

RELATIONSHIPS BETWEEN STUDENT ENGAGEMENT AND ACADEMIC ACHIEVEMENT: A META-ANALYSIS

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Most scholars have argued that student engagement positively predicts academic achievement, but some have challenged this view. We sought to resolve this debate by offering conclusive evidence through a meta-analysis of 69 independent studies (196,473 participants). The results revealed that (a) there was a moderately strong and positive correlation between overall student engagement and academic achievement, and an analysis of the domains of behavioral, emotional, and cognitive engagement showed that almost all had a positive correlation with students' academic achievement; and (b) a moderator analysis revealed that the relationship between student engagement and academic achievement was influenced by the method of reporting engagement, cultural value, and gender. Furthermore, the relationships of behavioral, emotional, and cognitive engagement with academic achievement were influenced by reporting method for engagement, cultural value, or gender.

Keywords: student engagement, behavioral engagement, cognitive engagement, emotional engagement, academic achievement, cultural value.

Student engagement refers to students being actively involved in their learning tasks and activities. This engagement not only appears to affect school changes directly, such as, teacher's professional identity, and school's positive atmosphere (Marks, 2000), but also seems to lead to improvement in academic achievement of students whose grades have been poor, and lowering levels of student dissatisfaction and dropout rates. Therefore, for the past 20 years, researchers

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have maintained a strong interest in student engagement and its various functions (Appleton, Christenson, Kim, & Reschly, 2006; Shernoff & Schmidt, 2008).

Academic achievement has consistently been regarded as an important outcome of student engagement. Although there is extensive empirical research on the relationship between the two, the results so far have been inconsistent. There are two major perspectives on this relationship. For example, Zhu (2010) found that there was a significant and relatively strong correlation between student engagement and academic achievement, and King (2015) concluded that academic achievement was positively correlated with behavioral and emotional engagement. Pietarinen, Soini, and Pyhältö (2014) found a positive correlation between cognitive engagement and academic achievement. The proposed mechanism underlying these relationships is that student engagement promotes academic success (Crossan, Field, Gallacher, & Merrill, 2003), which further promotes students' engagement with learning activities, thus forming "a virtuous cycle of learning" (Lei, Xu, Shao, & Sang, 2015; Wäschle, Allgaier, Lachner, Fink, & Nückles, 2014). Some researchers have pointed out that, compared to emotional and cognitive engagement, the positive correlation between behavioral engagement and academic achievement is more obvious (Furrer & Skinner, 2003). Taken together, the findings in these studies indicate that different aspects of student engagement have differing relationships with academic achievement.

However, other scholars did not reach similar conclusions, and in some studies researchers have not even found any significant correlation between student engagement and academic achievement. For example, Shernoff and Schmidt (2008) found that student engagement did not predict grade point average among African-Americans. Chen, Yang, Bear, and Zhen (2013) also found no significant correlation between student engagement and academic achievement. Shernoff (2010) argued that there was no significant correlation between students' active emotional engagement and their mathematics and English achievement scores. Appleton et al. (2006) found that the correlation between cognitive engagement and academic achievement was weak. A possible explanation for these results might be that students who achieve good grades master the skills needed to learn content quickly, thus devoting less time to studying. In contrast, students who get poor grades do not have a good foundation of skills that help them learn, so they have difficulty getting good grades even when they attempt to engage more.

Within this background, the relationship between student engagement and academic achievement remains ambiguous. A possible reason for the inconsistency in results is the use of small samples. As such, it might be possible to determine the nature and magnitude of any association between student engagement and academic achievement by performing a meta-analysis, which involves statistically integrating the results of multiple studies.

Another possible reason for the contradictory results is the influence of moderating factors, such as the method of reporting achievement, cultural value,

and gender. In several previous studies, researchers have, indeed, considered that the relationship between student engagement and academic achievement might be influenced by various factors related to the method of reporting student engagement and other individual factors (Fredricks, Blumenfeld, & Paris, 2004; Marks, 2000; Shernoff & Schmidt, 2008). Therefore, we hypothesized that the relationship between student engagement and academic achievement would be influenced by (a) the method of reporting student engagement (mainly for behavioral and emotional engagement), (b) cultural value, and (c) gender.

The method of measuring student engagement used by researchers in their studies is equivalent to selecting a particular conceptualization of a construct; the term, student engagement, can mean many things to many people. Before the method for measuring student engagement can be selected, it is necessary to define clearly the concept of student engagement. Early researchers typically operationalized *student engagement* in terms of observable behaviors, such as the level of participation in various tasks, and the time taken to complete them (Brophy, 1983). Later, researchers began to incorporate into their understanding of student engagement the emotional aspect of students' experience while learning tasks (Connell & Wellborn, 1991; Finn, 1989). More recently, however, researchers have begun to conceptualize student engagement as a multidimensional phenomenon. As already described, student engagement comprises three dimensions: behavioral engagement, emotional engagement, and cognitive engagement. *Behavioral engagement* refers to students' levels of participation in their learning, including their involvement in learning activities. *Cognitive engagement* centers on the cognitive and self-regulation strategies used by students in their learning processes (Fredricks et al., 2004; Walker, Greene, & Mansell, 2006). *Emotional engagement* is defined as students' emotional reactions to teachers, students, learning, and school in general, including their sense of belonging, value, and identity, as well as their level of interest, boredom, happiness, sadness, anxiety, and other emotions (Finn, 1989).

There have not yet been any systematic studies of how the method of reporting student engagement might influence the results recorded on the relationship between student engagement and academic achievement. However, in empirical studies the results have shown that the correlation between engagement and academic achievement varies substantially between self-reported or other-reported measures of study engagement, with the greatest differences observed for behavioral and emotional engagement. For example, Fall and Roberts (2012) found that the Pearson correlation coefficient between teacher-reported behavioral engagement and academic achievement was .48, whereas that for student self-reported behavioral engagement was only .27. Similarly, Furrer and Skinner (2003) found that the Pearson correlation coefficients of teacher-reported behavioral and emotional engagement with academic achievement were .57 and .53, respectively, whereas those for student-reported engagement were

.33 and .19. Overall, then, the method of reporting student engagement may be a key variable influencing the relationship between student engagement and academic achievement.

Regarding demographic variables, we focused on cultural value and gender. In several studies the results have shown that student engagement differs substantially with an individual's cultural background, with findings demonstrating that this has obvious effects on the correlation between student engagement and academic achievement (Shernoff & Schmidt, 2008). For example, Sciarra and Seirup (2008) found that the correlation of white American students' emotional engagement and academic achievement was higher than was the correlation of Asian students. Shernoff and Schmidt (2008) also indicated that the correlation of black students' emotional engagement and academic achievement was lower than that of white students.

Currently, there have been relatively few studies conducted in which the findings have demonstrated that gender is a key variable influencing the correlation between student engagement and academic achievement. However, in one Chinese study the researchers found that, compared with boys, girls' engagement was more strongly correlated with academic achievement (Wen, Zhang, Yu, & Dai, 2010). Based on this finding, we considered gender as a possible moderator of the relationship between student engagement and academic achievement.

To explore these issues further, we investigated the correlation between student engagement and academic achievement among students in Grades 1 to 12 by performing a meta-analysis. We were also interested in determining which factors affected this correlation. This study had two main purposes, (a) to confirm the effects of the strength of the relationships of the three domains of student engagement, and of overall student engagement, with the level of academic achievement, and (b) to investigate whether or not these relationships were influenced by the method used for reporting engagement, by cultural values and by gender.

Method

Literature Search

In our preparation for this meta-analysis, we searched for literature published between 2003 and 2015. We chose this period because our study was based on the three-factor model of student engagement, which was proposed in 2003 (Fredricks et al., 2004).

We limited the publications searched to those written in Chinese and English. We performed a keyword search for literature on the relationship between student engagement and academic achievement in various electronic databases, both

Chinese (including CNKI, VIP, and Wanfang) and English (including Web of Science, Elsevier SDOL, EBSCO, Springer, PsycINFO, and ProQuest Digital Dissertations), along with Google Scholar. The keywords we used for the search were “engagement,” “involvement,” “academic performance,” “achievement,” and “academic achievement.” If we could not find an original study, we acquired it via literature transfer from a school library or by exchanging emails with the authors of the study. The literature was subsequently analyzed and filtered by applying certain criteria. Initially, we retrieved 273 articles.

Criteria for Literature Selection

As described in the previous section, in research on student engagement scholars have typically conceptualized engagement in terms of three domains: behavioral, emotional, and cognitive engagement. Therefore, we focused only on studies that used this conceptualization. We note here that some researchers have based their conceptualization of engagement on theories of happiness and have proposed a different three-dimensional structure comprising vigor, dedication, and absorption, which has been measured using the College Student Work Engagement Questionnaire (Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). However, because the theoretical basis for this conceptualization differs from the conceptualization we had selected as our focus, we excluded all studies that employed this scale or model from our meta-analysis. In the literature selection we also abided by the following criteria: (a) the researchers mainly discuss the correlation between student engagement and academic achievement via empirical methods; (b) the researchers report the Pearson correlation coefficient between student engagement and academic achievement; (c) the sample size is clear; (d) participants in the study were from the general population; and (e) student engagement is measured at the individual level, rather than at the class level. According to these criteria, 204 studies were rejected and 69 studies met the criteria for inclusion in the meta-analysis.

Coding

The selected literature was coded in terms of the following characteristics: sample characteristics (i.e., gender, cultural value), sample size, student engagement scores for behavioral, emotional, and cognitive engagement, and overall score of all the three domains of engagement, method of reporting student engagement, year of publication of the study, academic achievement index, method of reporting academic achievement, and effect size. We point out here that cultural value was coded as Eastern, Western, or other; *Eastern* referred to participants from Asian countries, such as China (Mainland China, Hong Kong, Taiwan), Korea, The Philippines, and Singapore. *Western* referred to participants from European and North American countries such as Germany, the United States of America, and *other* referred to participants from countries such as Africa.

When we were extracting the effect sizes we abided by the following principles. First, the effect sizes were generated for independent samples; if a single study contained multiple independent samples, effect sizes were calculated for each sample. We extracted effect sizes only for the relationships between academic achievement indices and the various measures of student engagement we have listed. When correlations between the same domain of student engagement and the same index of academic achievement were calculated at different time periods in a study, we selected only one effect size by performing the main effect size check in order to avoid biasing the results because too many effect sizes were being generated for the same sample. The average value of the effect sizes was used. Second, for studies in which the researchers reported on correlations between academic achievement and all three domains of student engagement, but not on overall student engagement, we calculated the average correlation of the three domains to determine the relationship between overall student engagement and academic achievement. For studies in which the researchers had investigated the correlation between only one of the three student engagement domains and academic achievement, we took the average correlation between multiple aspects and academic achievement as the correlation between the certain aspect of student engagement and academic achievement. Finally, the above standards were applied to determine the main effect size. However, we performed our meta-analysis from the perspective of variable adjustment, so that if a study contained multiple correlated independent samples, they could be considered as the effect sizes of independent samples at the time of coding.

Data Analysis

All data were analyzed using Comprehensive Meta-Analysis software (version 2.0). Pearson's correlation coefficient (r) was employed as the effect size; we employed either the correlation coefficient reported in the study or the average coefficient after data processing. During data analysis, we converted each r coefficient into its corresponding Fisher's z score, and then transformed it back in order to display the results. This method of calculation is different from merely taking the average, as weights are applied in the equation. The effect size z score and its variance can be used to calculate the joint effect and confidence intervals (CI).

Results

Sample Features

Following the literature filtering, we included 69 independent samples in the analysis, and calculated 163 effect sizes. These samples comprised 196,473 participants, of which overall student engagement accounted for 14.31% of the total, behavioral engagement accounted for 45.20%, emotional engagement

accounted for 24.76%, and cognitive engagement accounted for 15.73%. The number of independent samples in each study ranged from 1 to 8.

Overall Relationship

We reported the average weighted effect size (r), sample size (k), and 95% CI for the various relationships, and we used a fixed effect model to calculate homogeneity statistics. The results indicated that overall engagement and each of the three domains of engagement were positively correlated with academic achievement, as follows: overall engagement, $r_{OE} = .269$ ($z = 46.095, p < .001, k = 30, 95\% \text{ CI} = .258, .279$); behavioral engagement, $r_{BE} = .350$ ($z = 108.688, p < .001, k = 55, 95\% \text{ CI} = .344, .355$); emotional engagement, $r_{EE} = .216$ ($z = 48.333, p < .001, k = 47, 95\% \text{ CI} = .208, .224$); and cognitive engagement, $r_{CE} = .245$ ($z = 43.968, p < .001, k = 31, 95\% \text{ CI} = .235, .256$). These values fit the condition of a mesomeric effect occurring.

Moderator Analysis

In order to examine the effect of moderators on the relationship between student engagement and academic achievement, we initially carried out homogeneity testing of the 163 effect sizes. The results show that the homogeneity coefficients for the relationships of overall engagement and of each of the three domains of engagement with academic achievement were as follows: overall engagement, $Q_T(29)_{OE} = 250.906, p < .001, I^2 = 88.442$; behavioral engagement, $Q_T(54)_{BE} = 1972.869, p < .001, I^2 = 97.263$; emotional engagement, $Q_T(46)_{EE} = 549.016, p < .001, I^2 = 96.621$; cognitive engagement, $Q_T(30)_{CE} = 359.469, p < .001, I^2 = 91.654$. As the homogeneity test results reached a level of significance, the presence of moderator variables in this relationship was assumed. We therefore tested the following moderators: form of reporting student engagement, form of reporting results, cultural value, and gender.

Meta-analysis of variance

Method of reporting engagement. The results of the homogeneity test ($Q_{B,BE} = 429.996, df = 1, p < .001, I^2 = 90.132$) revealed that the method for reporting student engagement significantly influenced the relationship between behavioral engagement and academic achievement. Specifically, the effect size ($r = .428, p < .001$) between other-reported behavioral engagement and academic achievement was significantly higher than that for self-reported behavioral engagement ($r = .303, p < .001$). The homogeneity test result ($Q_{B,EE} = 62.035, df = 1, p < .001, I^2 = 81.712$) also showed that the method of reporting engagement moderated the relationship between emotional engagement and academic achievement; again, the effect size for this relationship was higher for other-reported emotional engagement ($r = .431, p < .001$) than for self-reported emotional engagement ($r = .211, p < .001$).

Cultural value. The homogeneity tests revealed that cultural value was also a significant moderator of the relationships between all engagement domains and academic achievement ($Q_{B,OE} = 22.309, df = 2, p < .001, I^2 = 78.286$; $Q_{B,BE} = 29.567, df = 2, p < .001, I^2 = 83.431$; $Q_{B,EE} = 37.588, df = 2, p < .001, I^2 = 90.281$; $Q_{B,CE} = 53.547, df = 2, p < .001, I^2 = 88.781$). Specifically, the correlations between overall, emotional, and cognitive engagement and academic achievement were higher for Eastern students ($r = .320, p < .001; r = .276, p < .001; r = .343, p < .001$, respectively) compared to Western students ($r = .257, p < .001; r = .205, p < .001; r = .241, p < .001$, respectively). Conversely, the correlation between behavioral engagement and academic achievement was higher for Western students ($r = .354, p < .001$) than for Eastern students ($r = .377, p < .001$).

Meta-regression analysis. To test whether or not gender was a moderator in the relationship between student engagement and academic achievement, we performed a meta-regression analysis of the average effect sizes between student engagement, its three domains, and academic achievement. The results showed that gender significantly moderated the relationships of overall, behavioral, and cognitive engagement with academic achievement, $Q_{M,OE} (1,k = 26) = 87.383, p < .001$; $Q_{M,BE} (1,k = 48) = 26.538, p < .001$; $Q_{M,CE} (1,k = 27) = 12.252, p < .001$, respectively. In other words, as the number of male participants in the sample increased, the effect sizes for overall, emotional, and cognitive engagement decreased; conversely, as the number of female participants increased, the effect sizes also increased, $r_{OE} = .881, r_{BE} = .614, r_{CE} = .499$, respectively. The effect of gender on the correlation between emotional engagement and academic achievement was nonsignificant, $Q_{M,EE} (1,k = 94) = 3.472, p > .05$.

Discussion

Academic achievement is commonly used to predict the success of an educational system, to evaluate the performance of schools, to assess teachers' class management ability, and to measure changes in individual students' level of achievement (Lei et al., 2015). Thus, in the context of educational assessment, it is necessary to analyze the factors that affect students' academic achievement. Accordingly, we used a meta-analysis to explore the relationships between student engagement and academic achievement in order to provide a scientific basis for observed changes in students' level of academic achievement. We quantitatively analyzed data from 69 independent samples to determine the relationship of overall student engagement and its various facets with academic achievement, as well as examining how this relationship is influenced by certain potential moderators. The results indicated that there was a medium positive correlation of all facets of student engagement (overall, behavioral, emotional, and cognitive) with academic achievement. In other words, a higher level of

overall, behavioral, emotional, and cognitive engagement was associated with higher academic achievement. These results are consistent with the results of Mo and Singh (2008). The participation–identification model of student engagement (Finn, 1989) offers an explanation for this phenomenon. According to this theory it is argued that continued behavioral engagement leads to successful academic performance, which, in turn, leads to students' greater recognition of the importance of school (Finn, 1989). This recognition has a positive feedback effect, whereby students are motivated to devote themselves further to study activities and, therefore, their level of academic achievement improves, thus beginning the cycle anew (Finn, 1989).

Of the three types of engagement, we found the average effect size was highest between behavioral engagement and academic achievement, followed by the effect size for cognitive engagement, with emotional engagement being the lowest. These findings are essentially consistent with those reported in a previous study (Fredricks et al., 2004). A possible reason is that behavioral engagement directly promotes individuals' successful academic performance, which, in turn, improves their recognition of, and satisfaction with, studying. This subsequently leads to their continued behavioral engagement (Newmann, Wehlage, & Lamborn, 1992). In addition, in a model of the relationship between student engagement and academic achievement among junior school students, Wen et al. (2010) found evidence for a serial relationship model between student engagement and academic achievement, namely, emotional engagement → cognitive engagement → behavioral engagement → academic achievement. This model not only demonstrates that the relationship between behavioral engagement and academic achievement can be closely compared to that of emotional and cognitive engagement, but also demonstrates that the relationship between cognitive engagement and academic achievement is more accurately compared to that of emotional engagement. This model, therefore, supports the results of our meta-analysis.

We also found that the relationships between the various facets of student engagement and academic achievement were moderated by the method of reporting engagement, cultural value, and gender. First, we found that the method of reporting engagement moderated the relationships of behavioral and emotional engagement with academic achievement. Specifically, the average effect sizes when using other-reporting measures of these types of engagement were larger than when using self-reporting measures. This might be because reporting of behavioral and emotional engagement by others is mainly done by teachers, who may base their evaluations on students' actual academic performance. Therefore, this would lead to higher correlations between the constructs.

We were interested that there were significant differences between Eastern and Western students in the average effect sizes for their overall, behavioral, emotional, and cognitive engagement and their academic achievement. This

indicates that cultural value is also a moderator variable of these relationships. Specifically, the average effect sizes between overall, emotional, and cognitive engagement and academic achievement were significantly higher in samples of Eastern students than in samples of Western students; in contrast, the average effect sizes between behavioral engagement and academic achievement were higher in Western students than they were in Eastern students. This might be because in Asian cultures memorization and recitation in learning are emphasized, and these are skills often tapped by examinations (Xu & Gong, 2009). Generally, memorization and recitation require emotional and cognitive engagement, thus explaining the stronger effect in Eastern compared to Western students. In contrast, in Western cultures students' practice and operation in learning are emphasized, which are skills more relevant to behavioral engagement, and it is largely these skills that determine Western students' level of academic achievement (Xu & Gong, 2009). This likely explains the stronger average effect size among Western samples of students.

Finally, we found that the moderating effect of gender on the relationship between emotional engagement and academic achievement was nonsignificant, but gender did have an influence in the relationships of overall, behavioral, and cognitive engagement with academic achievement. Namely, as the number of female participants in the sample increased, the correlations between these facets of engagement and academic achievement became stronger; and, conversely, as the number of male participants increased, the correlations weakened. This suggests that educators should pay more attention to males when focusing on the relationships between these facets of engagement and the academic achievement of boys. One reason for this finding might be that, compared to girls, boys have higher self-esteem (Shi, Zhang, & Fan, 2017). This means that boys with good grades may be less willing to engage with their studies to demonstrate that they have better learning ability, whereas, because of their already poor results, boys with low grades are less willing to engage because they wish to avoid having other people ridicule their learning ability (Wen et al., 2010).

The current meta-analysis was executed using a strict procedure and standards. However, it had several limitations. First, in all the studies reviewed only direct effects were examined; however, in other studies researchers have found that engagement indirectly affects students' academic achievement across other variables as well. Therefore, for instance, we could have tested the indirect effects of academic emotions on academic achievement. Second, this meta-analysis was based on cross-sectional studies, so that no inferences of causal relationships can be made from these results; although we assumed that students' engagement influenced their academic achievement, the results only support correlations between two factors. Therefore, we recommend that future researchers implement longitudinal studies to test the causal relationship between academic emotions and academic achievement.

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