


Article

The Impact of Effective Teaching Practices on Academic Achievement When Mediated by Student Engagement: Evidence from Australian High Schools

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Abstract: Previous research has proposed a conceptual framework indicating the mediating role of student engagement on the relationship between effective teaching practices and student academic outcomes. This study is the first internationally to empirically test this conceptual framework for the key aspects of teaching practice—effective learning time and expectations for success—using robust, linked longitudinal survey–administrative data from 6825 public school students in Australia. Drawing on a system of structural equations, we demonstrate that effective learning time has a direct effect on students’ performance and an indirect effect via improved positive behavior, attendance and homework behavior. Expectations for success, in contrast, have a largely indirect effect, affecting students’ academic performance through improved positive behavior, attendance and homework behavior.

Keywords: teaching practices; student engagement; academic achievement; mediation



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1. Introduction

Numerous studies provide empirical evidence for the impact of teaching practice and learning facilitators on a variety of indicators of student engagement [1–3], and—in turn—for the impact of student engagement on students’ academic performance and attainment [4–9]. Both effective teaching practice and high student engagement have been independently linked to improved academic achievement. However, there is a dearth of empirical studies to investigate the direct and indirect links between teaching practice, student engagement and academic achievement, as well as research directly testing the mediating role of student engagement on the relationship between effective teaching practices and student academic outcomes within a single analytic framework [10]. This is despite previous calls in the literature for more longitudinal studies to investigate the mediating role of student engagement in the relationship between conditions for engagement and positive student outcomes [11,12]. Investigating such mediating effects is critical to further our understanding of the interrelations between effective practice and student engagement and to inform the design of appropriate interventions in practice.

This paper develops and tests a formal conceptual model to explicitly link effective teaching practice, student engagement and academic achievement, drawing on broader theoretical literature. Specifically, we draw on the conceptual work by Appleton and colleagues [11,13,14], who proposed a comprehensive model that describes the interrelations between student engagement and other constructs in an educational setting. The model is highly relevant for policy and practice: due to the malleable nature of student engagement, it has the potential to identify a crucial avenue for educational interventions.

We put this conceptual model to empirical test using a robust data set with linked longitudinal survey and administrative data from public schools in New South Wales, the largest state in Australia and one of the largest school systems in the world. The linked survey–administrative analytic data sample comprises responses of 6825 secondary school students, surveyed in both Years 7 and 9. This unique dataset has a number of benefits on which we are able to capitalize in this study. The survey component provides unique and rich data on students’ perception of school practice and student engagement that can only be collected using purpose-built instruments, while the administrative data capture students’ academic performance in terms of standardized test scores, enabling more accurate statistical estimation in comparison with using self-reported survey data. The multiyear longitudinal data allow us to account for the underlying dynamics over time, to build the temporal relationships between teaching practices, engagement and achievement into the modelling design, while also improving statistical efficiency and inference. We use this data to build a system of structural equations to demonstrate the direct and indirect effects of specific aspects of effective teaching practices on standardized reading scores, as mediated by the indicators of student engagement.

The study makes a number of important contributions to the literature, policy and practice. It is one of the first studies to combine longitudinal survey data on school practice and student engagement with standardized measures of academic achievement from administrative records. The findings add significantly to our conceptual and theoretical understanding of the mechanisms that link effective teaching practices to student achievement by pointing to an important mediating mechanism in the form of student engagement. The findings provide important pointers for educational policy and school practice by demonstrating that improving the quality of teaching instruction and creating a culture of high expectations has the potential to directly unlock the learning process and facilitate student learning indirectly as students’ behavior and attitudes to learning improve.

1.1. Effective Teaching Practices

Educational literature emphasizes the important role of effective teaching practices for improving student outcomes [15–18]. The ecological framework of child development [19] positions school as one of the most crucial settings that impact children’s development. Within school, it is the teacher–student relationships and interactions in the classroom that mainly influence students’ learning experiences and outcomes [17,20–23]. The impact of teaching practices on a range of learning outcomes, including student engagement, achievement and attainment, has been empirically explored and summarized in a number of robust meta-analytic and systematic review studies [11,24–26]. For instance, a recent systematic review of 46 studies conducted by Quin [25] concluded that effective teaching practices, including positive teacher–student relationships, better support for students and higher expectations and encouragement, are positively associated with a range of indicators of student engagement and outcomes (e.g., improved academic performance, improved attendance, less disruptive behavior and lower dropout).

While effective teaching practices involve a cohesive and complex system of aligned actions [17,27], accumulating research evidence particularly underlines the importance of two key elements that cut across these practices: academic press and academic support [28–30]. Academic press is defined as pressure—exerted by schools or teachers—on students to succeed and excel academically. Academic support provided by schools or teachers covers such aspects as organization of time, the provision of personalized support and effective instruction, with an emphasis on collaborative and engaging activities [28,31,32].

Academic press and academic support are complex concepts and have been captured in different ways in previous studies. Research on academic press has often focused on teachers pushing students to achieve [28,33,34], demonstrating the importance of teachers’ expectations for success. Academic support often covers aspects such as organization of time and support provided for teaching important or difficult material. Better academic support has been shown to induce higher-order thinking skills as well as to promote the

empowerment of students and their cognitive and behavioral engagement with the process of learning [35,36]. In this study, we operationalize the concept of academic press using a composite measure of *expectations for success* (which captures students' perceptions of teachers' expectations) and the concept of academic support using a composite measure of *effective learning time* (which captures students' perceptions of how teachers use classroom time, including whether classes are well organized and whether important or difficult concepts are taught well).

The literature also offers some insights into different mechanisms that could explain the impact of academic support and academic press on students' learning outcomes. For academic support, empirical evidence suggests that certain ways of teachers' instructions can trigger higher-order thinking skills and facilitate students' cognitive engagement in the learning process, and as such improve students' performance [35,36]. For academic press, an extensive body of literature uses the self-fulfilling prophecy hypothesis to explain the effect of teacher's expectations on students' motivation and academic outcomes [18,37]. However, there is a lack of conclusive evidence on the effect of teachers' expectations on students' performance, including direct and indirect mechanisms that could explain this effect—a gap that we address in this study by focusing on the role of student engagement in the process.

1.2. Student Engagement

The last two decades witnessed an increasingly prolific literature on student engagement [12,38,39]. A large body of literature has linked increased student engagement to improved outcomes, including better academic performance [7,40,41], lower drop out [9,42,43], better emotional wellbeing [44] as well as long-term adult education and occupation outcomes [45]. Part of the appeal of the concept is driven by the malleable nature of student engagement, and its potential for targeted interventions to improve students learning experiences and outcomes [6,11,12,46].

Like effective teaching practice, student engagement is also a complex and multifaceted phenomenon, typically considered to encompass emotional (or affective), behavioral and cognitive aspects [46]. The behavioral and cognitive dimensions are ones that have been particularly highlighted as responsive to teaching practices [32,35,36]. In this study, we capture a number of indicators of student engagement, mostly tapping into the behavioral facets, including *positive behavior at school*, *class participation*, *attendance* and *homework behavior*.

1.3. The Mediating Role of Student Engagement

The mediating role of student engagement has been previously conceptualized in the literature documenting the impact of family, community and school context on student outcomes [11–14,40]. In one prominent example, drawing on a framework depicted by Connell and Wellborn [40] as well as the process model of student-perceived control [41], Appleton and colleagues [11,13,14] proposed a comprehensive conceptual model that captures the interrelationships between student engagement and other concepts. The model illustrates the cyclical relations among the impact of a variety of supports from the social and school context on different components of student engagement, which in turn affect students' academic, social and emotional outcomes. Specifically, the model conceptualizes the contextual factors (e.g., school discipline practices, teachers' classroom practices, parental supervision and peer influence) as facilitators of engagement, while multiple dimensions of student engagement (e.g., attendance patterns, homework behavior and class participation) are considered indicators of engagement [11] (p. 382). The indicators of engagement are conceptualized in this model as mediators of the relationships between the contextual facilitators and student outcomes.

While Appleton's model has received a lot of attention in the literature, including in empirical studies, work to specifically test the mediating role of student engagement on the relationship between the key components of effective teaching practice and academic

achievement has been scarce. However, there is a body of research that provides indirect support to postulate such a model. For instance, teachers' academic support and academic press have been identified as key factors independently affecting student outcomes [29,30], and a number of studies investigated their combined and intersecting effects on achievement [28,34]. In addition, it is well established that a variety of teaching strategies can improve students' engagement in academic work [1]. More broadly, a range of studies explore the effects of students' perceived school environment (including teachers' support, expectations, instructional style, etc.) on student engagement [2,3,21,28,47], while other studies demonstrate the effects of student engagement on learning outcomes, including academic achievement [4–6,9], which combined suggests the presence of a mediating effect of student engagement. Furthermore, student engagement has been shown to be an important mediator in other relationships, such as in relationships between students' performance and a range of factors, including students' socio-economic background [48], perceived school environment [10,49], classroom context [21] and parental and teacher career support [50].

This combined body of evidence provides a strong basis to postulate a mediating role of student engagement in the relationships between effective teaching practices and academic achievement. In this paper we postulate such a model, capturing the interrelationships between different facets of effective teaching practice, student engagement and academic achievement. Specifically, we postulate that two components of teaching practice, *effective learning time* and *expectations for success* (which tap into the broader concepts of academic support and academic press, respectively), have *direct effects* on academic achievement (captured through standardized *reading test scores*) as well as *indirect effects* through improved student engagement (captured using indicators of *positive behavior*, *class participation*, *attendance* and *homework behavior*). Figure 1 shows the postulated conceptual relationship between teaching practice, student engagement and academic achievement and lists the key indicators used in this study to capture these concepts.

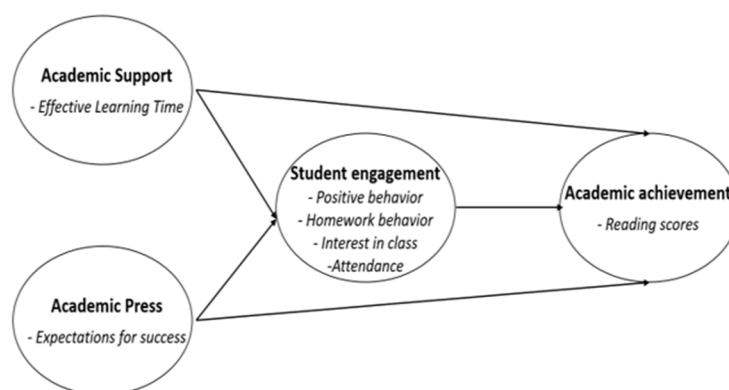


Figure 1. Conceptual model of relationships between key components of teaching practice, student engagement and academic achievement.

We test this model empirically using cutting-edge statistical methodology and robust, large-scale linked longitudinal survey and administrative data. By conducting the study in this manner, we address the following research questions:

- (1) What are the direct effects of effective teaching practices (*effective learning time* and *expectations for success*) on student achievement (standardized *reading scores*)?
- (2) Does student engagement (captured through *positive behavior*, *class participation*, *attendance* and *homework behavior*) fully or partially explain the association between effective teaching practices and student achievement, and if so, what is the relative strength of such mediation for different components of effective teaching practice?

By addressing these questions, the present study makes distinct contributions to the literature. First, to our knowledge, it is the first paper to explicitly link effective teaching

practices, student engagement and academic achievement in a single conceptual model that postulates a mediated relationship. Second, it uses robust, large-scale longitudinal data in the form of a linked survey–administrative dataset to rigorously test the conceptual model using a system of structural equations. We directly capitalize on the longitudinal nature of the data by controlling for previous academic achievement in the statistical models. One prominent criticism of previous empirical research on the mediating role of student engagement has been its reliance on cross-sectional data. Specifically, the few studies that look directly at the mediating role of student engagement in the association between school context and student academic performance are typically based on cross-sectional data [21,49,50], with a rare exception of the study by Wang and Holcombe [10], who used longitudinal data. Critics have pointed out that in the absence of high-quality longitudinal data, it is very difficult to establish causal relationships between student engagement, its drivers and its outcomes [18].

2. Data and Methods

2.1. Data

In this study, we leverage high-quality longitudinal linked survey and administrative data. The survey data is taken from the Tell Them From Me (TTFM) survey conducted in government schools in the state of New South Wales (NSW), Australia on behalf of the NSW Department of Education. The survey responses are linked to administrative data capturing students' academic performance on a standardized national reading test, further described in the next section.

TTFM is an online survey system that enables schools to capture the views of students and provides insight into student engagement, wellbeing and effective classroom and teaching practices at school. Developed in Canada [51], TTFM has been customized to the Australian schooling context and offered annually to all NSW government schools by the NSW Department of Education since 2013. The student survey captures a range of school practices as well as student engagement indicators. It has been previously validated [52] and has been used in a number of countries around the world, including the United States and Uruguay [52]. Participating schools are responsible for administering the surveys to students on computers during lesson time.

This paper uses student survey responses collected in 148 secondary schools that participated in both 2013 and 2015, focusing on the student cohort moving from Year 7 to 9 in that time. Overall, 6825 secondary school students completed the surveys in both years and provided information used to derive key analytic variables (see the next section).

This paper is exclusively based on secondary data analysis. The project was reviewed by the Office of Research Ethics and was deemed exempt from ethics review under the National Statement on Ethical Conduct in Human Research policy.

2.2. Outcome Variable: Academic Achievement

Academic performance is captured by the students' reading scores obtained from the National Assessment Program—Literacy and Numeracy (NAPLAN). NAPLAN is designed to assess all Australian students in Years 3, 5, 7 and 9 in reading, writing, language conventions (spelling, grammar and punctuation) and numeracy annually since 2008. Students sit the NAPLAN test when they are in Years 3, 5, 7, and 9, and thus there is a 2-year lag between their NAPLAN tests. As such, we include NAPLAN scores in Year 7 as control variables, while using NAPLAN scores in Year 9 as the outcome variable. Given that the NAPLAN score is a standardized measure, it can be compared across years, and as such, is a good indicator of academic performance in longitudinal data sets. The assessment process is performed using a national common reporting format by the Australian Curriculum, Assessment and Reporting Authority (ACARA). The reporting scales, ranging from 0 to 1000, are constructed so that given scale scores can be compared across school year levels and over time but are not comparable across the five domains [53].

In this paper, we focus on NAPLAN Reading scores as the outcome measure because reading ability forms the foundation for students' long term academic achievement [51,54,55]. For instance, Willms [51] highlighted the critical role of higher-order literacy skills on the pathway to school success. Students need to accomplish the transition from learning-to-read to reading-to-learn, which means that they are expected to use their reading skills to understand the content of other subjects, including the ability to abstract information from text, integrate and find out connections of this information, make inference and build up their own hypotheses. Students who have not fully grasped such higher-order literacy skills would fall behind in secondary schools and tend to gradually disengage from school [51].

2.3. Key Predictors: Effective Teaching Practices

As outlined earlier, our key predictors are indicators capturing the two central aspects of effective teaching practices: academic support and academic press. We operationalize academic support as effective learning time, capturing students' perception of the quality of their teachers' instruction and academic press as expectations for success, capturing students' perception of the extent to which their teachers expect them to work hard and succeed. Effective learning time and expectations for success are scales constructed by aggregating student responses to a set of individual survey items, recording the extent to which they agree or disagree with each statement on a 5-point Likert scale. Effective learning time was recorded with questions on the teachers' use of classroom time, such as whether difficult concepts are taught well or whether classes are well organized. Expectations for success were recorded with questions on whether students feel that teachers expect them to work hard and encourage them to perform better. Composite indicators were calculated by taking the mean responses to the survey items and re-scaled to 0–10, with higher values representing higher levels of effective teaching practice. This enables easy and clear interpretations of our model outputs. Cronbach's alpha shows high internal consistency of both indicators ($\alpha > 0.85$ for both indicators).

2.4. Mediating Variables: Student Engagement

Our mediating variables capture several indicators of student engagement, most directly tapping into the behavioral dimension of engagement. Consistent with the behavioral engagement literature [6], we operationalize student engagement using the following measures: (i) positive behavior, (ii) class participation, (iii) attendance and (iv) homework behavior. Each of these measures is derived using student responses to a number of individual items and converted into a score on a scale from 0 to 10 by taking the mean responses to these items. For example, positive behavior is captured by asking about students' behaviors in the learning environment, such as whether they are listening to their teachers or being disruptive in the class (reversely coded) ($\alpha = 0.81$). Class participation is captured by asking about the extent to which students pay attention to learning in the class ($\alpha = 0.75$). The measure of school attendance is similar to that developed for PISA and measures the extent to which students report that they skipped classes or missed days at school without permission or arrived late for school or classes ($\alpha = 0.64$). Homework behavior is measured by asking about the extent to which the students enjoy their homework and hand it in on time ($\alpha = 0.74$). The values of Cronbach's alpha indicate acceptable internal consistency for all these scales (all $\alpha > 0.6$).

2.5. Control Variables

In line with previous research in this field, we controlled for a range of students' demographic characteristics in all our models, which include gender (male; female), born in Australia (yes; no), born in a single-parent family (yes; no), Indigenous status (yes; no), parental education (university degree; vocational education; high school; below high school) and a measure of household possessions to approximate socio-economic status. The model also controls for a number of contextual factors representing the school and

classroom context, such as school climate and experience of being bullied. Finally, the models control for prior achievement (NAPLAN Reading scores in Year 7), as outlined further below.

2.6. Method

We simultaneously estimate multiple equations that describe the hypothesized relationships between measures of effective learning time and expectations for success, student engagement and academic performance. This approach is known as *path analysis*, falling within the family of structural equation modelling (SEM). Path analysis involves estimating a series of structural relationships between observed indicators while accounting for correlated unobserved characteristics in all equations. A distinct advantage of using this modelling technique is its capacity to undertake formal mediation analysis and examine student engagement as a possible underlying mechanism of the relationship between effective learning time and expectations for success and academic performance, while identifying direct and indirect (via student engagement) pathways for this effect.

Figure 1 introduces the conceptual mediation model of the hypothesized relationships between different types of indicators covered by the TTFM survey. The model examines the mediation effects of student engagement indicators on the relationships between measures of effective teaching practices and NAPLAN Reading scores. In practice, the analysis leverages the power of longitudinal data, and the model also controls for past achievement (captured by the NAPLAN Reading score two years prior), socio-demographic characteristics of students, parents and families and contextual factors representing the classroom context, such as school climate and experience of being bullied.

Specifically, effective learning time and expectations for success are captured at Year 7, and we estimate their effects on academic performance two years later (at Year 9). The mediating factors (student engagement indicators) are measured concurrently with the outcome variable at Year 9. One important reason for using teaching practices captured in Year 7 to predict NAPLAN in Year 9 is that the relationship is temporal: effective teaching practices take time to be reflected in improved academic performance. Furthermore, a two-year lag enables us to detect the effects that are durable and potentially persistent. To further leverage the longitudinal nature of the data, we are also able to incorporate prior achievement (Year 7 NAPLAN Reading score) as the key control variable that captures the differences in cognitive ability, as well as other contextual factors including socio-demographics and classroom and school characteristics at Year 7. In this way, the estimated effects control for the baseline differences among students at Year 7 in terms of their academic ability and classroom and school environments.

3. Results

3.1. Descriptive Analysis

Table 1 presents summary statistics of key analytical variables in our models. The mean reading score increases from Year 7 (549.50, $SD = 69.82$) to Year 9 (587.77, $SD = 72.70$). On a scale of 0 to 10, students score more highly on some aspects of student engagement than on others: the average scores for positive behavior and attendance are 9.32 ($SD = 1.41$) and 8.46 ($SD = 1.85$), whereas the average scores for class participation and homework behavior are 4.35 ($SD = 2.30$) and 4.83 ($SD = 2.53$). The majority of students in the sample are Australia-born (86%), non-Aboriginal (96%) and come from two-parent families (72%).

Table 2 reports bivariate correlations between key predictors, mediators and reading scores in Years 7 and 9. Student engagement measures are positively but weakly associated with reading scores. The associations are moderate between attendance and positive behavior (0.47), homework behavior and class participation (0.48) and homework behavior and positive behavior (0.40). As expected, reading scores in Year 7 and Year 9 are strongly correlated (0.83). All correlation coefficients are statistically significant ($p < 0.001$), except for the correlation between class participation and reading scores in Year 7, which is not significant.

Table 1. Summary statistics of key analytical variables.

Variable	Mean	SD	Median	Min	Max
Outcome					
Year 9 Reading	587.77	72.70	583.80	209.30	867.90
Predictors: Effective teaching practices					
Effective Learning Time	6.86	1.77	7.08	0.00	10.00
Expectation for Success	7.61	1.67	7.50	0.00	10.00
Mediators: Student engagement					
Class participation	4.35	2.30	4.17	0.00	10.00
Positive behavior	9.32	1.41	10.00	0.00	10.00
Attendance	8.46	1.85	8.57	0.00	10.00
Homework	4.83	2.53	4.44	0.00	10.00
Selected control variables					
Year 7 Reading	549.50	69.82	551.30	323.10	889.70
Female	0.51			0.00	1.00
Australian-born	0.86			0.00	1.00
Single-parent family	0.28			0.00	1.00
Aboriginal or Torres Strait Islander	0.04			0.00	1.00
Parent educ.—high school	0.14			0.00	1.00
Parent educ.—vocational	0.12			0.00	1.00
Parent educ.—university	0.38			0.00	1.00

Notes: TTFM 2013 (Year 7)/2015 (Year 9). Number of students: 6825.

Table 2. Bivariate correlations between predictors, mediators and outcome.

	Effective Learning Time Y7	Expectation for Success Y7	Class Participation Y9	Attendance Y9	Positive Behavior Y9	Homework Y9	Reading Y7
Class participation Y9	0.25 ***	0.19 ***					
Attendance Y9	0.13 ***	0.15 ***	0.13 ***				
Positive behavior Y9	0.21 ***	0.22 ***	0.18 ***	0.47 ***			
Homework Y9	0.29 ***	0.27 ***	0.48 ***	0.28 ***	0.40 ***		
Reading Y7	0.07 ***	0.08 ***	0.02	0.14 ***	0.25 ***	0.13 ***	
Reading Y9	0.09 ***	0.10 ***	0.04 ***	0.18 ***	0.29 ***	0.18 ***	0.83 ***

Notes: TTFM 2013 (Year 7)/2015 (Year 9). * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

3.2. Mediation Model

The mediation model offers a good fit to the data, with RMSEA at 0.039, CFI at 0.94, and TLI at 0.9. Figure 2 presents the coefficients estimated for the individual paths of the model. For simplicity, the diagram only focuses on the key relationships; a number of other variables that were controlled for in the model were omitted to improve readability.

We find that all path coefficients are statistically significant (except for the path from class participation to NAPLAN reading). First, the model shows the presence of the effects of effective teaching practices: effective learning time (1.94; $p < 0.001$) and expectations for success (0.65; $p < 0.1$) recorded in Year 7 on NAPLAN reading scores two years later (Year 9). Second, both effective learning time and expectations for success significantly predict all mediators in Year 9. For example, on a scale from 0 to 10, a 1-point increase in effective learning time in Year 7 is associated with a 0.18-point increase in class participation in Year 9. Similarly, a 1-point increase in expectations for success in Year 7 is associated with a 0.07-point increase in class participation in Year 9. The effects of mediators on NAPLAN reading are largely significant, except for class participation. For example, a 1-point increase in positive behavior in Year 9 is associated with an average increase of 1.44 in Year 9 NAPLAN reading scores ($p < 0.001$).

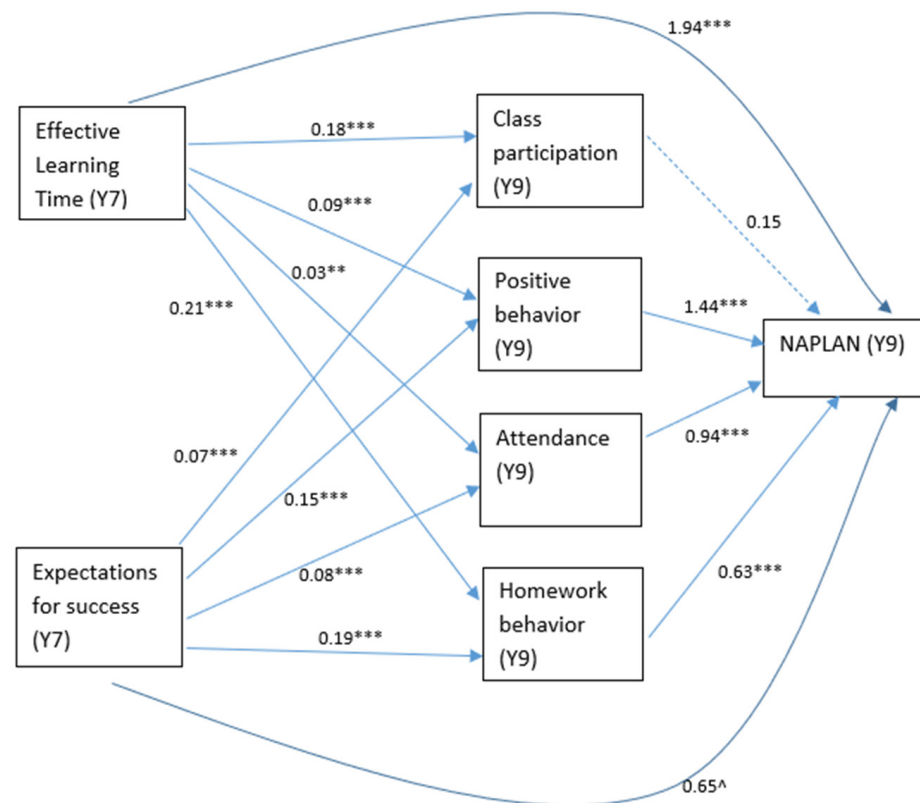


Figure 2. Mediation model for NAPLAN Reading. $\hat{p} < 0.1$, $* p < 0.05$, $** p < 0.01$, and $*** p < 0.001$.

3.3. Direct and Indirect Effects

The mediation model enables us to assess the direct, indirect and total effects of the predictors on the outcome. Direct effects correspond to the direct paths between the predictors and the outcome, while indirect effects are the effects explained through mediators, calculated as the product of the coefficient from the predictor to the mediator and the coefficient from the mediator to the outcome. The total effects are the sum of the direct and indirect effects. We present the effect sizes in Table 3. We find that the indirect effects of effective learning time and expectations for success on NAPLAN reading are positive and statistically significant, confirming that our engagement measures partially explain the relationship between effective teaching practices and students’ academic performance. There are substantial total effects mediated by the engagement measures: 14.5 per cent of the total effects of effective learning time on reading scores and 39.8 per cent of the total effects of expectations for success on reading scores are mediated by the engagement measures included in the model. These findings suggest that student engagement is an important mechanism through which effective teaching practices affect students’ academic performance.

Table 3. Direct, indirect and total effects of teaching practices on NAPLAN Reading.

	Effect Size	Relative Contribution
Direct effect		
Effective Learning Time	1.94 ***	85.5%
Expectations for Success	0.65 ^	60.2%
Indirect effect (through engagement indicators)		
Effective Learning Time	0.33 ***	14.5%
Expectation for Success	0.43 ***	39.8%

Table 3. Cont.

	Effect Size	Relative Contribution
Total effect		
Effective Learning Time	2.27 ***	100%
Expectation for Success	1.08 **	100%

Notes: Relative contribution measures the share of the (direct or indirect) effect over total effect. Control variables include prior achievement (Year 7 Reading scores), socio-demographic characteristics (gender, born in Australia, single parent family, Aboriginal status and parental education), and school and classroom context (captured through TTFM measures). $\hat{p} < 0.1$, * $p < 0.05$ and ** $p < 0.01$, *** $p < 0.001$.

4. Discussion and Conclusions

In this paper, we explored the impact of two key components of effective teaching practice: effective learning time and expectations for success, capturing the concepts of academic support and academic press on students' academic performance. We also investigated the mediating role of student engagement in this relationship. By conducting this research, we improve our understanding of how effective teaching practices may facilitate students to achieve better performance via improved student engagement by demonstrating the direct and indirect effects of effective learning time and expectations for success and decomposing the specific paths for these effects. To accomplish this, we draw on robust large-scale longitudinal survey data linked to administrative records from government schools in the largest state in Australia. We use the data to test the formal model employing path analysis in the family of structural equation modelling, which is a suite of models designed to formally test mediation processes.

The key results show that effective learning time has a strong direct effect on students' reading performance but also an indirect effect via improved positive behavior, attendance and homework behavior. On the other hand, in line with previous findings [29], we found no significant direct effect of expectations for success on students' academic performance. However, the mediation model reveals a substantive indirect effect, suggesting that teachers' expectations for success affect students' academic performance through improved positive behavior, attendance and homework behavior.

Importantly, the results shed new light on the mechanisms underlying the relationships between effective teaching practices and student outcomes, as we are able to draw on longitudinal data from two time points. Specifically, we use teaching practice in Year 7 to predict engagement and academic performance in Year 9, controlling for students' performance in Year 7. Consistent with previous research [10,18], we model the temporal relationship between teaching practices, engagement and achievement, while also controlling for students' academic ability as captured by their prior academic achievement. By controlling for previous performance in Year 7, we contribute to disentangling the independent effect of effective teaching practices on student engagement and academic performance irrespective of their baseline academic ability.

This paper contributes to the existing literature in a number of ways. First, it formally specifies a theory-informed conceptual model specifically linking the two important components of effective teaching practices (i.e., effective learning time and expectations for success) with students' academic performance and postulates the mediating role of student engagement in this relationship. Second, it tests this formal model using SEM framework drawing on robust and recent large-scale longitudinal survey data linked to administrative data from government schools in the largest state in Australia. Third, it capitalizes on the longitudinal nature of the data to identify direct and indirect effects of effective teaching practices on students' academic performance, while accounting for students' prior achievement, approximating their baseline academic ability. Finally, our work contributes to the Australian body of evidence and enriches international comparisons.

The study has a strong potential to inform educational policy and practice. The research reinforces the policy imperative to improve both the quality of individual teachers in classrooms and for system- and school-level policies to promote evidence-based practices.

Specifically, the study highlights the relevance of effective learning time, and of a culture of high expectations, for student behavior and learning. Drawing on the previous literature, in the following paragraphs we briefly discuss some of the ways that these crucial elements of effective teaching practices can be cultivated in schools.

Effective learning time can be improved through good lesson organization; paying particular attention to how important ideas are taught and helping students understand their significance; requiring students to demonstrate mastery, especially of difficult ideas; allowing students to ask questions and ensuring responses are clear and have been understood; telling students what they will be learning, and being clear about the purpose of tasks and ensuring students are given time to engage with the learning process and receive clear and timely feedback [56].

Teachers can demonstrate high academic expectations of their students by being clear about what is expected of students, following up on expectations, making it clear to all students that they must work hard to succeed and encouraging students to perform better, for instance, through personal-best goal setting [56]. Personal goals encourage students to best their own prior performance and to build their skills and understandings accordingly. Teachers can help students set goals that are relevant, specific and measurable. When goal setting takes this form, teachers can tell if goals are being achieved and whether they are challenging enough and can communicate high but reachable expectations for each individual student. In addition, to signal high expectations, teachers can provide feedback that explicitly identifies the next learning steps and the skills necessary to improve, and they should expect homework to be completed on time.

Despite its novel contributions, the paper is not without limitations. In this study, we were only able to draw on two waves of longitudinal data. With more data points, future studies could explore trajectories of engagement over time and link them to corresponding achievement trajectories, while estimating the effects of teaching practices on both engagement and achievement. The literature in this field would also benefit from future research looking at broader aspects of teaching practice and student outcomes. For example, simultaneously examining teachers' classroom management skills, the ability to elicit students' deeper understanding as well as academic support and press, would likely provide novel insights. Additional research could also look at outcomes other than academic achievement, for instance, attitudes to school and learning or educational aspirations. All these outcomes are important from an educational policy perspective yet are often overlooked in debates that focus on academic performance and school accountability. In addition, our study is based on students' self-reported measures, that is, students' perceptions of teaching practice. Future studies could further explore the effect of teaching practices using randomized in-class experiments [20]. For example, future studies could employ an external observation method to gauge effective teaching practices or a self-report survey to ask teachers to describe their teaching practices. Finally, qualitative research could tease out the nuances of the direct and indirect effects of effective learning time and expectations for success on academic achievement by exploring how exactly these effects occur in the classroom settings and under what circumstances. The present paper sets an important first step for all these avenues for future research.

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