 (20.4)	230 (79.6)	$x^2 = 7.01$,[c] $df = 1$, $p = .008$
Comparison of Fall and Spring semesters		$x^2 = 6.40$,[c] $df = 1$, $p = .01$			$x^2 = 17.66$,[c] $df = 1$, $p < .001$		

Abbreviation: MAP, mandatory attendance policy.
[a]Students included all PharmD students enrolled in the first 3 professional years of the four-year program.
[b]Students whose attendance dropped to 80% or below in a course violated the MAP.
[c]Significance at the *p* value indicated.

Table 4
Number of Pharmacy Courses[a] Where Video Recordings Were Withheld[b] Following Implementation of the MAP.

Semester	First academic year post-MAP 2021–2022			Second academic year post-MAP 2022–2023			
		Courses where video recordings withheld	Courses where video recordings not withheld		Courses where video recordings withheld	Courses where Video recordings Not withheld	Comparison of first and second academic years[c]
	N	*n* (%)	*n* (%)	*N*	*n* (%)	*n* (%)	
Fall	14	4 (28.6)	10 (71.4)	15	4 (26.7)	11 (73.3)	$p = 1.00$
Spring	16	6 (37.5)	10 (62.5)	17	3 (17.6)	14 (82.4)	$p = .26$
Comparison of Fall and Spring semesters[c]		$p = .71$			$p = .68$		

Abbreviations: MAP, mandatory attendance policy.
[a]Courses included all required PharmD courses in the first 3 professional years of the four-year program.
[b]If class cohort attendance fell below 80%, the video recording was withheld from the cohort until attendance returned to 80%.
[c]Fisher exact test, two-tailed comparison.

curriculum. Thus, lower pre-MAP attendance and greater course rigor may explain why the MAP had a greater impact on the third year compared to the first year when analyzing unweighted GPA and why it was associated with a significant increase in third-year weighted GPA.

Our study supports the notion that factors present during in-person class attendance aid learning. Such factors include the opportunity for direct, face-to-face instructor-student interaction about course content during and after class, face-to-face peer interaction that can foster spontaneous collaborative learning, enhanced attention due to a controlled classroom environment, and the motivation to learn that can result from building in-person relationships with instructors and classmates.[20] In addition, these factors can contribute to a student's development of their professional identity.

While the majority of individual students and class cohorts adhered to the MAP, the rise in spring semester absenteeism compared to the fall semester was consistent with faculty observations prior to the implementation of the MAP. Campbell and colleagues[21] reported a similar rise in spring semester absenteeism among students in undergraduate medical education. Newman-Ford and colleagues[22] documented a decline in attendance over the AY for undergraduate students and proposed likely reasons for the decline, including assessment demands, excessive workload, and stress. Skoglund and colleagues'[23] research identified some of the reasons given for PharmD student absenteeism: the commute, early morning class, and work/family obligations. Earlier research by Westrick and colleagues[24] identified 2 main factors for PharmD student class absenteeism, namely working on assignments or studying for tests for other courses and obtaining course content from other sources. Other factors they identified as influencing absenteeism to a lesser extent included illness, tiredness/oversleeping, attendance not impacting course grades, and low course difficulty.[24]

Paradoxically, if MUCOP students who missed class instead attended, they would be in proximity to on-campus resources designed to assist with many of the reasons for absenteeism. These resources include health and psychological services, wellness programs, physical fitness facilities, academic support services, and student care services, including housing, financial aid, and referrals to community resources for various social services.

Students whose personal absenteeism rate exceeded 20% were found to be in violation of the MAP and MUCOP's Professional Code of Conduct. When this occurred, students were sanctioned with 1 or more of the following: a professionalism warning, a written reflection assignment related to the infraction, or professional probation. Students on professional probation were ineligible to run for office or serve as an elected or appointed leader, attend professional meetings and conferences, or be inducted into honor and leadership societies. Usually, a professional code of conduct sanction was sufficient to deter repeat offenses. In cases where a student did commit a repeat offense, sanctions typically increased in severity.

The overall consistency in the percentage of courses where video recordings were withheld due to lack of attendance and the decrease, though not statistically significant, in these percentages from spring 2022 to spring 2023 was likely due to cohorts managing member attendance through encouragement from cohort leadership and peers to ensure that overall cohort attendance did not fall below the 80% threshold.

When video recordings were withheld from a cohort, high attenders suffered sanctions along with low attenders, which became a source of contention and complaint among students and some faculty members. Due to students' ability to share videos, we were unable to identify a consistent and fair means by which we could withhold video recordings from individual MAP violators while simultaneously distributing them to those in compliance. Future research into MAPs should examine thresholds other than 80% in terms of both student adherence and academic performance.

Colleges considering a MAP should note that lack of technology (eg, card readers) can be a potential barrier to implementation. Our students used mobile identification cards, which allowed them to tap their smartphones on the reader. Given that students intending to miss class would be reluctant to give their phones to a classmate, we were confident in the accuracy of the attendance data collected. In the absence of card reader technology, alternate methods of recording attendance, such as in-class electronic quizzes, can be employed and contribute to overall course grades. Recording and monitoring student attendance is time-consuming despite the use of technology. Staff members can be enlisted to assist with processing the collected data. Infrequently, delays of up to a week occurred in the imposition of sanctions on cohorts and individual students. Immediate sanctions might have had a greater effect.

Other academic benefits to the MAP were noted, including proactive communication from students to faculty about attendance, and fostering greater student accountability. Students who knew they were going to be absent from class typically communicated this in advance, with supporting documentation. Nonacademic benefits of the MAP were also observed, including increased student socialization and a heightened sense of community on campus due to the presence of students.

This study had several limitations. It was conducted as a single school of pharmacy within courses that followed an approximate 80% lecture and 20% active learning format, limiting its generalizability to other programs and course structures. Due to curriculum changes, findings could not be assessed longitudinally for repeated validity. The lower academic performance of students in 2020–2021 may have been associated with the COVID-19 pandemic. Some students may have been experiencing pandemic-related stressors and negative effects, including illness, isolation, mental health challenges, and illness among family and friends, among others.[25] While comparison cohorts were found to

be similar in terms of demographic characteristics, other differences may have been present. Competing explanations for the findings could not be controlled for, and therefore causality was not established.

5. Conclusions

Among PharmD students, a MAP with an 80% attendance threshold for both individuals and class cohorts was associated with improved academic performance, as reflected in the overall distribution of grades, a reduction in failing grades, and an increase in GPAs. Adherence to the MAP was high for both individual students and class cohorts but declined over time. The implementation of a MAP warrants consideration by schools and colleges of pharmacy seeking to improve students' academic performance.

Author Contributions

Conceptualization, methodology, validation, investigation, resources, data curation, writing – original draft, writing – review and editing, visualization, project administration: C.L.W. *Conceptualization, methodology, validation, formal analysis, resources, data curation, writing – original draft, writing – review and editing, visualization, supervision, project administration*: C.W.B. *Methodology, validation, formal analysis, resources, visualization, writing – original draft, writing – review and editing:* A.P.B.

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Declaration of Competing Interest

None declared.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ajpe.2025.101389.

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