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Class Attendance in College: A Meta-Analytic Review of the Relationship of Class Attendance With Grades and Student Characteristics

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*A meta-analysis of the relationship between class attendance in college and college grades reveals that attendance has strong relationships with both class grades (*k = *69,* N = *21,195,* ρ = *.44) and GPA (*k = *33,* N = *9,243,* ρ = *.41). These relationships make class attendance a better predictor of college grades than any other known predictor of academic performance, including scores on standardized admissions tests such as the SAT, high school GPA, study habits, and study skills. Results also show that class attendance explains large amounts of unique variance in college grades because of its relative independence from SAT scores and high school GPA and weak relationship with student characteristics such as conscientiousness and motivation. Mandatory attendance policies appear to have a small positive impact on average grades (*k = *3,* N = *1,421,* d = *.21). Implications for theoretical frameworks of student academic performance and educational policy are discussed.*

KEYWORDS: student behavior, attitude, colleges, individual differences, meta-analysis, validity, reliability.

Many college instructors exhort their students to attend class as frequently as possible, arguing that high levels of class attendance are likely to increase learning and improve student grades. Such arguments may hold intuitive appeal and are supported by findings linking class attendance to both learning (e.g., Jenne, 1973) and better grades (e.g., Moore et al., 2003), but both students and some educational researchers appear to be somewhat skeptical of the importance of class attendance. This skepticism is reflected in high class absenteeism rates ranging from 18.5% (Marburger, 2001) and 25% (Friedman, Rodriguez, & McComb, 2001) to 40% (Romer, 1993) and even as high as 59% and 70% (in two separate biology classes; Moore et al., 2003) and in explicit arguments against the importance of attendance in general and mandatory attendance policies in particular (e.g., Hyde & Flournoy, 1986; St. Clair, 1999). This article aims to help resolve the debate regarding the importance of class attendance by providing a quantitative review of the literature investigating the relationship of class attendance with both college grades and student characteristics that may influence attendance.

At a theoretical level class attendance fits well into frameworks that emphasize the joint role of cognitive ability and motivation in determining learning and work performance (e.g., Kanfer & Ackerman, 1989). Specifically, cognitive ability and motivation influence academic outcomes via two largely distinct mechanisms—one mechanism related to information processing and the other mechanism being behavioral in nature. Cognitive ability influences the degree to which students are able to process, integrate, and remember material presented to them (Humphreys, 1979), a mechanism that explains the substantial predictive validity of SAT scores for college grades (e.g., Halpin, Halpin, & Schaer, 1981; Bridgeman, McCamley-Jenkins, & Ervin, 2000). Noncognitive attributes such as conscientiousness and achievement motivation are thought to influence grades via their influence on behaviors that facilitate the understanding and retention of academic material (e.g., studying, planning for the on-time completion of assignments). These noncognitive attributes have exhibited impressive predictive grade-related validities on their own (e.g., Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002; Robbins et al., 2004) but are not as good predictors of college grades as the actual academic behaviors that they are thought to influence. A recent meta-analytic review of the substantial literature relating to study behaviors (Credé & Kuncel, 2008), for example, illustrated that study habits and study skills are (a) almost as predictive of college grades as SAT scores and high school grades (HSGPA), (b) significantly related to noncognitive attributes such as achievement motivation and conscientiousness, and (c) largely independent of both SAT scores and HSGPA. We believe that class attendance may represent an in-class behavioral corollary to academically important extraclass behaviors (e.g., studying) and be as important for (and predictive of) academic achievement as these extraclass behaviors.

A quantitative review of the attendance literature not only will help to resolve the ongoing debate regarding the importance of class attendance and thereby assist in the continuing development of theoretical models of student performance that acknowledge both student characteristics and student behaviors (e.g., Credé & Kuncel, 2008) but also is likely to have important practical and policy implications. Attendance is voluntary in many college classes, primarily because of the difficulty of taking attendance in large classes on a regular basis but also because of the view that students should have some autonomy in determining the manner in which they engage with academic material (Stephenson, 1994). Findings suggesting that class attendance is an important determinant of grades may result in policy changes in regard to class attendance, particularly given that recent technological advances such as personal response systems or "clickers" (e.g., Hoekstra, 2008) substantially ease the burden of collecting attendance data. At a minimum, findings suggesting that class attendance is strongly related to class performance should provide instructors with evidence that might persuade a larger proportion of students to attend class voluntarily.

Why Class Attendance Should Influence Grades

Attending class not only allows students to obtain information that is not contained in textbooks or lecture materials presented online but also allows students varied contact with material (lectures, review of notes, demonstrations, etc.). In addition, consistent class attendance represents a system of distributed practice that has been shown to be effective in increasing the retention of information while

also offering the possibility for the overlearning of material—especially when students are also asked to complete homework assignment and revise material on their own time. Both distributed practice and overlearning have been linked to higher exam scores and better long-term retention of material (e.g., Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006; Cull, 2000; Donovan & Radosevich, 1999; Peladeau, Forget, & Gagne, 2003). The Donovan and Radosevich (1999) meta-analysis found that individuals engaging in distributed practice outperform individuals engaging in massed practice by almost half a standard deviation ($d = .46$). This finding is particularly relevant for class attendance when considering that students with poor class attendance are likely to attempt to compensate for this by engaging in massed practice (e.g., cramming for exams). Although the debate as to the relative effectiveness of different modes of instruction (e.g., lectures, small group discussions, laboratory applications, video-based instruction) continues (e.g., Brooke, 2006; Mayer et al., 2009; Wynegar & Fenster, 2009), class attendance is likely to be beneficial for learning irrespective of the specific teaching mode or modes used by the instructor.

Even lecture-based instruction—still the most popular form of instruction in many college-level classes (e.g., Benzing & Christ, 1997; Markham, Jones, Hughes, & Sutcliff, 1998)—appears to offer significant benefits for students despite the relatively passive role played by them in the learning process (Bligh, 1998) and the lack of regular feedback or the ability to engage in practice and application of material (e.g., Blum & Naylor, 1968; Campbell & Kuncel, 2001). Indeed, a recent meta-analytic review of the training literature (Arthur, Bennett, Eden, & Bell, 2003) showed lecture-based instruction to be effective for increasing cognitive, interpersonal, and even psychomotor skills and behaviors. Students who deny themselves the benefit of attending lectures (and the full range of activities involved in lecture attendance) and who rely only on other contact with class material are unlikely to retain relevant material as well as those attending class and subsequently perform less well on class tests and exams.

Hypothesis 1: Attendance in a class will be positively related to academic performance in that class.

If class attendance does exhibit a strong relationship with the grades attained in the class, it also becomes important to examine three related questions: (a) whether class attendance is influenced by individual difference variables such as students' personality, intelligence, or motivation; (b) whether attendance can explain variance in grades not already accounted for by traditional predictors of grades (particularly HSPGA and SAT); and (c) whether students in classes with mandated attendance perform, on average, better than students in classes where attendance is voluntary.

The Influence of Student Characteristics

In many colleges and universities the act of attending class is a largely volitional behavior with short-term opportunity costs (i.e., not engaging in other activities) and likely long-term benefits (e.g., better grades, greater likelihood of getting into graduate school). As such, class attendance should be related to variables that reflect high levels of personal discipline (e.g., conscientiousness), academic

motivation (e.g., need for achievement), a sense of control over academic achievement (e.g., core self-evaluations), and variables reflective of the ability to anticipate the long-term consequences of poor class attendance (e.g., cognitive ability). Many of these variables also exhibit meaningful relationship with grades (e.g., Hezlett et al., 2001; Lievens et al., 2002; Robbins et al., 2004).

Hypothesis 2: Class attendance will exhibit positive relationships with individual difference variables that reflect students' levels of conscientiousness, motivation, core self-evaluations, and cognitive ability.

Any observed relationships of class attendance with both grades and the various individual difference factors known to exhibit nontrivial relationships with grades suggest four possibilities for the relationship among grades, class attendance, and these individual difference variables. We summarize these relationships in Figure 1. The first possibility (the mediated effects model) is that class attendance mediates the relationship between individual difference variables and grades. That is, individual difference factors such as motivation, conscientiousness, and intelligence increase the likelihood of a student attending class, and class attendance, in turn, increases the likelihood of a student obtaining a good grade. This model would imply that class attendance is largely a behavioral manifestation of student motivation, traits, and abilities and would also imply that class attendance explains little unique variance in grades not already accounted for by these individual difference predictors. Such a model would find support in strong relationships between attendance and grades and between student characteristics and attendance.

Hypothesis 3 (Alternative 1): Class attendance will mediate the relationship between student characteristics and grades.

The second possibility (the unique effects model) is that class attendance and individual differences exert largely unique effects on grades; that is, individual difference variables not only affect the degree to which students attend classes but also affect grades in other ways. For example, intelligent students may understand material more easily whereas conscientious students are more likely to spend sufficient time reviewing class material or meeting with professors outside of class hours. Thus, the unique effects model implies that class attendance exerts effects on grades that are distinct from the effects of individual difference outcomes. Such a model would find support in a strong attendance–grade relationship coupled with weak relationships between attendance and student characteristics that are known to be related to grades (e.g., SAT scores).

Hypothesis 3 (Alternative 2): Class attendance will explain unique variance in grades above and beyond the variance accounted for by individual difference predictors.

The last two possible relationships are difficult to directly investigate. Thus, instead of proposing alternative hypotheses for these last two possible relationships,

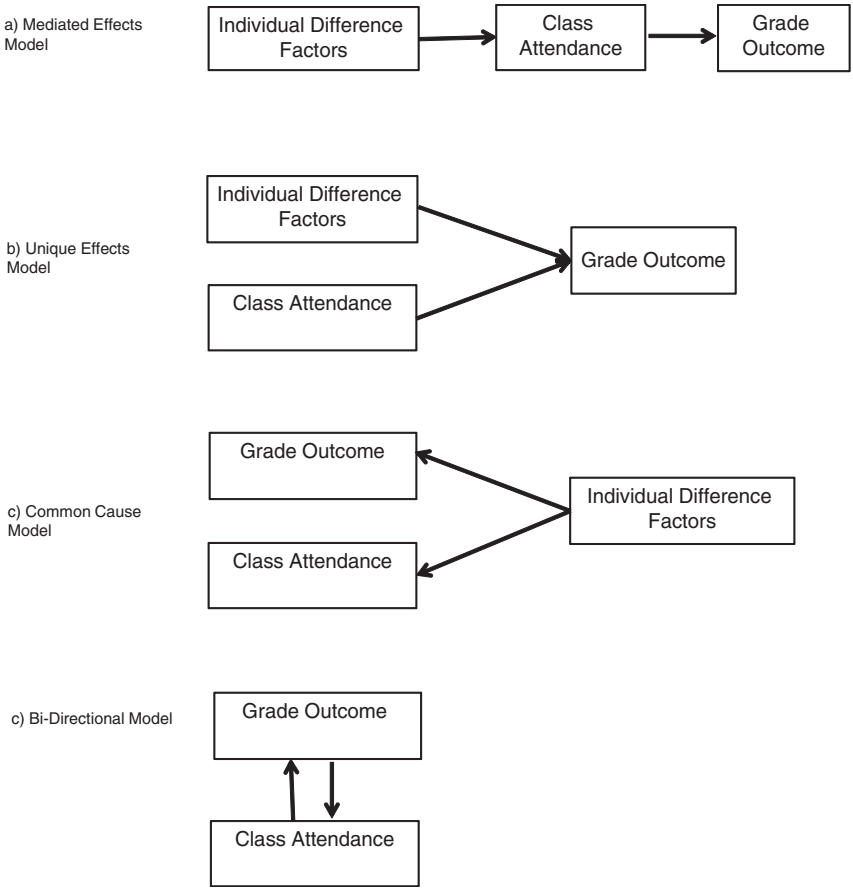

FIGURE 1. *Summary of possible relationships among class attendance, grades, and student characteristics*.

we instead examine indirect pieces of evidence that may suggest the last two possible relationships. The third possibility (the common cause model) is that any relationship between class attendance and grades is a spurious function of the fact that both attendance and grades are influenced by the same set of causal variables (e.g., motivation). Such a model is difficult to confirm via a simple examination of relationships among variables, although the absence of individual difference factors related to both attendance and grades would shed some light on the validity of this model. The common cause model can also be tested by examining the effect that mandatory class attendance policies have on grades. Specifically, an increase in average grades resulting from a mandatory attendance policy would suggest that a common cause explanation cannot fully account for any observed correlation between attendance and grades. Thus, the

influence of mandatory attendance policies on grades is explored, not as a means of supporting the common cause model but as a means of ruling out this possible relationship.

Hypothesis 3 (Alternative 3): Students in classes with mandatory attendance policies will have higher average grades than students in similar classes without mandatory attendance policies.

The fourth possibility is that the relationship between class attendance and grade is bidirectional in nature such that poor performance on tests acts as either a motivator or demotivator, resulting in either increases or decreases in class attendance. Jones (1984) found evidence for such a relationship; students who had poor attendance prior to a test had lower average grades on the test than students with good attendance and then lowered their subsequent attendance even further in comparison to students with good attendance. This model is in line with stress and appraisal frameworks (e.g., Lazarus & Folkman, 1984) whereby some students who perform poorly on tests experience stress and then withdraw from the source of the stress. Unfortunately, such a bidirectional relationship cannot be tested via a simple examination of correlations.

Method

Identification of Data Sources

Potential sources of data were identified via keyword searches of the PsycINFO, Dissertation Abstracts, Education Full Text, EBSCO, ScienceDirect, and ERIC databases, complemented by searches of the Internet. Articles were included only if they reported correlations between either (a) class attendance and college GPA or (b) attendance in a particular class and the grade obtained in that class. Articles that presented data in a manner that allowed computation of either of these relationships were also included. Articles that report laboratory studies or attendance in high school or primary school classes were not included (the vast majority of high schools and primary schools have mandatory attendance policies). Articles were also not included if only statistically significant findings were reported because an inclusion of such articles would have resulted in an upwardly biased estimate of the relationship between attendance and grade outcomes. In other words, articles were excluded if they reported statistics only regarding the significant relationships but failed to report statistics for their nonsignificant relationships, given that often a single article would provide several useful data points. Finally, articles were also excluded if the grade in a class was based, in part, on class attendance (e.g., Freeman et al., 2007; Snell & Mekies, 1995). Inclusion of such articles would also have resulted in an upwardly biased effect size estimate.

In addition to the correlation between attendance and grades or GPA, any reported correlations between attendance and student characteristics (cognitive ability, achievement motivation, conscientiousness, age, gender, SAT, HSGPA, etc.) were also recorded. Data sources were also coded according to relevant demographic data (i.e., number of participants, type of class). Finally, we carefully screened all data sources to ensure that data that had been published more than once (e.g., Farsides & Woodfield, 2003; Woodfield, Jessop, & McMillan, 2006) were included only once in our analysis.

Coding Procedure

Relevant information from all articles were coded by the first two authors using standardized coding sheets that increase the accuracy of coding by cuing the coder to attend to specific study details. The two coding sheets for each study were compared to each other by the third author, who found more than 95% agreement. The remaining discrepancies in coding typically involved differences in sample sizes because of inconsistencies in the manner in which data were reported in coded articles (e.g., text vs. tables) and were resolved via discussion among the authors.

Final Database

The final database for the relationship of class attendance with academic outcomes consisted of 99 correlations from 90 independent samples representing data from a total of 28,034 students. In addition, the database also included 83 correlations for the relationship between attendance and other student characteristics, representing data from 33 independent samples and 11,110 students. The data set contained articles and dissertations covering 82 years, from 1927 to 2009, and consisted of 52 published articles and 16 unpublished dissertations or papers.

Criterion and Predictor Categories

We restricted our analyses to two main criterion categories: grades obtained in an individual class and college GPA. Our examination of possible predictors of attendance was restricted to a relatively small number of variables because of the limited number of factors reported in the extant attendance literature. We conducted meta-analyses only for those categories where information from at least three independent samples was available. We therefore examined only demographic variables (age and gender), trait variables (e.g., Big Five Traits, core self-evaluations), prior achievement (SAT scores, and HSGPA), and variables reflecting interest and motivation (academic motivation, time spent studying).

Examined Moderators

The nature of the published data allowed examination of only two moderators of the attendance–grade relationship: the type of class (science classes vs. nonscience classes) and time of publication. There are two broad reasons why we suspect that attendance may be more important in science than nonscience classes. First, science classes may be more likely to include hands-on demonstrations and applications of principles that have been covered than nonscience classes. Missing such activities and illustrations may represent a serious challenge to performing well. Second, material in science classes may be more cumulative in nature than material in most nonscience classes. For example, an organic chemistry student who has missed lectures on stereochemistry is likely to also experience difficulty understanding material presented later in the same class that assumes knowledge of stereochemistry. A student taking a class on personality psychology who has missed lectures on psychodynamic theories of personality may not be similarly affected when later lectures focus on biopsychological theories of personality. Our expectation that effect sizes might be negatively correlated with year of publication is based on the notion that the increasing quality of textbooks and, more recently, the availability of online class material might reduce the necessity of class attendance. Thus, we expect larger relationships in older studies.

Analyses

The analysis was completed using the Schmidt and Le (2004) software based on the Hunter and Schmidt (2004) psychometric meta-analytic method. A random effects model was used, which not only allows for the estimation of the population correlation between the predictor and criterion variables but also provides an estimate of the variation in the population parameter across samples after accounting for variation because of both sampling error and differences in study artifacts (e.g., unreliability in the measurement of predictor and/or criterion variables). This estimate of the variation in the population parameter ($SD\rho$) provides an indication of the presence and size of unaccounted for moderators—nonzero $SD\rho$ values indicate that different studies provide different estimates of the population correlation even after taking into account sampling error and any examined study artifacts (e.g., unreliability in measurement). The $SD\rho$ values were used to establish the upper and lower bounds of the 90% credibility interval. If the credibility interval overlaps zero, it is possible the true population correlation (ρ) is actually zero in some cases; the credibility interval is used in determining the distribution of parameter values and is useful in determining the existence of moderators (Hunter & Schmidt, 2004).

Because not all of the studies included in this meta-analysis reported information on the reliability of scores of examined variables, we used the interactive meta-analytic procedure outlined by Hunter and Schmidt (2004). Available reliability information was used to construct separate reliability distributions for criterion and predictor variables, and the sample-size-weighted distribution of observed correlations was then disattenuated using the reliability distributions of the predictor and criterion variables. In instances in which no reliability information was available for a variable, no reliability corrections were performed for that variable in that meta-analysis, except for GPA (see below). Similarly, we conservatively assumed that class attendance was measured with perfect reliability because more than 85% of attendance data came from class records rather than being based on student self-reports.

Given the lack of reliability information for GPA among the examined studies, we based our artifact distribution for this criterion on four published estimates of the reliability of GPA (Barritt, 1966; Bendig, 1953; Reilly & Warech, 1993; Stricker, Rock, Burton, Muraki, & Jirele, 1994). We did not correct for unreliability in grades for individual classes because of the lack of available information.

Results

Class Attendance and Outcomes

Meta-analytic results for the relationship between class attendance and academic performance are shown in Table 1. In support of Hypothesis 1, attendance correlates strongly with both performance in an individual class ($k = 69$, $N = 21{,}195$, $\rho = .44$) and college GPA ($k = 33$, $N = 9{,}243$, $\rho = .41$), although the relatively large credibility intervals suggest likely moderators of these relationships. According to Cohen (1988), a correlation of .50 represents a large effect size. Table 1 also provides results for one of our two examined moderators: science versus nonscience classes. In line with our expectations, the attendance–grade relationship was slightly stronger for science classes ($k = 12$, $N = 8{,}524$, $\rho = .49$) than for nonscience classes ($k = 57$,

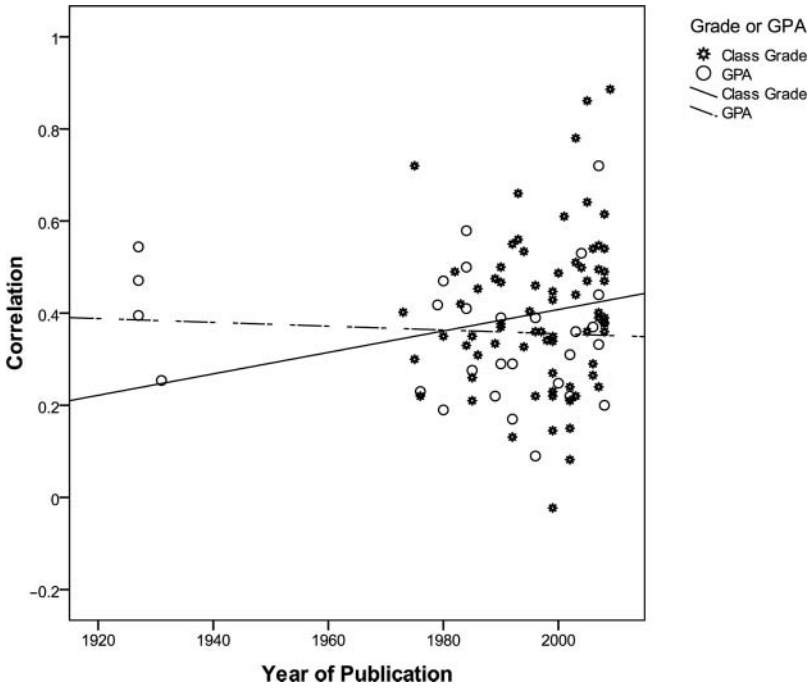

FIGURE 2. *Scatterplot of the relationship between observed attendance–grade correlations and year of publication*.

$N = 12{,}394$, $\rho = .41$). The correlation between year of publication and the attendance–performance relationship was negligible for both class grade, $r(69) = .09$, *ns*, and GPA, $r(33) = -.16$, *ns*, suggesting that the importance of class attendance has not significantly changed over time. Thus, it appears that use of online classroom resources and improved textbooks have not decreased the importance of attending class. A scatterplot of the observed correlations against year of publication (Figure 2) also does not suggest a dramatic change in attendance–grade correlations at the approximate point of the introduction of Web-based technologies.

Correlates and Antecedents

Results for the relationship of class attendance with student characteristics (Hypothesis 2) are presented in Table 2. The relationships represented effect sizes in the small to medium range for most variables, including the Big Five personality traits, SAT scores, and intelligence. According to Cohen (1988), a correlation of .10 represents a small effect size and a correlation of .30 represents a medium effect size. The strongest relationships were observed for the number of hours spent studying ($k = 7$, $N = 1{,}532$, $\rho = .20$), high school GPA ($k = 5$, $N = 963$, $\rho = .16$), and conscientiousness ($k = 6$, $N = 1{,}874$, $\rho = .24$). These effect sizes probably reflect the influence of an overall conscientiousness factor. Core self-evaluations exhibited a slight positive relationship with attendance ($k = 7$, $N = 763$, $\rho = .18$),

TABLE 1

Meta-analytic results for relationship of class attendance with class grades and GPA

Criteria	N	k	r_{obs}	ρ	SD_ρ	10%CV	90%CV	File Drawer x
All Class Grades	21,164	68	0.44	0.44	0.14	0.26	0.62	530
Science Classes	8,524	11	0.49	0.49	0.14	0.32	0.67	97
Non-Science Classes	12,640	57	0.41	0.41	0.14	0.24	0.58	410
GPA	9,243	33	0.37	0.41	0.13	0.24	0.58	238

N = number of subject, k = number of studies, r_{obs} = sample size weighted mean observed correlation, ρ = true score correlation, SD_ρ = standard deviation of true, score correlation, 10%CV and 90%CV upper and lower bound of 90% credibility interval, File Drawer x = number of studies with average sample size and zero correlation necessary to bring overall correlation down to trival size (r = .05)—assumes fixed effects model.

whereas year in college also exhibited a slight negative relationship with attendance ($k = 3$, $N = 4{,}141$, $\rho = -.11$), such that students in their junior and senior years are less likely to attend class. Thus, Hypothesis 2—suggesting that class attendance will exhibit positive relationships with individual difference variables that reflect students' levels of conscientiousness, motivation, core self-evaluations, and cognitive ability—received weak to moderate levels of support.

Table 2 also presents meta-analytic estimates of the attendance–grade relationship derived from just the subsample of studies that were used to calculate the relationship between attendance and each student characteristic. For example, the correlation between attendance and SAT scores was estimated to be $\rho = -.01$ based on six studies, whereas the estimate of the attendance–grade relationship from these same six studies is $\rho = .45$. The range of these estimates of the attendance–grade relationship was from $\rho = .24$ to $\rho = .52$, with a mean of $\rho = .43$ and a median of $\rho = .46$. These results suggest that the findings that (a) attendance–grade relationships are strong whereas (b) the student characteristic—attendance relationship is weak to moderate is not simply a function of deriving estimates of these relationships from different samples.

The lack of strong relationships between attendance and student characteristics coupled with the finding that attendance–grade relationships remain strong even within the same subset of studies suggests that a mediated effects model (Hypothesis 3, Alternative 1) is unlikely to be valid for these student characteristics and that a unique effects model (Alternative 2) may better capture the relationships among attendance, grades, and student characteristics.

Incremental Validity

As a further test of Hypothesis 3 (Alternative 2), hierarchical regression was used to assess whether class attendance explains incremental variance in GPA beyond the variance explained by the two of the most commonly used predictors of academic performance (SAT scores and high school GPA). These two predictors

TABLE 2

Meta-analytic results for relationship of attendance with student characteristics

Student Characteristics	N	k	r_{obs}	ρ	SD_ρ	10%CV	90%CV	$r_{\text{Attend-Grade}}$
Age*	882	5	0.06	0.06	0.13	–0.11	0.24	0.24
Gender (Male = 1, Female = 0)*	1,252	4	–0.12	–0.12	0.02	–0.15	–0.09	0.45
Year in College*	4,141	3	–0.11	–0.11	0.00	–0.11	–0.11	0.53
SAT Scores*	2,154	6	–0.01	–0.01	0.06	–0.09	0.06	0.45
HSGPA*	963	5	0.16	0.16	0.00	0.16	0.16	0.33
IQ*	1,047	4	0.11	0.11	0.08	0.01	0.22	0.46
Hours of employment*	599	3	–0.09	–0.09	0.00	–0.09	–0.09	0.36
Hours of study*	1,532	7	0.20	0.20	0.09	0.08	0.31	0.33
Agreeableness	1,874	6	0.02	0.02	0.12	–0.13	0.17	0.49
Conscientiousness	1,874	6	0.22	0.24	0.10	0.12	0.36	0.49
Extraversion	2,144	8	–0.09	–0.10	0.05	–0.16	–0.04	0.53
Neuroticism	1,874	6	0.01	0.01	0.10	–0.12	0.14	0.49
Openness	1,874	6	–0.02	–0.02	0.05	–0.09	0.05	0.49
Core Self-Evaluations*	763	7	0.18	0.18	0.11	0.03	0.32	0.37
Academic Motivation	1,231	4	0.10	0.11	0.10	–0.02	0.25	0.48

N = number of subject, k = number of studies, r_{obs} = sample size weighted mean observed correlation, ρ = true score correlation, $SD\rho$ = standard deviation of true score correlation, 10%CV and 90%CV upper and lower bound of 90% credibility interval. $r_{\text{Attend-Grade}}$ represents correlation between attendance and grades for subsample of studies included in this analysis, * signifies relationships not corrected for unreliability due to the lack of available information.

are chosen not only because they represent important student characteristics (cognitive ability and prior achievement) but also because the relationship of these two variables with college grades has been so well illustrated. Our regression analysis was based on the meta-analytic estimates from this study and imported validities from a large-scale meta-analytic review of the relationship among SAT scores, HSGPA, and college GPA (Hezlett et al., 2001). Specifically, we used the operational validity of .35 for SAT scores and .40 for HSGPA. For each of the two analyses the utilized sample size was the harmonic mean of the sample sizes associated with each meta-analytic estimate. Results indicate that attendance explains a very large amount of incremental validity over SAT scores (adj. $\Delta R^2 = .19$, $p < .01$) and over HSGPA (adj. $\Delta R^2 = .13$, $p < .01$)—not surprising given the relative independence of attendance from both SAT scores and HSGPA. These results are in general support of Hypothesis 3 (Alternative 2).

Effect of Mandatory Attendance Policy

In exploration of Alternative 3 of Hypothesis 3 regarding the effect of mandatory attendance policies, we were able to identify only three studies (Berenson, Carter,

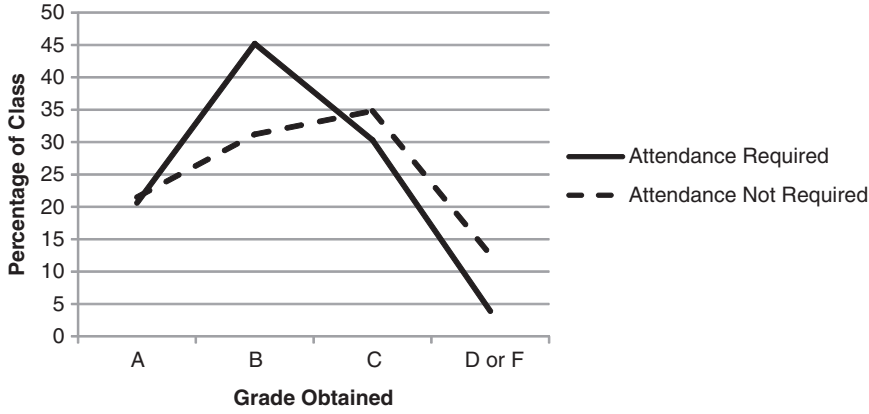

FIGURE 3. *Illustration of the effects of a mandatory attendance policy on grade outcomes*. Data from Kooker (1976).

& Norwood, 1992; Chan, Shum, & Wright, 1997; Kooker, 1976) that examined the effects of a mandatory attendance policy on class grades and that reported data in a manner that allowed inclusion in a meta-analysis. Meta-analysis of these three studies revealed a small increase in average grades associated with a mandatory attendance policy ($k = 3$, $N = 1{,}421$, $d = .21$), thus providing some tentative support for Hypothesis 3 (Alternative 3). Other authors (e.g., Hancock, 1994) note dramatic differences in test grades between classes with and without an attendance policy but did not provide data that allowed inclusion. The manner in which data were presented by Kooker (1976) also allowed a more detailed secondary examination of the data that showed that an attendance policy may be disproportionately beneficial for low performing students. Specifically, a reanalysis of Kooker's data ($N = 835$) shows that the proportion of students getting a D or an F in an experimental psychology class was 12.6% when attendance was not mandatory and that this dropped to 3.9% when class attendance was mandatory (see Figure 3). This difference is significant ($p < .01$), whereas the difference in the proportion of A grades obtained in the two conditions (21.5% vs. 20.6%) was not significant ($p > .05$). There was no significant difference ($p < .05$) in the proportion of students who withdrew from class under the two conditions (7.4% when attendance was mandatory and 9.6% when attendance was not mandatory).

Curvilinear Effects of Attendance on Grades

Given Kooker's (1976) finding that an attendance policy may be particularly effective at reducing the number of failures while having weaker effects on the number of A's received by students, we also decided (post hoc) to examine whether the general relationship between class attendance and grades also exhibited similar relationships. Two authors (Gendron & Pieper, 2005; Hyde & Flournoy, 1986) not only reported a correlational table but also presented their data in a manner that allowed us to substantially recreate the original data and test for possible curvilinear

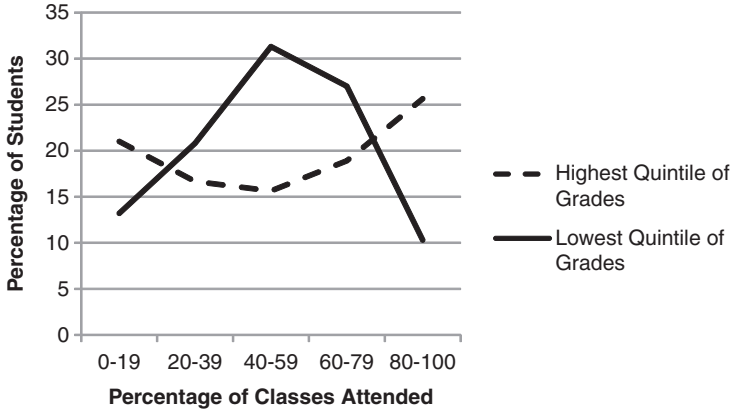

FIGURE 4. *Illustration of the curvilinear relationship between attendance and grade outcomes*. Data from Hyde and Flournoy (1986).

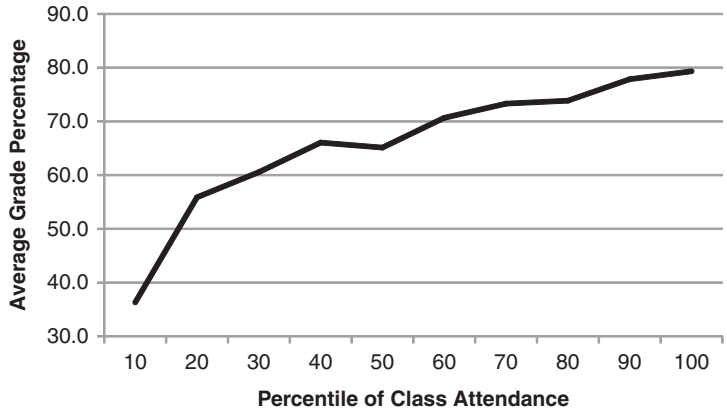

FIGURE 5. *Illustration of the curvilinear relationship between attendance and grade outcomes.* Data from Gendron and Pieper (2005).

relationships between attendance and grades. Using hierarchical regression, we found significant curvilinear effects ($\Delta R^2 = .046$, $\Delta F = 8.19$, $p < .01$) for the data from Hyde and Flournoy (1986), such that the highest performing students had either very good or very poor class attendance and those students in the lowest quintile of grades were most likely to have average (rather than poor) attendance (see Figure 4). Similar data reported by Gendron and Pieper (2005) also revealed a significant curvilinear effect ($\Delta R^2 = .029$, $\Delta F = 21.82$, $p < .01$), although the nature of the relationship was somewhat different inasmuch as the benefits of attendance for grades appear to decrease once an average level of attendance has been attained (see Figure 5). That is, the difference in grades between students with poor

attendance and students with average attendance was larger than the difference between students with average attendance and students with very good attendance.

In aggregate, our findings that suggest that (a) attendance is strongly related to grades, (b) attendance is only weakly to moderately related to student characteristics, and (c) a mandatory attendance policy has a (small) positive effect on average grades provide strongest support for the unique effects model (Figure 1). The lack of evidence for student characteristics that are strongly related to both grades and attendance suggests that the mediated effects model is unlikely to be valid, whereas the positive effects of an attendance policy suggest that the attendance–grade relationship is unlikely to be an artifact of a common causal variable.

Discussion

This article has provided meta-analytic summaries of the relationships of class attendance with both grades in a class and overall GPA while also providing meta-analytic estimates of the relationships between class attendance and a variety of student characteristics. Our results show that class attendance is strongly correlated with class grades and GPA in college—indeed, the observed correlations with grades are larger even than those observed in meta-analytic reviews of the validities of both SAT scores and HSGPA (Hezlett et al., 2001) and study habits and study skills (Credé & Kuncel, 2008). As such, class attendance provides a dramatic increase in the amount of variance in grades that can be explained from student characteristics and behaviors. Such a finding is in clear agreement with theories of learning and training that emphasize the importance of repeated and extensive contact with information and repeated practice of skills.

Our results, however, do not only show that class attendance is very strongly related to academic performance and moderately related to specific student characteristics (e.g., conscientiousness). Rather, they can also be used to shed light on the validity of a number of competing models exploring the nature of the relationship among class attendance, grades, and student characteristics. The relatively weak relationships between class attendance and student characteristics suggest that neither a mediated effects model nor a common cause model (see Figure 1) is likely to be valid—at least for the examined student characteristics. That is, our results do not suggest that students with high class attendance are simply those with dramatically higher levels of motivation or conscientiousness—characteristics that would account for the higher grades observed among students with high levels of attendance. Rather, the results are most supportive of a unique effects model in which class attendance and student characteristics make unique contributions toward academic performance, especially when considering other evidence suggesting that student characteristics such as prior achievement (e.g., Hezlett et al., 2001) and certain personality traits (Poropat, 2009) are related to grades. That is, student characteristics and attendance are more strongly related to grades than to each other.

We are, of course, hesitant to make inferences of causality on the basis of correlational data despite the strong relationship between class attendance and grade and the lack of examined student characteristics that could act as common causal variables of both attendance and grades. It may, for instance, be that educational researchers have simply not examined the full range of such possible common causal variables (see our discussion of this below). Alternatively, it may be that

class attendance and grades are so strongly related not because attendance fosters learning but because instructors use class time to communicate information to students that is not effectively captured in textbooks or notes posted on class websites. Such unique information may include instructor expertise that extends beyond textbook material but may also contain explicit or implicit information about what questions are most likely to be asked on tests and exams or how assignments should best be completed or approached. In this latter case the attendance–grade relationship would simply be an artifact of students being better able to anticipate test questions or the criteria used to evaluate other assignments.

At the same time, it is important to note that our findings would have strong implications for educational practices and policies if even a relatively small proportion of the attendance–grade relationship is causal in nature. The low levels of support that our results show for a mediated effects model or a common causal model and the better support that appears evident for a unique effects model suggest that some causal relationship is certainly plausible. Our theoretical understanding of the learning process (e.g., the importance of overlearning) is also broadly supportive of at least some causal relationship. Any such causal relationship would, in turn, be strongly supportive of efforts to boost class attendance rates—particularly if the goal is to reduce failure rates in classes (Kooker, 1976). Indeed, our findings that attendance is a better predictor of class grades than any other known predictor (including HSGPA, SAT scores, and study habits) suggest that the benefits of better attendance in college classes are likely to be substantial. Not only are all students likely to learn more from their classes, but also failure rates are likely to be substantially decreased. Assuming an approximately normal distribution of grades, even a small benefit that accrues equally to all students will result in a relatively large reduction in those students falling below the cut line that distinguishes passing grades from failing grades. If, for example, we assume a normal distribution of grades in a class and a 10% failure rate, then an even moderate across-the-board increase in grades ($d = .5$) would reduce the failure rate to less than 4%—a more than 60% reduction in the failure rate. Evidence from individual studies (e.g., Kooker, 1976) that attendance disproportionately benefits lower ability students would suggest that the reduction in failure rates may be even larger.

Of course, the benefits of reducing failure rates accrue not only to the individual student but also to the college or university and society in general. Failing even one class can defer students' graduation by a semester, resulting in additional tuition fees, deferred entry into the labor market, and subsequent reduced life earnings. Public universities, whose funding may be linked to graduation rates or time-to-degree-completion statistics, are also likely to benefit from lower class failure rates—as will the taxpayers who fund such institutions.

Experimental or quasi-experimental data will ultimately be most useful for evaluating the causal nature of the attendance–grade relationship, but such data are sparse in the educational literature. Indeed, our results regarding the effect of mandatory attendance policy are, unfortunately, based on only three studies and represent only a small effect size. We present them largely to summarize the existing evidence and argue for further work on this important issue. The weak positive effect for attendance policies, based on a small total sample, cannot in itself make the argument for mandatory attendance policies. However, we do believe that the results are of interest, especially the effects of a mandatory attendance policy

on weaker students. Even though there is emerging evidence that lectures can be entirely replaced with an online presentation of material coupled with small group interactive discussions of material without loss of learning (e.g., Scheines, Leinhardt, Smith, & Cho, 2005), Figure 2 shows no decrement on attendance–grade relationships evident since the beginning of the Internet age. Thus, it appears that even though during the past 10 years or so more instructional material has been available online, class attendance is still important in the majority of classes. Indeed, our findings regarding the importance of class attendance for science classes suggest that attendance will remain important, and perhaps even gain importance, if the proportion of students taking increasingly complex science classes were to increase.

It is our position that the question of whether attendance policies are appropriate is ultimately as much a question of educational philosophy as a question of empirical findings. The argument that adult students should be free to decide on how to best use their time and whether classes are worth attending is a compelling one (e.g., Romer, 1993), as is the counterargument that state-funded universities cannot ethically afford to allow students to cut an unlimited number of classes (e.g., Street, 1975). Ultimately, instructors and universities should allow their decision regarding mandatory attendance policies to be guided by a joint consideration of the best available empirical evidence and an evaluation of their educational philosophy.

Most educators are likely to agree, however, that class attendance is a generally desirable behavior, and there is encouraging evidence that mandatory policies are not necessary for dramatically improving class attendance or class performance. Moore et al. (2003), for example, found that simply stressing the importance of attendance to students at the beginning of a semester raised average grades by 9% when compared to a similar class in which attendance was not stressed—and reduced the failure rate by 70% (from 23% to 7%).

Limitations and Future Research

Any meta-analytic review is restricted to a consideration of the existing literature in a particular domain. The literature on class attendance provides clear evidence that attendance is strongly associated with grades but provides significantly less evidence on two related important questions. First, the evidence relating to the effect of an attendance policy on grades is very limited. This is understandable given the very real practical difficulties of comparing grades when attendance is voluntary to grades when attendance is mandatory, but we hope that future research will examine this important policy issue in more detail. Second, the determinants of voluntary class attendance also remain poorly understood. We have presented evidence that some student characteristics are weakly to moderately related to attendance, but studies examining the role of these characteristics were relatively few, and the overall sample size for these analyses was moderate, such that the findings regarding relationships between attendance and student characteristics need to be interpreted with some caution. Future researchers should not only attempt to explore the role of the variables that we have discussed in greater detail but also expand their examination of the influences on voluntary class attendance to other variables.

Two classes of variables appear particularly promising. First, class attendance represents a trade-off between short-term gains (e.g., sleeping, spending time with friends) and long-term gains (e.g., better grades). Individual difference variables such as self-control, delay gratification, and long-term time orientation may therefore exhibit stronger relationships with attendance than those variables summarized in this article. Dispositional factors such as these are particularly likely to influence class attendance when considering our finding that attendance in a single class is so strongly related not only to the grade in that class but also to overall GPA (i.e., performance over all previous classes). This finding suggests that attendance is likely to be relatively consistent across classes such that students who have poor attendance in one class are also likely to have poor attendance in other classes. Such a consistency in attendance would, in turn, suggest the influence of dispositional or attitudinal factors on class attendance. Second, class attendance is likely to be substantively influenced by contextual factors, such as attendance norms at the university, perceived difficulty of the class, characteristics of the instructor, and whether students can obtain lecture material online. An examination of within-person variability in class attendance may help shed light on the influence of some of these contextual variables.

An expansion of the student characteristics and contextual characteristics that are considered as possible influences on attendance would also allow future researchers to better evaluate the validity of the various models we present in Figure 1. We believe that the best fitting model of the relationships among student characteristics, class attendance, and grades is ultimately likely to be composed of elements of three of the models we present in Figure 1. That is, class attendance is likely to exert unique effects—separate from student characteristics—on grades (the unique effects model) while also mediating the relationships between other student characteristics and grades (the mediated effects model) and exhibiting bidirectional relationships with grade over time (the bidirectional model). Tests of such an expanded model require not only an expansion of the student characteristics that are examined as possible influences on attendance but also further examinations of how attendance rates change in response to grades obtained on tests and assignments (as done by Jones, 1984).

Finally, the construct of class attendance may itself warrant further attention. As currently measured by most researchers, class attendance simply denotes physical presence in the classroom. Physical presence in a classroom, however, encapsulates a very wide range of possible student behaviors, ranging from students who listen to the professor, take notes, and attempt to understand the material and integrate it with their existing knowledge structure to students who may be physically present but engage in few of the behaviors or cognitive processes that are likely to result in learning. A closer examination of this range of possible classroom behaviors is likely to shed additional explanatory light on the observed variance in grades among students with similar attendance levels.

Conclusion

Class attendance appears to be a better predictor of college grades than any other known predictor of college grades—including SAT scores, HSGPA, studying skills, and the amount of time spent studying (Credé & Kuncel, 2008; Hezlett

et al., 2001). Indeed, the relationship is so strong as to suggest that dramatic improvements in average grades (and failure rates) could be achieved by efforts to increase class attendance rates among college students.

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