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Do teachers differ in the level of expectations or in the extent to which they differentiate in expectations? Relations between teacher-level expectations, teacher background and beliefs, and subsequent student performance

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ABSTRACT

Previous studies have indicated that, although some teachers have substantial expectation effects on student outcomes, the effects for most teachers are only small. Furthermore, teacher expectations are associated with key pedagogical differences related to teacher beliefs about providing instruction and support for learning. The aim of this study was to explore (a) teacher-level differences in the level and differentiation of expectations, (b) associations between teacher differences in expectations and teacher background and beliefs, and (c) relationships with subsequent student performance. Secondary analyses were performed on data for 42 teachers and their students in New Zealand. The results were supportive of the notion that some teachers were differentiating more between students in their expectations than others. Teachers who differentiated more perceived students generally as more competent, but felt less related to the school team, and perceived more classroom stress. Differentiation in expectations was negatively related to end-of-year mathematics scores.

KEYWORDS

Teacher expectations; teacher beliefs; teacher background; differentiation; mathematics performance; multilevel modelling

Introduction

Several studies have indicated that the expectations that teachers hold for their students are likely to be a function of teacher characteristics and consequently teachers tend to develop expectations depending on their beliefs rather than on objective data (e.g., Babad, 2009; Li & Rubie-Davies, 2017; Rubie-Davies, 2007; Weinstein, 2002). This has challenged the dominant notion that teacher expectations are based on students' individual characteristics (Brophy, 1983); that is, that teachers' expectations are formed based on student characteristics and then portrayed to students through teacher verbal and non-verbal behaviours. The concept that teachers vary in their beliefs and how they portray their expectations takes the focus away from studies that focus on student differences as related to whether teachers' expectations for individual students are likely to be high

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or low (e.g., De Boer, Bosker, & Van der Werf, 2010; Timmermans, De Boer, & Van der Werf, 2016). Instead, the focus moves more centrally to teachers and what it is about their beliefs about teaching and student learning that means that expectations can be portrayed differently to students in one class compared with those in another class taught by a different teacher (Rubie-Davies, 2010).

The shift in focus towards expectations as a class-level phenomenon emanating from teachers' beliefs has been supported by several findings. First, there is evidence that some teachers have substantial expectation effects on students whereas the expectation effects for most teachers are only small (Brophy, 1983; Brophy & Good, 1974; Rubie-Davies, Hattie, Townsend, & Hamilton, 2007). Second, research in the expectation field has shown that in some classes the achievement gap is exacerbated whereas in other classes it decreases (McKown & Weinstein, 2008; Timmermans, Kuyper, & Van der Werf, 2015). Third, there are studies in the expectation field (e.g., Rubie-Davies, 2015; Weinstein, 2002) that have shown that there are key pedagogical differences in the ways that classrooms are structured which relate to teacher beliefs about providing for student learning. These differences appear to moderate the expectation effects. For example, in classrooms where teachers create a warm socioemotional climate (Rubie-Davies, 2010), promote intrinsic motivation (Weinstein, 2002), and provide similar and challenging materials to all students (Harris & Rosenthal, 1985), they make greater than average learning gains. In contrast, in classes where expectations are portrayed through a more structured class environment, where the focus is on performance, and learning activities are sharply differentiated (Rubie-Davies, 2015; Weinstein, 2002), overall student progress is likely to be constrained.

Thirty years after the first calls to investigate teacher or class-level expectations (Brophy, 1983), however, still a fairly dominant focus of teacher expectation studies is on teachers' expectations of individual students (Rubie-Davies et al., 2007). The focus on the level of individual students is also reflected in the frequently used conceptualisations of teacher expectations; that is, the term "teacher expectations" refers to inferences made by teachers with respect to students' potential to achieve based on the teachers' current knowledge about those students (Good, 1987; Riley & Ungerleider, 2012). Teacher expectations have also been described as "primarily cognitive phenomena, inferential judgments that teachers make about probable future achievement and behavior based upon the student's past record and his present achievement and behavior" (Brophy & Good, 1974, p. 129). Teacher expectations can be viewed as "a dyadic relationship whereby teachers have differing expectations for each individual child in the classroom (often related to characteristics of the child, for example, ethnicity, social class, gender, ability)" (Rubie-Davies, Flint, & McDonald, 2012, p. 271).

Given previous information, it seems that not every teacher is equally likely to transmit Pygmalion effects to students (Babad, Inbar, & Rosenthal, 1982). It seems probable that some teachers have higher expectations for the students in their classes compared to others (Rubie-Davies et al., 2007), and that some teachers differentiate more in their expectations than others (Weinstein, 2002). The aim of the current study was to explore the variation among teachers in the association between students' academic performance and the teachers' expectations. We considered two ways in which the association between students' academic performance and the teachers' expectations might differ between teachers, which were the degree of class-level expectations and the extent of differentiation in expectations. Various characteristics of individual teachers may be

associated with the expectations they have for the students in their classes. Potential candidates include teacher background (Rubie-Davies, 2006; Solomon, Battistich, & Hom 1996) and beliefs regarding student ability, and attribution of success and failure (Brophy, 1983; Good & Brophy, 1980). A second aim of this study was therefore to investigate whether differences between these teachers found in their expectations were related to their background, the teachers' beliefs, and subsequent student performance.

Between-teacher differences in expectations

Research with respect to some teachers having greater expectations than others has predominantly been conducted by Rubie-Davies and colleagues. In a series of studies, Rubie-Davies (Rubie, 2004; Rubie-Davies, 2007, 2010) identified, from a sample of 21 teachers in New Zealand, six teachers who held expectations significantly above achievement for all students in their class (HiExp), and three teachers who had expectations of their whole class that were significantly below actual achievement (LoExp). The students of HiExp teachers made substantial progress across the year of the initial study (effect size gains across the six classrooms were $d = 0.50–1.44$), whereas those with LoExp teachers made considerably less progress ($d = -0.03–0.20$). Li and Rubie-Davies (2017), who showed that when teachers held a particular expectation for one class, they were likely to hold similar normatively high or low expectations for all their other classes, provided further evidence that teachers, instead of individual student characteristics, played a key role in the development of expectations.

The notion of some teachers having greater expectations than others is also supported by a number of studies outside the New Zealand context (McKown & Weinstein, 2008; Timmermans et al., 2015; Van den Bergh, Denessen, Hornstra, Voeten, & Holland, 2010). In these studies, a significant part of the variation in the teachers' expectations was associated with the teacher, class, or school level, usually after student performance or other characteristics of individual students had been taken into account. For example, in two studies, 17% of the variance in teacher expectations was associated with the class level (McKown & Weinstein, 2008) and 13% with the teacher level (Van den Bergh et al., 2010).

The studies by Rubie-Davies (Rubie, 2004; Rubie-Davies, 2007, 2010) pointed out that the HiExp and LoExp teachers had distinguishing characteristics, classroom practices, and beliefs that were important teacher moderators of expectation effects. It is, however, difficult to really distinguish differences in practices from differences in beliefs between the two groups of teachers. LoExp teachers preferred directive teaching approaches and offered students dissimilar learning experiences according to ability. HiExp teachers considered teaching and learning as a partnership between teacher and students, made less differentiation between activities for high- and low-ability students, and believed in facilitative approaches (Rubie-Davies et al., 2007). In a later sample of 68 New Zealand teachers, unexpectedly no significant associations were found between teachers' whole-class expectations and their self-efficacy related to student engagement, instructional strategies, and classroom management beliefs, nor with the teachers' perceived mastery and performance approaches to instruction (Rubie-Davies et al., 2012).

Research on between-teacher differences with respect to differentiation in expectations has predominantly been conducted by Weinstein and colleagues. In their studies, high-differentiating teachers were those who provided distinctly different work for students for whom they had high or low expectations and who constantly provided students

with messages about their abilities. Low-differentiating teachers, on the other hand, did not make ability differences salient in their classrooms (Brattesani, Weinstein, & Marshall, 1984). In a series of five studies, Weinstein and colleagues investigated how teachers treated high- and low-ability students (Brattesani et al., 1984; Kuklinski & Weinstein, 2000; Weinstein, Marshall, Brattesani, & Middlestadt, 1982; Weinstein, Marshall, Sharp, & Botkin, 1987; Weinstein & Middlestadt, 1979). In classes of high-differentiating teachers, expectations explained 14% of the variance in student end-of-year achievement, whereas in classes of low-differentiating teachers only 3% of the variance in student end-of-year achievement could be explained by teachers' expectations (Brattesani et al., 1984).

The idea that some teachers differentiate more in their expectations is also supported, be it in a different way, by studies showing that teachers differ in the weights they give to student attributes when forming expectations (Timmermans et al., 2016; Timmermans et al., 2015). These studies have indicated that the differences in expectations between subgroups (e.g., majority and minority students) are much larger for some teachers compared to other teachers, and in all cases the differences between teachers exceeded general subgroup differences.

Specific teacher practices and beliefs appeared to be associated with high- and low-differentiating teachers. High-differentiating teachers believed in ability as a stable trait, and they valued performance goals and extrinsic rewards. In their classroom practice, this was apparent from placing children in relatively fixed ability groupings with little room to switch when the students' performance changed, frequent implementation of negative behaviour management strategies, and discouraging student interaction (Weinstein, 2002). Low-differentiating teachers, on the other hand, believed in incremental notions of intelligence and viewed student mistakes as opportunities for learning, and as a reflection of their teaching. These teachers used interest-based mixed-ability groupings and promoted peer support within these, stressed mastery goals and intrinsic motivation, awarded group efforts, group support and cooperation, and developed more positive relationships with their students.

The current study

In the current study, we aimed to explore the variation among teachers in the association between students' academic performance and the teachers' expectations in the context of New Zealand intermediate schools. We considered two ways in which the association between students' academic performance and the teachers' expectations could differ between teachers; that is, in the degree of variation in class-level expectations and the extent of differentiation in expectations. Second, we aimed to investigate whether differences between these teachers found in their expectations were related to their background as well as their beliefs. Teacher beliefs in the current study were categorised into five groups to structure the remainder of the study, that is: (1) teachers' perceptions of student attributes, (2) teacher efficacy, (3) teacher psychological needs, (4) teacher work engagement, and finally (5) perceptions of the requirements of the teaching job. These were beliefs that had been identified by both Rubie-Davies (2015) and Weinstein (2002) as those whereby high- and low-expectation teachers and high- and low-differentiating teachers differed. Categorisation of the beliefs is either based on previous research (e.g., teachers' perceptions of student attributes; Rubie-Davies, 2010) or by the framework

from which they were derived (e.g., psychological needs as central concepts of self-determination theory; Ryan & Deci, 2000). The third aim of the current study was to investigate how between-teacher differences in expectations were related to end-of-year mathematics achievement.

Method

Context

The New Zealand compulsory education sector is comprised of primary and secondary components. Students attend primary school from Year 1 to Year 8 (aged 5–12 years), with intermediate schools catering for Years 7 and 8, and, thereafter, students move to the secondary system which caters for Years 9 to 13. Most students in New Zealand primary schools attend schools in their local area, and all schools in Auckland (the largest city), where the study took place, are ethnically diverse. Primary school rolls in urban and suburban Auckland vary from approximately 150 to 800 students, whereas intermediates range from approximately 250 students to just over 1,000. All schools in New Zealand are self-governing, meaning that a board comprised of the principal, a staff member, and several community members plays a governance role in the running of the school.

Procedure and data collection

The data were collected as a part of a study examining the relations between student and teacher beliefs (Meissel & Rubie-Davies, 2015; Rubie-Davies & Peterson, 2016). Data were collected from both teachers and students. Following ethical approval for the study, principals in three schools agreed to participation by their teachers and students. Teachers and students (with parent consent) participated voluntarily.

Three weeks into the academic year, in the absence of school records and away from their classroom, teachers completed a questionnaire with several teacher belief scales. At the same time, teachers completed a teacher expectation scale for all students in their class. Raudenbush's (1984) meta-analysis established that teachers form their expectations early in the school year, normally within the first week, and, after that time, expectations are assumed to remain stable.

One week later, students completed standardised mathematics tests. The tests were couriered to each class, teachers administered the tests, and then they were returned to the researchers who marked them. At the beginning of every test was a very clear protocol with explicit instructions, which teachers read aloud to the students. This helped to ensure consistent delivery across classes. At the end of the year, a similar mathematics test was administered following the same procedure.

Collecting data through multiple questionnaires and at several moments during the school year inevitably leads to some incomplete records. Data on both students' mathematics performance and teacher expectations were collected at the beginning of the year in 54 classes for 1,425 students (first aim and analysis). Of these 54 teachers, 42 teachers completed the beginning-of-the-year questionnaire on teacher beliefs as well (second aim and second part of analysis). For 1,328 students in 53 of the 54 initial classes, mathematics end-of-year test scores were available (third aim and analysis).

Participants

The three schools participating in the study were located in different areas of one city with different student populations. One school was in a low-socioeconomic area, one was from a middle-income area, and the other was from a high-socioeconomic area.

Of the 42 teachers for whom both expectations and beliefs were available, 25% were male, and 46% were teaching a Year 7 class. The majority of the teachers had a New Zealand (NZ) European background (60.5%), and teachers had a variety of experience in terms of teaching years, ranging from 1 to 5 years (33%) to over 25 years (20%).

Concerning the students for whom beginning-of-the-year information was complete (1,425 students), 51% were boys and 49% were in Year 7. Students were aged from 10 (1%) to 13 (5%), though most were 11 (40%) or 12 (54%). In relation to ethnicity, 38% were NZ European, 12% Māori (the indigenous group), 27% Pasifika (originating from one of the Pacific Islands), and 21% Asian.

Instruments and variables

In the following overview, we first provide the student-level variables, that is, student beginning- and end-of-year mathematics performance and the teachers' expectations for individual students. Thereafter, all teacher-level variables are described, including demographic background and beliefs. Descriptive statistics for all variables are presented in Table 1.

Student mathematics performance

Student mathematics performance was assessed at the beginning and end of the academic year using e-asTTle mathematics (Electronic Assessment Tools for Teaching and

Table 1. Descriptive statistics for student- and teacher-level variables.

	N student	*Min.*	*Max.*	*M*	*SD*
Math performance	1,425	−3.12	3.91	.00	1.00
Teacher expectation	1,425	1.00	7.00	5.09	1.18
	N teacher	*Min.*	*Max.*	*M*	*SD*
Perceptions of student attributes					
Student Academic Competence	42	3.00	4.50	3.77	0.44
Student Satisfaction	42	3.17	5.00	4.25	0.49
Teacher efficacy					
Student Engagement	42	5.00	9.00	7.48	0.97
Instructional Strategies	42	5.75	9.00	7.74	0.94
Classroom Management	42	6.00	9.00	8.05	0.94
Teacher psychological needs					
Autonomy	42	4.57	8.57	6.53	0.96
Competence	42	5.40	9.00	7.42	0.89
Relatedness	42	4.60	9.00	7.40	1.05
Teacher work engagement					
Vigour	42	4.67	8.50	6.90	0.96
Dedication	42	5.00	9.00	7.83	1.01
Absorption	42	4.50	9.00	6.78	1.18
Perception of the teaching job					
Quitting	42	1.00	6.33	3.16	1.72
Commitment	42	4.67	9.00	7.25	1.28
Classroom Stress	42	2.00	8.75	5.17	1.44
Workload Stress	41	4.00	8.33	6.61	1.13

Learning). e-asTTle is a standardised mathematics test used in New Zealand with Years 4–12 students (aged 8–16 years). The e-asTTle system can create tests of varying lengths, at different curriculum levels, assess different aspects of the curriculum, and be completed either online or in a paper-and-pencil version. All items were pre-calibrated in national norming trials using item response theory (Embretson & Reise, 2004), which means that students can be expected to score similarly, no matter which e-asTTle test they are given. Therefore, scores can be compared across classes, schools, and year levels. The standard error of any e-asTTle test is approximately 15 points. Once a test has been created, e-asTTle has the facility to generate a similar test, at a later time. Thus, the tests that students took at the beginning and end of year were not identical but were similar. This avoided practice effects, but because of the calibration of individual items we could be confident that the tests were equivalent.

In consultation with the deputy principals of the schools involved, a 40-min mathematics test was created that included items ranging from Levels 2 to 6. The levels related to the New Zealand curriculum levels. Students spend approximately two years at each curriculum level. Hence, average Year 7 and 8 students would normally be working at Level 4. At both the beginning and end of year, the tests included items related to number knowledge, number sense, and algebra. All students completed the tests in paper-and-pencil form, and the tests were then marked online in the e-asTTle system. Total scores for mathematics can range from 1,100 to 1,900 points. In the current study, scores at the beginning of the year ranged from 1,226 to 1,845 ($M = 1500.11$, $SD = 92.97$), and at the end of the year from 1,271 to 1,845 ($M = 1544.19$, $SD = 92.14$). To be able to include both Year 7 and 8 students in a simultaneous analysis, the e-asTTle scores were standardised by first subtracting the student scores from the Year 7 and 8 national means (available for every 3 months), and second calculating *z* scores.

Teacher expectations

Teachers provided expectations in mathematics for each student at the beginning of the academic year. Teacher expectations were assessed using a 1–7 Likert five-item scale. This scale was developed specifically for the current project (Rubie-Davies & Peterson, 2016) to avoid the use of just one item to assess expectations and enable reliability estimates to be calculated. In relation to the five-item scale, teachers provided (1) a judgement in relation to mathematics of where students were currently achieving; (2) the level in mathematics they predicted students would achieve by end of year; (3) whether they predicted students would receive a good initial school report; (4) the degree to which they believed the student would be successful in their class; and (5) the degree to which they thought the student would have a successful school career; $\alpha = .89$ for the current sample.

Teacher background

Teacher background was measured using five variables, including gender (male = 1 and female = 2), ethnic background (NZ European = 1 and other = 2), years of teaching experience (1–5 years = 1; 6–10 years = 2; 11–17 years = 3; 18–25 years = 4; 25 years + = 5), current grade taught (Year 7 = 1 and Year 8 = 2), and, finally, the socioeconomic background of the school (low = 1; middle-income = 2; and high = 3). Socioeconomic background of the school was measured by government categorisations which determine

the extent to which the school draws their students from low-socioeconomic communities, whereby "1" is the lowest level and "10" is the highest.

Perceptions of student attributes

Teachers' perceptions of student attributes were measured using two short scales adapted from the Student Personal Perception of Classroom Climate (Rowe, Kim, Baker, Kamphaus, & Horne, 2010), measuring Student Academic Competence and Student Satisfaction on a 1–5 Likert scale. Items were rephrased to measure the teachers' perspective. Perceived Student Academic Competence was measured using four items, from which an example is "Overall, students in my class believe they are smart enough to do their schoolwork"; α = .76 for the current sample. Perceived Student Satisfaction was measured using six items of which "Overall, students in my class like being in school" is an example item; α = .80 for the current sample.

Teacher efficacy

The teacher efficacy questionnaire used in the current study was the Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001). The short 12-item form, on a 1–9 Likert scale, of the TSES was used to measure teachers' personal teaching efficacy in mathematics with respect to student engagement, instructional strategies, and classroom management. It includes items that describe tasks in which teachers commonly engage (Woolfolk Hoy, Hoy, & Davis, 2009). An example item for Efficacy for Student Engagement was, "I can get students to believe they can do well in maths"; for Efficacy regarding Instructional Strategies, "I can provide an alternative explanation or example when students are confused in maths", and for Efficacy regarding Classroom Management, "I can calm a student who is disruptive or noisy". The internal consistency was good for all three scales in the current sample (Student Engagement α = .82; Instructional Strategies α = .76; Classroom Management α = .88).

Teacher psychological needs

Teachers' basic psychological needs were measured using the 23-item scale of the Work-Related Basic Need Satisfaction Scale (Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010), measuring the Need for Autonomy, Need for Competence, and Need for Relatedness. Teachers responded on a 1–9 Likert scale. Need for Autonomy was measured using seven items, from which an example is, "I feel free to express my ideas and opinions in this job"; α = .70 for the current sample. Need for Competence was measured using six items of which "I really master my tasks in my job" is an example item; α = .69 for the current sample. Relatedness was measured using 10 items, of which "At work, I feel part of a group" is an example item; α = .87 for the current sample.

Teacher work engagement

Teachers' work engagement was measured using the long 17-item version of the Utrecht Work Engagement Scale (UWES; Schaufeli, Salanova, González-Romá, & Bakker, 2002; Seppälä et al., 2009). The UWES was used to measure the three dimensions of work engagement, namely, Vigour, Dedication, and Absorption on a 1–9 Likert scale. Vigour was measured using six items, from which an example is, "At my job, I feel strong and vigorous"; α = .79 for the current sample. Dedication was measured using five items of which

"My job inspires me" is an example item; α = .85 for the current sample. Absorption was measured using six items of which "Time flies when I'm working" is an example item; α = .71 for the current sample.

Perceptions of the requirements of the teaching job

Four variables were included related to requirements of the teaching job which were Quitting, Commitment, and Classroom and Workload Stress. Quitting and Commitment were measured based on a three- and six-item scale using a 1–9 Likert scale (Klassen & Chiu, 2011). "I think about quitting the teaching profession" is an example item from the quitting scale; α = .79 for the current sample. "I definitely want a career for myself in teaching" is an example item for the six-item commitment scale; α = .82 for the current sample. In addition, Workload Stress and Classroom Stress (i.e., stress from student behaviours) were measured using a three- and four-item scale, respectively. These items were derived from the Teacher Stress Inventory (Boyle, Borg, Falzon, & Baglioni, 1995). The items were presented with the stem, "As a teacher, how great a source of stress are these factors to you?" and item content such as, "Maintaining class discipline" or "Having too much work to do". The reliability was somewhat higher for Classroom Stress (α = .83) compared to Workload Stress (α = .65).

Analytic strategy

The teacher expectation data had a hierarchical structure with students (Level 1) nested within classes (Level 2), and were analysed using a two-level multilevel model (Snijders & Bosker, 2012), using the MLwiN 3.0 software (Charlton, Rasbash, Browne, Healy, & Cameron, 2017). The school level was not included in the multilevel model because the data were gathered at only three intermediate schools, which was an insufficient number to be included as a hierarchical level. In the first model (Model 1), to explore between-teacher differences in the association between student performance and teacher expectations, the teacher expectations served as the dependent variable and student mathematics performance (beginning of year) as the predictor variable. The random part of the model consisted of random intercepts at student and teacher level. The intercept variance at the teacher level gave an indication of whether, after controlling for student performance, teachers differed in their expectations for students with average performance levels. In Model 2, the random part was extended by allowing random slopes at the teacher level for mathematics performance. The random slope variance of mathematics performance at the teacher level gave an indication of whether some teachers differentiated more strongly in their expectations compared to others. Related to the first aim of the study, if Model 2 showed considerable intercept variation at the teacher level and very little or no slope variation at the teacher level, this would support the notion of whole-class high- and low-expectation teachers. If Model 2 indicated significant slope variation at the teacher level with or without intercept variation, this would support the notion of high- and low-differentiating teachers.

The between-teacher differences in expectations (residuals) derived from Model 2 were exported from MLwiN and merged into the SPSS database including teachers' responses to the beliefs questionnaire and their background characteristics. Related to the second aim, bivariate correlations were calculated between the teacher differences in

expectations and the teacher beliefs scales. Furthermore, between-teacher differences in expectations were related to teacher background variables. These were single-level analyses with data that is strictly at the teacher level.

For the third aim, two additional multilevel models were estimated. In these models, the students' end-of-year mathematics scores were the dependent variable. Student beginning-of-year mathematics performance was used in the first model to predict end-of-year mathematics (Model 3). For this, the class-level beginning-of-year average mathematics performance as well as individual mathematics performance were included. For the variables at the student level, group mean centring was applied (Enders & Tofighi, 2007). In the following model (Model 4), three teacher expectation variables, derived from Model 2, were added. The model entailed the intercept and slopes residuals at the teacher level as indications about whether teachers had greater expectations for the average student (intercept) and whether teachers differentiated in their expectations (slope). Also the student-level residuals, indicating whether a teacher had a particularly high or low expectation for a specific student, were added to the model.

Results

Teacher-level expectations: degree and differentiation

The results of Model 1, to investigate between-teacher differences in expectations, are presented in Table 2. Model 1 indicated that, on average, teacher expectations were positively related to students' beginning-of-year mathematics performance; $b = .331$, $t(1421) = 9.74$, $p < .001$. An increase of one standard deviation in mathematics performance was associated with an increase of .331 points on teacher expectations. Assuming a similar association between mathematics performance and teacher expectations among teachers, a significant part of the variance in expectations was associated at the teacher level (12.6%[1]).

In Model 2, it appeared that the association between performance and expectations could not be considered to be equivalent across teachers, as adding the teacher-level random slopes of performance led to a significant decrease in model misfit (Deviance = 111.00, $df = 2$, $p < .001$). Differences among teachers in their expectations are presented in Figure 1. In this figure, each line represents a teacher, and the lines are shown for the range of student mathematics performance present in the teachers' classes. For most teachers, the association between mathematics performance and expectations was positive. These teachers have higher expectations for the high-performing students, while having lower expectations for the low-performing students. However, for some teachers there is almost no association between performance and expectations resulting in a nearly horizontal line. These teachers seem to have rather similar expectations for all students in their class, no matter what their beginning-of-year mathematics performance was. Concerning the teacher-level random slopes of mathematics performance, 95% of the classes were expected to lie in the range between a points' increase of .112 and .766[2] in expectations per standard deviation increase in mathematics performance.

A second important finding can be derived from Figure 1, which is the dependency in the between-teacher variation in expectations at the level of student performance.

Table 2. Results of the multilevel regression Models 1 and 2.

	Model 1					Model 2				
	b	SE(*b*)	CI 2.5%	CI 97.5%	*p* value	*b*	SE(*b*)	CI 2.5%	CI 97.5%	*p* value
Fixed Part										
Intercept	5.077	0.061	4.958	5.197	<0.001	5.210	0.048	5.115	5.305	<0.001
Mathematics performance	0.331	0.034	0.264	0.398	<0.001	0.439	0.074	0.294	0.584	<0.001
Random Part										
Teacher level										
Var(Intercept)	0.154	0.038				0.066	0.024			
Var(Mathematics performance)						0.028	0.026			
Covar(Intercept/Mathematics performance)						0.223	0.056			
Student level										
Var(Intercept)	1.071	0.041				0.954	0.037			
Model fit										
# Teachers	54					54				
# Students	1,425					1,425				
−2*loglikelihood	4,224.5100					4,113.5095				

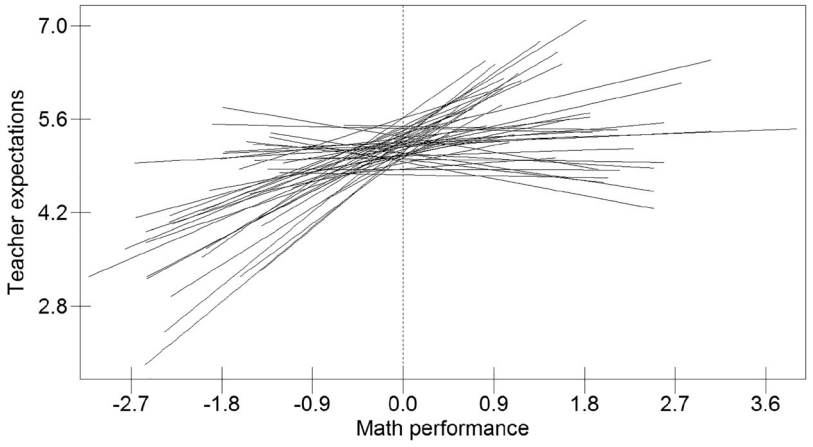

Figure 1. Relationship between teacher-level expectations and student mathematics performance.

Teachers differed most in their expectations for the most and least able students, whereas they were much more alike in their expectations for the average students. All in all, the results of Model 2 indicated that speaking of high- and low-expectation teachers was too simple a representation of the complex interplay of expectations among teachers. The data appeared more supportive of the notion that some teachers were differentiating more between students in their expectations than others.

Teacher-level expectations and teacher background

Four between-teacher indices were derived from Model 2 regarding the low-performing students (one standard deviation below average), average-performing students, high-performing students (one standard deviation above average), and differentiation (steepness of the slope). For each of the four abovementioned categories, the teacher-level residual indicated the difference from the average teacher in the sample. How these differences between teachers in expectations related to their background are presented in Table 3. When it came to the teachers' individual background variables gender, ethnic background, years of teaching experience, and the grade level currently taught, there were no statistically significant differences in expectations between subgroups. Differences, however, did arise when the schools' socioeconomic status was considered; $F(2, 50) = 31.27$, $p < .001$. The pattern of outcomes is presented in Figure 2. Post-hoc tests revealed that the teachers from the intermediate school that drew most students from high-socioeconomic neighbourhoods differentiated far less in their expectations between low- and high-performing students ($M = -0.35$, $SD = 0.25$) compared to the teachers in the two other intermediate schools (low $M = 0.23$, $SD = 0.27$; middle $M = 0.29$, $SD = 0.33$). Although the teachers in the high-SES school differentiated less in their expectations, the general association between performance and expectations was still positive (0.089[3]), yet very close to zero. Consequently, the teachers from the intermediate school that drew most students from high-socioeconomic neighbourhoods had relatively high expectations for low-performing students ($M = 0.31$, $SD = 0.27$) and relatively low expectations for high-performing students ($M = -0.39$, $SD = 0.35$) compared to the teachers in the two other intermediate schools.

Table 3. Means of teacher-level expectations for average-, high-, and low-performing students as well as the strength of differentiation in expectations.

	Average		High		Low		Differentiation	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gender								
Male ($n = 14$)	−0.02	0.19	0.02	0.52	−0.05	0.45	0.03	0.45
Female ($n = 40$)	0.01	0.19	−0.01	0.50	0.02	0.38	−0.01	0.41
Ethnic background								
NZ European ($n = 24$)	0.01	0.17	−0.01	0.49	0.02	0.46	−0.01	0.44
Other ($n = 18$)[a]	−0.00	0.21	0.09	0.38	0.09	0.48	−0.09	0.38
Years of teaching experience[b]								
1–5 years ($n = 15$)	0.03	0.21	0.08	0.56	−0.03	0.47	0.05	0.48
6–10 years ($n = 9$)	0.01	0.14	0.14	0.47	−0.12	0.49	0.13	0.46
11– 17 years ($n = 11$)	0.03	0.26	0.03	0.53	0.03	0.27	0.00	0.33
25 years + ($n = 9$)	−0.01	0.13	0.01	0.58	−0.03	0.44	0.02	0.50
Grade currently taught[c]								
Grade 6 ($n = 26$)	−0.05	0.20	−0.01	0.44	−0.09	0.54	0.04	0.42
Grade 7 ($n = 25$)	0.04	0.16	0.01	0.50	0.09	0.38	−0.05	0.41
School socioeconomic status								
low ($n = 14$)	0.03	0.13	0.26	0.32	−0.21	0.28	0.23	0.27
middle ($n = 16$)	0.03	0.24	0.32	0.46	−0.26	0.34	0.29	0.33
high ($n = 23$)	−0.04	0.18	−0.39	0.35	0.31	0.27	−0.35	0.25

Notes: [a]This includes teachers with a Maori ($n = 2$) or Pacific Island ($n = 2$) background. [b]The category 18–25 years was omitted from the table because it contained only one teacher. [c]The category Grade 6/7 was omitted from the table because it contained only one class.

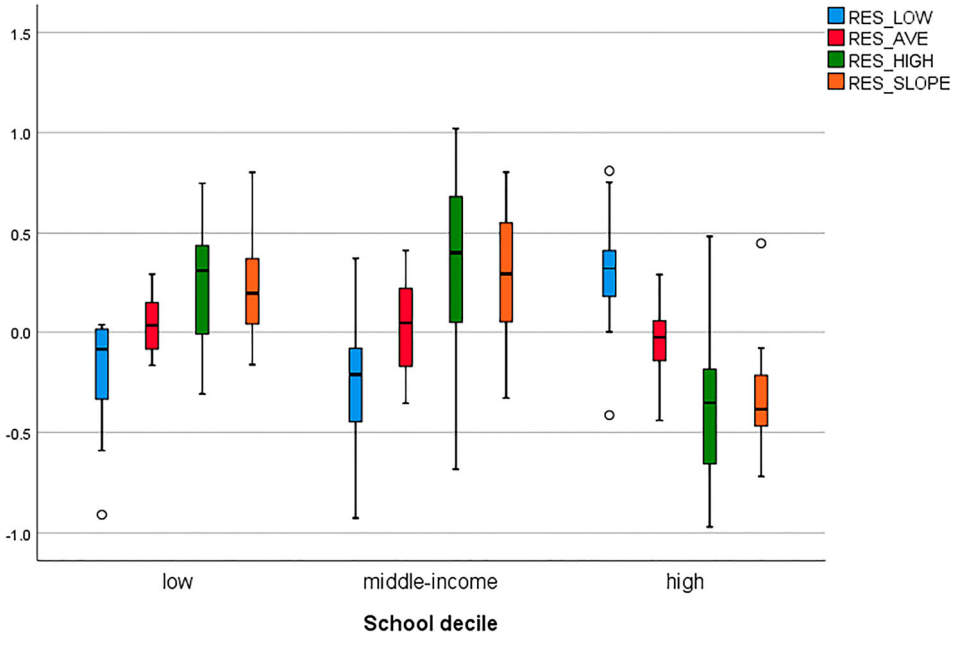

Figure 2. Between-teacher differences in expectations for three intermediate schools differing in socio-ecomonic background.

Notes: RES_LOW: teacher-level intercept residuals for low-performing students (−1 SD); RES_AVE: teacher-level intercept residuals for average-performing students; RES_HIGH: teacher-level intercept residuals for the high-performing students (+1 SD); RES_SLOPE indicates the teacher-level slope residuals related to mathematics performance.

Teacher-level expectations and teacher beliefs

When differences between teachers in their expectations were related to their beliefs (Table 4), it appeared that most correlations were only small and non-significant. None of the variables concerning Teacher Efficacy and Teacher Work Engagement were significantly related to teacher expectations. However, teachers who held relatively high expectations for the average-performing students also perceived their students as being more competent ($r = .420$, $p = .006$), and these teachers also described themselves as being more competent with high scores on Need for Competence ($r = .313$, $p = .043$). Teachers who held relatively high expectations for the high-performing students also perceived students as being more competent ($r = .444$, $p = .003$). These teachers also reported higher levels of Classroom Stress ($r = .305$, $p = .050$). Having relatively high expectations for the low-performing students was positively associated with Need for Relatedness ($r = .344$, $p = .026$) and negatively to Classroom Stress ($r = -.437$, $p = .004$). The extent to which teachers differentiated between high- and low-performing students in their expectations was related to three teacher beliefs scales; that is, Perceived Student Academic Competence ($r = .344$, $p = .026$), Need for Relatedness ($r = -.307$, $p = .048$), and Classroom Stress ($r = .395$, $p = .010$). Teachers who differentiated more in their expectations perceived students generally as more competent, but they felt less related to the school team, and felt more classroom stress as opposed to teachers who differentiated less in their expectations for students.

Teacher-level expectations and end-of-year mathematics performance

In Table 5, the results are presented for the prediction of end-of-year mathematics performance. Model 3 indicated that mathematics end-of-year performance was positively related to both the class-level average beginning-of-year mathematics; $b = .801$, $t(1323)$

Table 4. Bivariate correlations between teacher beliefs and teacher-level expectations for average-, high-, and low-performing students as well as the strength of differentiation in expectations.

	Average	High	Low	Differentiation
Perceptions of student attributes				
Student Academic Competence	**.420**	**.444**	−.167	**.344**
Student Satisfaction	−.082	−.043	−.020	−.015
Teacher efficacy				
Student Engagement	.095	.121	−.062	.102
Instructional Strategies	.161	.116	.001	.068
Classroom management	.162	.099	.021	.048
Psychological needs				
Autonomy	.078	−.163	.260	−.225
Competence	**.313**	.144	.097	.037
Relatedness	.081	−.232	**.344**	**−.307**
Teacher work engagement				
Vigour	−.011	.000	−.009	.004
Dedication	.113	.123	−.049	.096
Absorption	−.116	.054	−.163	.112
Perception of the teaching job				
Quitting	.084	.106	−.054	.089
Commitment	−.074	−.199	.173	−.203
Classroom Stress	−.088	**.305**	**−.437**	**.395**
Workload Stress*	−.009	.142	−.175	.170

$N = 42$. Bold-faced correlations are significant at the .05 level. *$N = 41$ for workload stress.

Table 5. Results of the multilevel regression Models 3 and 4.

	Model 3					Model 4				
	b	SE(*b*)	CI 2.5%	CI 97.5%	*p* value	*b*	*SE*(*b*)	CI 2.5%	CI 97.5%	*p* value
Fixed Part										
Intercept	0.008	0.036	−0.063	0.079	0.826	0.001	0.033	−0.065	0.066	0.982
Mathematics performance (Group mean centred)	0.801	0.017	0.767	0.835	<0.001	0.802	0.017	0.768	0.836	<0.001
Class average Maths performance	0.910	0.055	0.802	1.017	<0.001	0.835	0.057	0.724	0.946	<0.001
Student-level expectation						0.029	0.014	0.002	0.055	0.035
Teacher-level expectation average						−0.141	0.195	−0.523	0.240	0.468
Teacher-level expectation slope						−0.259	0.096	−0.448	−0.070	0.007
Random Part										
Teacher-level variance	0.059	0.013				0.048	0.011			
Student-level variance	0.221	0.009				0.220	0.009			
Model fit										
# Teachers	53					53				
# Students	1,328					1,328				
−2*loglikelihood	1,869.215					1,855.356				

= 47.12, $p < .001$, and the student within-class beginning-of-year mathematics performance; $b = .910$, $t(1323) = 16.55$, $p < .001$. This indicated that the end-of-year mathematics scores were higher if the class was already performing well at the beginning of the year. Furthermore, if a student had a higher than the class average score at the beginning of the year, this was predictive of higher end-of-year scores.

In Model 4, it appeared that the three teacher-level variables explained a significant amount of variance in end-of-year mathematics scores in addition to the beginning-of-year performance in mathematics. Adding these variables led to a significant decrease of model misfit; Deviance = 13.859, $df = 3$, $p = .003$. Two of the teacher expectation variables showed significant associations with end-of-year mathematics performance, that is, the slope of the teacher-level expectation (the extent of differentiation in expectations) and the within-class expectations for individual students. The extent of differentiation in expectations was negatively related to end-of-year performance ($b = -.259$, $t(1320) = 2.70$, $p < .007$), indicating that the more teachers differentiated in expectations, the lower the expected end-of year mathematics scores. If within a class a teacher had a particularly high expectation for a specific student, this was positively related to end-of-year mathematics; $b = .029$, $t(1320) = 2.07$, $p = .035$, although this association can be described as weak at best.

Discussion

In the current study, we aimed to explore the variation among teachers in the association between students' academic performance and the teachers' expectations in the context of New Zealand intermediate schools. We considered two ways in which the association between students' academic performance and the teachers' expectations could differ between teachers. These differences were the degree of variation in class-level expectations and the extent of differentiation in expectations. Second, we aimed to investigate whether differences between these teachers in their expectations were related to their background as well as their beliefs. The third aim of the current study was to investigate how between-teacher differences in expectations were related to end-of-year mathematics.

With respect to the first aim, the results indicated that speaking of high- and low-expectation teachers was too simple a representation of the complex interplay of expectations among teachers when an entire group of teachers were included in the analyses. It is worth noting that in all of Rubie-Davies' previous work, studies regarding high- and low-expectation teachers have isolated those teachers whose expectations were very high or very low for all students from the teachers whose expectations could be said to be more accurate. When data pertaining to these separate groups of teachers have been analysed, clear differences have become evident in terms of student outcomes and teacher beliefs and practices (e.g., Rubie-Davies, 2007, 2008). However, these high- and low-expectation teachers are a minority with approximately one quarter able to be identified as high-expectation teachers and approximately one eighth as low-expectation teachers (Rubie-Davies, 2015).

Nevertheless, the data for all teachers in the current sample appeared more supportive of the notion that some teachers were differentiating more between students in their expectations than others, with teachers who differentiated less in expectations having

relatively high expectations for low-performing students and low expectations for high-performing students. Although a different approach was applied, the results are most in line with the findings of Weinstein and colleagues identifying high-differentiating teachers who provided distinctly different work for students for whom they had high or low expectations and who constantly provided students with messages about their abilities (Brattesani et al., 1984; Kuklinski & Weinstein, 2000; Weinstein et al., 1982; Weinstein et al., 1987; Weinstein & Middlestadt, 1979). Further, although our results indicated that the expectations of low-differentiating teachers were low for high achievers, Weinstein has shown, in several studies (e.g., McKown & Weinstein, 2008), that all students benefit when they are in classes of low-differentiating teachers. The results are also in line with the notion that teachers differ in the weights they give to student attributes when forming expectations (Timmermans et al., 2016; Timmermans et al., 2015).

Results with respect to teacher background indicated, consistent with previous research on teacher-level expectations in New Zealand (Rubie-Davies et al., 2012), no statistically significant differences in teacher-level expectations between subgroups of teachers based on gender, ethnic background, years of teaching experience, and the grade level currently taught. Differences, however, were apparent when considering the schools' socioeconomic status; the teachers from the intermediate school that drew most students from high-socioeconomic neighbourhoods differentiated far less in their expectations between low-and high-performing students compared to the teachers in the two other intermediate schools. It should be noted that the results regarding the schools' socioeconomic status may be confounded with other unobserved school characteristics, as only three schools participated in the current study. How these results relate to previous research is complicated as the existing body of evidence is very inconsistent. Although Solomon et al. (1996) found that teachers working in low-socioeconomic schools had lower expectations for their students than teachers working in middle-class schools, Rubie-Davies (2006) showed that teachers with high expectations for all students could be found in schools in low-socioeconomic areas more frequently than in middle-class schools, and, in a third study (Rubie-Davies et al., 2012), no significant associations were present. How and why teacher expectations are related to the socioeconomic environment remains unclear and should, given the consequences concerning equity, remain on the research agenda.

Results with respect to the association between teacher-level expectations and teacher beliefs generally showed weak associations. That most correlations were only small and non-significant is, on the one hand, in correspondence with previous research in which teacher-level expectations were related to a set of teacher beliefs measured by questionnaires (Rubie-Davies et al., 2012). On the other hand, studies based on classroom observations and interviews generally have shown quite distinctive patterns between high- and low-expectation teachers (Rubie-Davies, 2015) or high- and low-differentiating teachers (Weinstein, 2002) on key pedagogical issues related to teacher beliefs about providing for student learning. However, some beliefs stood out in the current study. Teachers who held relatively high expectations for the average-performing students also perceived their students as being more competent, and these teachers also described themselves as being more competent. The first association was expected, as previous research has shown that high-expectation teachers positively perceived students for a range of attributes (Rubie-Davies, 2010) often associated with success at school (Patrick, Anderman,

& Ryan, 2002). That having higher expectations is associated with greater teacher competence may also not come as a surprise, although previous research has failed to detect this relationship (Rubie-Davies, 2010), as feeling competent (or self-efficacious) may be a prerequisite of having high expectations for students. Furthermore, we found that teachers who differentiated more in their expectations perceived students generally as more competent, but they felt less related to the school team, and felt more classroom stress as opposed to teachers who did not differentiate as much in their expectations for students. The latter association has been studied and confirmed in previous research identifying challenges of providing differentiated and adaptive instruction; that is, limited preparation time, teachers' heavy workload, and lack of resources (Chan, Chang, Westwood, & Yuen, 2002; Scott, Vitale, & Masten, 1998).

The third aim of the study was the exploration of the association of between-teacher differences in expectations with end-of-year mathematics performance. First, as expected, strong associations were found between beginning- and end-of-year mathematics performance, both at the class and at the individual level. Teacher expectations explained a significant amount of end-of-year mathematics performance in addition to the prior performance. The more teachers differentiated in expectations, the lower the expected end-of year mathematics scores. This finding is, in general terms, consistent with the notion that teachers differ in expectation effects (Brophy, 1983; Rubie-Davies et al., 2007). Moreover, it seems to correspond with the idea that in classes where expectations are portrayed through a more structured class environment, where the focus is on performance, and learning activities are sharply differentiated (Rubie-Davies, 2015; Weinstein, 2002), overall student progress is likely to be constrained. Additionally, if within a class a teacher had a particularly high expectation for a specific student, this was positively related to end-of-year mathematics, although this association should be described as weak at best.

Limitations and strengths

In interpreting the results of this study, a number of strengths and limitations need to be considered. First, the relatively small sample of 42 New Zealand teachers needs to be considered. Although the number of 42 teachers is considered to be sufficient to validly estimate between-teacher differences in expectations, the sample is from the same context as several earlier studies on teacher-level expectations (Rubie, 2004; Rubie-Davies 2007, 2010). It remains worthwhile to replicate teacher-level expectation studies in different contexts, educational systems, and for different age groups, in order to investigate the generalisability of the findings. Second, information on teachers' expectations and their beliefs were both based on teacher reports and were both measured by means of questionnaires. Although the relationships appeared very modest, because of measuring the constructs by the same method, the relations among these variables may have been accentuated. It should be noted that, although most of the teacher beliefs scales had good psychometric characteristics, for a few scales the reliability was relatively low (e.g., Workload Stress $\alpha = .65$), which may have attenuated the associations between teacher-level expectations and teacher beliefs. A third limitation also stems from the measurement method because the teacher reports did not allow us to distinguish between the beliefs as reported by the teachers and the actual behaviour of the teachers in their daily practice. It was therefore not possible to investigate whether the teachers who differentiated more

in expectations showed similar behaviour in their classes as the high-differentiating teachers in previous research (Weinstein, 2002). For example, we could not test whether the high-differentiating teachers in our sample, as identified by high slopes, viewed ability as stable, placed children in relatively fixed ability groupings with little room to switch when the students' performance changed, emphasised performance goals and extrinsic rewards, frequently implemented negative behaviour management strategies, and discouraged student interaction.

However, the expectation a teacher had for a particular student was measured for the current study using a highly reliable five-item scale (Rubie-Davies & Peterson, 2016), which is a major strength as opposed to many teacher expectation studies that use a single item (Timmermans et al., 2015). Second, the multilevel modelling applied in the current study allowed for a more nuanced investigation of the association between student beginning-of-year performance and the teachers' expectations at the class level. Being able to investigate both the degree of class-level expectations and the extent of differentiation in expectations in the same model is an addition to previous research on teacher-level expectations.

Conclusions

Although the current study included only a relatively small number of teachers, it does provide evidence of the need to shift attention in teacher-expectation investigations to teacher- rather than student-focussed scenarios. The study highlights a complex interplay of expectations and performance at the teacher level. Further, expectation studies that investigate teacher moderators and mediators and which include larger numbers of participants will facilitate the generalisability of the results of the current study. Such research is important as it could lead to increased understandings of differing types of teachers, who, in turn, appear to have differing effects on students. From a practical perspective, although most teachers are aware that their expectations of students can have an effect on their outcomes, they are not often aware of the idea that there are particular teachers who have greater and lesser effects on students because of their expectations. Moreover, associations between teacher beliefs and behaviours with expectations are not commonly known among teachers. If teachers are to raise their expectations and have positive effects on all students, it will be important that extensive professional development programmes are initiated so that teachers can learn more about the complex interplay between their expectations and the associated beliefs and practices that can increase student learning. In an experimental study, Rubie-Davies, Peterson, Sibley, and Rosenthal (2015) showed that when teachers were trained in the practices of high-expectation teachers, student achievement markedly improved compared with that of students of untrained teachers. Building on this kind of work provides a way forward for providing more equitable learning opportunities for all students and enabling all to reach their potential.

Notes

1. The part of the variance associated with the teacher level is calculated as an intra-class correlation based on the two variance components of Model 1 in Table 2 (Snijders & Bosker, 2012). For the current example, the intra-class correlation .126 is derived as follows .154/(.154 + 1.071).

2. A 95% coverage interval (Leckie, 2013) is presented here to indicate the range in which we may expect to find 95% of the teachers, assuming that the variance in slopes has a normal distribution. The range can be calculated from the Table 2 Model 2 information by 0.439 +/−1,96 * $\sqrt{0.028}$.
3. The average association between performance and expectations in the sample was 0.439 (Table 2), the average residual for teachers in the school drawing many students from high-socioeconomic areas was −0.350.

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