Teachers' sense of responsibility for educational outcomes and its associations with teachers' instructional approaches and professional wellbeing

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Abstract Teachers' formal accountability and duties have been the focus of high-stakes educational reforms, for instance in the context of national accountability systems. Yet, teachers' sense of personal (rather than formal) responsibility and willingness to assume responsibility for their teaching and students remains an understudied area. The main purpose of this study was to investigate contextual and person-specific predictors of teachers' sense of personal responsibility, as well as the potential implications of teachers' personal responsibility for their instructional approaches and wellbeing. A path analysis indicated that high school teachers ($n = 287$) who felt responsible for their teaching and students reported higher levels of work engagement and job satisfaction than less responsible teachers, and were more likely to endorse mastery-oriented instructional practices that emphasized student effort, task mastery, and individual growth. Teachers' perceptions of their school's social climate (teachers' evaluations of their relationships with students), their sense of teaching self-efficacy, and incremental beliefs of intelligence emerged as positive predictors of teacher responsibility. Teacher responsibility partially mediated the positive effects of these predictors on teachers' wellbeing and mastery-oriented instructional practices. The results suggest that both contextual (e.g., school climate) and person-specific (e.g., self-efficacy) factors can contribute to teachers'

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sense of personal responsibility, and that responsibility, in turn, can have positive implications for teachers' wellbeing and instructional practices. Directions for future research and practical implications are considered.

Keywords Teachers · Responsibility · Implicit theories · Self-efficacy · Relational climate · Instructional practices

1 Introduction

Over the past twenty years, educational policies across Western countries have increasingly focused on the teaching profession as a key source for improving the quality of education, since *"High-quality teaching is a pre-requisite for high quality education and training"* (European Commission 2011, p. 2; see also: Organization of Economic Co-operation and Development [OECD] 2005). In this context, a strengthened interest in accountability systems and in teachers' formal duties and responsibilities has emerged (e.g., Eurydice European Unit, 2008; Mausethagen 2013). However, this special focus has not been accompanied by a commensurate amount of attention devoted to teachers' *personal* sense of responsibility. For instance, two comprehensive reviews suggested that whereas the concept of responsibility itself has been studied from various perspectives, until recently, relatively few studies had specifically focused on teachers and on their *personal* sense of responsibility for educational outcomes (Lauermann and Karabenick 2011, 2014). Teachers' personal sense of responsibility is important because people who feel responsible, rather than just being held formally accountable, are self-determined and willing to invest effort in work-related tasks even without external monitoring and control and beyond their formal obligations (Lauermann 2014; Lauermann and Karabenick 2011, 2014). Specifically, Lauermann and Karabenick (2011) defined teachers' personal sense of responsibility as: "A sense of internal obligation and commitment to produce or prevent designated outcomes, or that these outcomes should have been produced or prevented" (p. 127). With this definition, the authors differentiated personal responsibility from formal accountability, which refers to compliance with regulations and professional norms (e.g., Anderson 2005). This distinction is important, because formal accountability does not necessarily imply feeling responsible for outcomes for which one is held accountable (Lauermann and Karabenick 2011, 2014).

Unfortunately, despite the recent awareness of its relevance in the educational policy context, and even though teacher responsibility research represents an expanding field, research on the educational implications of teachers' sense of responsibility for both students and teachers, and on the conditions that may foster teachers' sense of personal responsibility is still scant (see review in Lauermann and Karabenick 2014). Prior research has focused, for instance, on the measurement of teacher responsibility (Lauermann and Karabenick 2013), on relations between personal responsibility and emotions in prospective teachers (Eren 2014), on teachers', students' and parents' reciprocal ascriptions of responsibility for student learning (Helker and Wosnitza 2014), or has relied on qualitative interview data to study the nomological network of teacher responsibility (Halvorsen et al. 2009;

Lauermann 2014). Expanding upon this research, the present study uses a quantitative approach to examine the associations between teacher responsibility and some of its hypothesized predictors and potential outcomes. Specifically, we examine the predictive power of both contextual (school social climate, as perceived by teachers) and personal factors (teachers' self-efficacy and their incremental theories of intelligence) to explain interindividual differences in teachers' personal sense of responsibility for educational outcomes (e.g., for student learning and motivation). In addition, we examine the associations of teacher responsibility with teachers' occupational wellbeing (work engagement and career choice satisfaction) and endorsed instructional approaches (mastery-oriented practices that focus on students' personal growth, learning, and effort). The hypothesized associations among these constructs are explained in the following sections.

2 Literature review

2.1 Teachers' personal sense of responsibility

From an organizational perspective, a school is a particular form of corporation whose mission is the pursuit of learners' achievement (Perrenoud 1994). Teachers' professional responsibilities include not only teaching but extend to feeling responsible for student outcomes. For instance, Lauermann and Karabenick (2013) identified four distinct dimensions of teacher responsibility, including responsibility for student achievement, student motivation, for having positive relationships with students and for the quality of their teaching. These authors also provided evidence for a conceptual and empirical distinction between teacher responsibility and self-efficacy beliefs, which refer to teachers' confidence in their teaching ability (Lauermann and Karabenick 2013). Despite a positive correlation between these two constructs, teachers' confidence in their capability to produce desired outcomes (i.e. sense of self-efficacy) did not necessarily imply a sense of responsibility for these outcomes, and vice versa (Lauermann and Karabenick 2013). Using this conceptualization of teacher responsibility, the present study focused on its associations with key hypothesized antecedents (teachers' beliefs and their perceptions of the school climate) as well as its associations with teachers' endorsed instructional practices and indicators of occupational wellbeing.

2.2 Predictors of teachers' personal sense of responsibility: school climate, incremental beliefs of ability, and teacher efficacy

Three potential sources of teacher responsibility were examined in the present study, namely the perceived social climate of the school, teachers' sense of self-efficacy, and their incremental theory of intelligence. Ample research has shown that teachers' perceptions of the social–emotional climate in their schools are a key predictor of their teaching efficacy, experienced stress and job satisfaction (e.g., Borg 1990; Collie et al. 2012; De Nobile and McCormick 2008; Hoy and Woolfolk

1993; Skaalvik and Skaalvik 2009, 2011). In addition, qualitative research suggests that teachers identify having a supportive school environment as a key influencing factor on both their willingness to accept personal responsibility for their teaching and students, as well as on their ability to fulfill their professional responsibilities (Lauermann 2014, see also review in Lauermann and Karabenick 2011). Teachers' perceived relationships with their students are a key aspect of a positive school climate. Responsive and warm teacher-student relationships have been associated, for instance, with students' social and academic motivation, with students' social functioning at school and with students' academic performance (for a review, see Wentzel 2010). Expanding upon previous qualitative research, which had used teacher interview data (Lautheir general choiceermann 2014), we hypothesized that the perceived positive relational climate between teachers and students would function as a positive predictor of their sense of responsibility for educational outcomes. This assumption is plausible, because positive teacher-student relationships are a valuable resource that can enable teachers to fulfill their professional responsibilities, and because such relationships imply that teachers care about their students and may therefore feel responsible for their students' educational success.

In addition to teachers' perceptions of such contextual factors as the interpersonal climate in the school, teachers' personal beliefs and self-perceptions have also been found to shape their sense of professional responsibility (e.g., Diamond et al. 2004; Lauermann 2014). In this study we particularly focused on two types of personal beliefs, namely incremental beliefs of intelligence (Dweck 1999) and teacher self-efficacy (Bandura 1993). Both of these constructs are concerned with teachers' beliefs about the extent to which their students' ability and academic success can be improved and influenced. Specifically, incremental theory of intelligence reflects teachers' beliefs in the degree to which students' competence and abilities can change over time, i.e., are malleable (Dweck 1999), whereas self-efficacy reflects teachers' beliefs in their personal capabilities to influence students' ability and to motivate and promote learning (Bandura 1993). We expected both types of personal beliefs to be positively linked to teachers' willingness to assume responsibility for their teaching and for student-related outcomes. Specifically, teachers who believe that student abilities can be modified and improved (incremental beliefs) and, at the same time, who believe to be able to promote student learning (teacher efficacy) should be more likely to assume personal responsibility for these outcomes, because they would be at least subjectively more likely to fulfil their assumed responsibilities (e.g., to provide high quality education or to enhance student learning). In agreement with this assumption, personal responsibility has been directly linked to the perceived possibility to influence an event or outcome (Matteucci and Gosling 2004).

2.3 Personal sense of responsibility as a potential predictor of endorsed instructional practices and teachers' occupational wellbeing

A small number of research contributions have investigated the link between teacher responsibility and such desirable outcomes as teachers' job satisfaction and lower levels of stress symptoms, as well as positive student outcomes such as student

achievement. For example, teachers' collective responsibility for student learning—i.e., shared responsibility among teachers—has been associated with students' achievement gains over time (Lee and Smith 1996), although it is important to note that the assessment of responsibility used in this study included items originally designed to measure teacher self-efficacy (see review in Lauermann and Karabenick 2013). In addition, teachers' willingness to assume responsibility for their work has been linked to teachers' job satisfaction (Winter et al. 2006), although this responsibility assessment did not focus on specific educational outcomes, and used a generic assessment of work responsibility. One study further suggested that teachers who were willing to hold themselves responsible for their students' academic outcomes, deemed themselves also more able to influence the causes or antecedents of student failure, relative to less responsible teachers (Matteucci 2008). Finally, teacher responsibility was strongly and positively related to the self-reported level of work engagement in a sample of beginning teachers (Guglielmi et al. 2016); work engagement reflects a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption (Schaufeli et al. 2002). The present study expands upon this evidence by examining the potential links between teachers' work engagement and teachers' personal sense of responsibility for educational outcomes, as conceptualized by Lauermann and Karabenick (2011, 2013), as well as by focusing on experienced rather than beginning teachers.

As for work-related wellbeing, this construct is considered to be multidimensional, and to include subtleties in experiences of work (Cropanzano and Wright 2001). Teachers' work-related wellbeing and motivation have been related to career-choice satisfaction (Richardson et al. 2014), conceptualized as "the individual's response to their general choice of career, given the perceived alternatives" (Kelly and Northrop 2015, p. 628). In this framework, Watt and Richardson (2008), studying professional plans, satisfaction levels, and motivations of different teacher types, found that teachers identified as "highly engaged persisters" started out with and retained the highest levels of satisfaction with the choice of a teaching career. Recently, prospective teachers' career choice satisfaction and sense of personal responsibility were found to be positively and significantly related to each other (Eren 2015; Lauermann et al. in press). Accordingly, in the present study, we included not only work engagement as an indicator of work-related wellbeing, but also teachers' career-choice satisfaction. We expected that teachers' sense of personal responsibility for work-related outcomes may predict teachers' reported levels of work engagement and career choice satisfaction, because responsibility is linked to teachers' willingness to invest effort in their work, which is likely to facilitate a sense of significance, enthusiasm, and challenge.

According to our conceptualization of teacher responsibility (see Lauermann and Karabenick 2011, 2013), one of the most important aspects of teacher responsibility concerns teaching-related activities (e.g., selecting and developing teaching/learning materials, investing effort to prepare and present effective and engaging lessons). A higher level of personal responsibility for teaching-related activities may therefore have implications in the selection of instructional practices aiming at providing students with high quality education and, as a consequence, the connection between teacher responsibility and the adoption of high quality/adaptive instructional

practices is worth studying further. Research on effective instructional practices has highlighted that teachers differ in the extent to which they tend to shape a mastery or performance classroom goal structure (Retelsdorf et al. 2010). Performance goal structure in a classroom is produced by a strong emphasis on social comparisons and competition among students, normative evaluation practices, and where students' ability differences are made salient. A mastery goal classroom structure is characterized by an emphasis on learning, on understanding and on the individual growth of each student, and teachers with high levels of mastery goal structure in their classroom have been found to provide instructional and motivational support for students, and to provide students with frequent motivational messages, encouraging students to persist and to view mistakes as part of the learning process (Turner et al. 2002). A recent study found that teachers' personal sense of responsibility for teaching culturally diverse students positively predicted teachers' endorsement of mastery-oriented instructional classroom practices (Kumar et al. 2015).

Given what we know about the effectiveness of mastery instructional practices, it is reasonable to expect that teachers who feel an internal sense of obligation and duty toward educational outcomes—i.e. feeling personally responsible for learning outcomes and for teaching-related activities, would be more likely to invest effort to achieve these outcomes by implementing, for instance, a mastery goal structure in their classroom. As noted previously, mastery-oriented practices imply an emphasis on student learning, individual growth, and task mastery, and willingness to adapt instructional practices to individual student needs. We expected that teachers who felt personally responsible for their students' learning and for the quality of their teaching would be more likely to endorse such practices as a means of fulfilling their professional responsibility.

3 The present study

To sum up, the notion of teacher responsibility—as conceptualized by Lauermann and Karabenick (2011, 2013)—needs to be further investigated in order to better understand its relations with potential predictor and outcome variables included in the study. Earlier research on teachers' personal sense of responsibility and its perceived antecedents and consequences was conducted collecting qualitative data (by means of open-ended questions; Lauermann 2014), but these relations still need to be clarified with a larger sample and across different educational contexts. The following hypotheses were formulated based on the theoretical and empirical evidence discussed in the previous sections: teacher responsibility would be positively related to teachers' self-efficacy beliefs (Hypothesis 1a), to teachers' incremental beliefs of intelligence (Hypothesis 1b), and to teachers' perceptions of a positive social climate in the school, in terms of positive teacher-student relationships (Hypothesis 1c).

With regard to the hypothesized consequences, we expected that teacher responsibility would be positively related to their career-choice satisfaction (Hypothesis 2a), work engagement (Hypothesis 2b) and to their endorsement of mastery-oriented instructional practices (Hypothesis 2c). In addition, we

investigated the potential role of responsibility as a mediator of the associations between the examined predictor variables and the consequences mentioned above, since previous studies have shown that (a) teachers' responsibility is a mediator between personal beliefs and teachers' endorsement of mastery-focused instructional practices, at least in the context of teaching culturally diverse students (Kumar et al. 2015), (b) teachers identify personal responsibility as an antecedent of personal and job satisfaction in qualitative research (Lauermann 2014) and in research focusing on generic work responsibility (Winter et al. 2006), and (c) work responsibility has already been found to be a work demand that has the potential to promote work engagement (Guglielmi et al. 2016). Therefore, we assume that a teacher's responsibility for educational outcomes may also, at least in part, mediate the relations between personal and contextual predictors (school climate, self-efficacy, and incremental beliefs) and outcomes (mastery instruction and teachers' work engagement and career-choice satisfaction). Consistent with this reasoning, we hypothesized that teachers' responsibility, on the one hand, would function as a mediator in the relations between teachers' self-efficacy, incremental beliefs of intelligence, perceived relational climate, and teachers' work engagement, career-choice satisfaction and mastery practices on the other hand (Hypothesis 3).

4 Methodology

4.1 Participants and procedure

A convenience sample of 287 Italian public high-school teachers was recruited from two regions in Italy (Emilia-Romagna and Puglia) and from urban areas schools, which were selected to represent a diverse student body in terms of socioeconomic status and school specialization. The teachers agreed to participate in a survey using an online questionnaire sent to teachers via the school email system. Teachers' participation was voluntary and informed consent was obtained from each participant. The response rate was 53%. The age range of the participating teachers was between 27 and 64 years ($M = 49.95$, $SD = 7.36$); their teaching experience ranged between 0 and 36 years ($M = 15.95$, $SD = 10.49$), and the majority were female (64%; N = 181). Twenty-nine percent were teaching in the highest academic track schools in the Italian school system, 67% in technical schools, and the remaining 4% in vocational schools. The majority of the participants had a tenured position (83%; N = 238). The amount of missing data on each variable of interest in the present study ranged from 0 to 9%. The full information maximum likelihood approach was used for handling missing data (Schafer and Graham 2002).

4.2 Measures

The following measures were included in the present study. Scales that were not available in Italian were translated and back-translated.

4.2.1 Demographics

Respondents were asked to provide information about their gender, age, school track in which they teach (professional, technical, or lyceum), enrollment status (tenured vs. non-tenured position), educational degrees (PhD, master or secondary education), years of teaching experience, subjects taught (e.g. Italian language and Literature, History, Geography, Philosophy, Mathematics, foreign language), and whether the teacher had a leadership position within the school (e.g., principal, assistant principal, project coordinator).

4.2.2 School climate

The "Student Relations" subscale of the Revised School-Level Environment Questionnaire (The Revised-SLEQ; Johnson et al. 2007) was used to assess relational aspects of the school climate, as perceived by teachers (4 items; e.g., "Most students are helpful and cooperative with teachers," $\alpha = .78$). The items were rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

4.2.3 Theories of intelligence

A three-item theories of intelligence scale originally developed by Dweck and Henderson (1989) was used to assess whether an individual believes that intelligence is a fixed (i.e., entity theory) or a malleable human attribute (i.e., incremental theory). Respondents indicate their agreement with three statements (e.g., "People have a certain amount of intelligence, and they can't really do much to change it," $\alpha = .92$) on a six-point Likert scale, ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Scores on the three items form an overall indicator of individuals' thoughts about intelligence. A higher score on these items reflects an incremental view of intelligence.

4.2.4 Teacher self-efficacy

The teacher self-efficacy scale was taken from The Patterns of Adaptive Learning Survey (PALS by Midgley et al. 1996). The original scale included seven items that refer to teachers' beliefs that they are contributing significantly to the academic progress of their students and can effectively teach all students. However, one item was deleted due to poor psychometric properties and only six items were used in our final scale (e.g., "If I try really hard, I can get through to even the most difficult student," $\alpha = .59$).[1] All items were rated on a five-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree).*

[1] The item "Factors beyond my control have a greater influence on my students' achievement than I do" led to decreased internal consistency and decreased predictive validity of the overall scale. This item was therefore removed from the analyses. Excluding two additional reverse worded items would have improved the internal consistency of the scale further (up to $\alpha = .63$; see van Sonderen et al. 2013, regarding psychometric challenges related to reverse worded items). However, the exclusion of these two additional items would have reduced the scale's predictive validity in the present study. These items were

4.2.5 Teacher responsibility

The Teacher Responsibility Scale (TRS, Lauermann and Karabenick 2013) was used to capture teachers' self-judgments of responsibility. The scale includes 12 items designed to represent the following four areas of responsibility: responsibility for student motivation; (e.g., "I would feel personally responsible if a student of mine was not interested in the subject I teach," $\alpha = .88$); student achievement (e.g., "I would feel personally responsible if a student of mine had very low achievement," $\alpha = .87$); relationships with students (e.g., "I would feel personally responsible if a student of mine did not think that he/she can trust me with his/her problems in or outside of school," $\alpha = .94$); and teaching (e.g., "I would feel personally responsible if a lesson I taught failed to reflect my highest ability as a teacher," $\alpha = .91$"). The items were preceded by the following statement: "Imagine that the following situations would occur in your classroom. To what extent would you feel personally responsible that you should have prevented each of the following?" The items were rated on a seven-point Likert scale, ranging from 0 (*not at all*) to 6 (*completely*). Data from validation studies support the use of this scale, as it has high internal reliability (for a detailed discussion of the psychometrics of these measures, see Lauermann and Karabenick 2013). Because the four sub-dimensions of responsibility were highly interrelated in the present study ($r = [.54, .73]$, $ps < .001$), we formed one overall responsibility score, which had very good internal consistency ($\alpha = .94$).

4.2.6 Career choice satisfaction

Career choice satisfaction was assessed with two items from the Factors Influencing Teaching Choice Scale (FIT-Choice Scale, Watt and Richardson 2007, part D of the scale), namely "How happy are you with your decision to become a teacher?" and "How satisfied are you with your decision to become a teacher?" The items were rated on a seven-point Likert scale, ranging from 1 (*not at all important*) to 7 (*extremely important*). The internal consistency of this scale was very good ($\alpha = .91$).

4.2.7 Work engagement

The short version of the Utrecht Work Engagement Scale (Schaufeli and Bakker 2003) was used, consisting of a nine-item scale (three for each dimension): vigor (e.g., "At my work, I feel bursting with energy," $\alpha = .85$), dedication (e.g., "My job inspires me," $\alpha = .90$), and absorption (e.g., "I am immersed in my work," $\alpha = .86$). All items were rated on a seven-point scale, ranging from 0 (*never*) to 6 (*always*). For the purpose of this study, we followed Schaufeli et al. (2006)

Footnote 1 continued
therefore retained in our analyses, so we can explain additional variance in our outcome measures. Our main results are consistent with and without these items.

recommendation and computed an overall engagement score of the UWES, which we used in subsequent analyses ($\alpha = .93$).

4.2.8 Mastery instructional practices

A four-item scale was adapted from the Patterns of Adaptive Learning Survey (PALS) (Midgley et al. 1996), which refers to teachers' strategies that convey to students that the purpose of engaging in academic work is to develop competence (mastery goal) (e.g. "I make a special effort to recognize students' individual progress, even if they are below grade level", $\alpha = .62$). All items were rated on a five-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), and were prefaced with the heading "In my classroom…"

4.3 Data analysis

A series of sequential path analyses were tested to examine the hypothesized associations between teacher responsibility and the remaining variables of interest (school climate, teacher efficacy, incremental beliefs, work engagement, career choice satisfaction, and mastery-oriented classroom practices). The data were analysed with SPSS 21 and Mplus 7.11 programs. Chi square difference tests were used to compare the fit of nested models (Jöreskog and Sörbom 1993). The following fit indices and guidelines for overall model fit were used (Hu and Bentler 1999): root-mean-square error of approximation (RMSEA) values of less than .10 were considered evidence of adequate fit and values of less than .06 were considered evidence of a good fit; values for the comparative fit index (CFI) and the Tucker-Lewis index (TLI) greater than .90 (Bollen 1989) were considered evidence of adequate fit, and values greater than .95 were considered evidence of very good fit; the minimum discrepancy divided by its degrees of freedom (CMIN/DF) in the range of 2–1 or 3–1 is indicative of an acceptable fit between the hypothetical model and the sample data (Carmines and McIver 1981). To further facilitate model comparisons, we computed the Expected Cross-Validation Index (ECVI), a single sample cross-validation index proposed by Browne and Cudeck (1989). The model with the smallest ECVI in a given set of alternative models shows the greatest potential for replication.

Mediation analyses of the effect of antecedent variables on the outcome variables (i.e., work engagement, career-choice satisfaction, and instructional practices) via the mediation of teachers' responsibility were performed following the recommen-dations of MacKinnon et al. (2002) and Preacher and Hayes (2008). Bootstrapping has been found to be a superior statistical method for testing intervening variable effects and should be used instead of the causal step approach (Hayes 2009; MacKinnon et al. 2002). Bootstrapping can be used to estimate bias-corrected confidence intervals (e.g., 95% CI) and inferences can be made about the significance of the estimated indirect effect if zero is not included in the bootstrapped 95% CI.

Table 1 Descriptive statistics, scale reliabilities and correlations

	1	2	3	4	5	6	7	8	9
1. Responsibility	/	.29***	.17**	.18**	.24***	.25***	.30***	−.14*	−.21**
2. Self-efficacy		/	.11†	.12*	.18**	.24***	.34***	−.11†	−.12†
3. Incremental theory			/	.09	.11†	.18**	.17**	−.07	−.04
4. Relationships with students				/	.23***	.25***	.11†	−.01	.03
5. Career-choice satisfaction					/	.47***	.21***	−.08	−.05
6. Work engagement						/	.24***	−.04	−.07
7. Mastery practices							/	−.06	−.10
8. Age								/	.75***
9. Teaching experience									/
Range	1–7	1–5	1–6	1–5	1–7	1–7	1–5	27–64	0–36
M	4.53	3.22	4.30	2.80	5.26	5.93	3.72	49.95	15.95
SD	1.13	0.50	1.30	0.79	1.25	1.19	0.57	7.36	10.49
N	287	286	285	286	287	285	286	265	261
α	0.94	0.59	0.92	0.78	0.91	0.93	0.62	/	/

$N = 287$; † $p < .10$ * $p < .05$, ** $p < .01$, *** $p < .001$ *(two tailed)*

5 Results

5.1 Descriptive statistics and zero-order correlations

Table 1 presents the descriptive statistics, internal reliability estimates, and correlations for all variables of interest. All correlations were in the expected direction. Specifically, we found positive relations between personal and contextual factors (teacher efficacy, incremental beliefs and school climate concerning relationships with students) and teacher responsibility ($r = [.17, .29]$, $ps < .01$). Also as expected, personal responsibility was positively correlated with career-choice satisfaction, work engagement and endorsement of mastery practices ($r = [.24, .30]$, $ps < .001$). Thus, both Hypothesis 1 (1a–1c) and Hypothesis 2 (2a–2c) were supported, even though it is important to note that all correlation coefficients were weak to moderate, albeit significant and in the expected direction.

5.2 Mediating role of teacher responsibility

The hypothesized mediated relations between variables of interest were analysed via path analyses of the full data set. Bootstrapping with 2000 iterations was used to test the direct and indirect effects of hypothesized predictors (self-efficacy, incremental theory of intelligence and school climate) on hypothesized outcomes (career choice satisfaction, work engagement and mastery practices), mediated via teacher responsibility (Hypothesis 3). Three alternative path analyses were compared to determine the best fitting model: a path model in which the

Table 2 Overview of fit indices for tested models

Model	χ^2 (df)	CFI	TLI	RMSEA	ECVI	CMIN/DF
M1	0.00 (0)	–	–	–	–	–
M1 Revised	11.01 (6)	.98	.93	.054	.241	1.834
M2 Fully mediated	68.91 (13)	.73	.62	.122	.395	5.300

CFI Comparative fit index; *TLI* Tucker-lewis index; *RMSEA* Root mean square error of approximation; *ECVI* Expected cross-validation index; *CMIN/DF* minimum discrepancy divided by its degrees of freedom

antecedents had both direct and indirect effects on outcomes via teacher responsibility (M1), a revised model in which nonsignificant paths were constrained to zero to obtain a more parsimonious model (M1-Revised), and finally (M2) a full mediation model in which we can determine if responsibility only partially or fully mediates the associations between predictor variables (self-efficacy, incremental intelligence and school climate) and outcomes (career choice satisfaction, work engagement and mastery practices).

Model fit is reported in Table 2. The full model M1 included all possible paths and was thus fully saturated ($df = 0$); accordingly, model fit cannot be tested. Nonsignificant paths were then fixed to zero (M1-Revised) in order to estimate a more parsimonious model, which is illustrated in Fig. 1. Nonsignificant paths with the lowest standardized coefficients were deleted one at a time until only significant paths remained in the model. Specifically, the paths between incremental intelligence and career choice satisfaction ($\beta = .05$, $b = 0.05$, $p = .495$), and between school climate and mastery practices ($\beta = .03$, $b = 0.02$, $p = .589$) were fixed to zero. In addition, the covariances between mastery practices and career-choice satisfaction, mastery practices and work engagement, incremental theory and school climate, and incremental theory and self-efficacy were fixed to zero (ps $\geq .078$, see Fig. 1). However, two marginally significant effects from our fully saturated model M1 were retained in M1-Revised, because fixing them to zero led to a significant reduction in overall model fit compared to a model in which these paths were freely estimated ($\Delta\chi^2$ (2) $= 7.45$, $p = .023$, ΔCFI $= 0.027$, ΔRMSEA $= 0.014$); these two marginally significant paths were the predictive effects of self-efficacy on career choice satisfaction and of incremental theory on mastery practices (see Fig. 1). This final model (M1-Revised) had very good fit to the data (see Table 2), and thus demonstrates that paths that are not shown in Fig. 1 can be excluded from our model without substantial loss in overall model fit. Finally, we tested a fully mediated model in which all direct paths from predictor variables to outcome variables were fixed to zero, but—as can be seen from the third row of Table 2—the fit indices indicate that it did not fit the data well and had a significantly worse fit to the data relative to model M1-Revised. Accordingly, only partial mediation was supported (Hypothesis 3).

As noted in the previous section, Fig. 1 illustrates our final model (M1-Revised), according to which responsibility partially mediates the predictive effects of self-efficacy, incremental theory of ability, and school climate on mastery-oriented

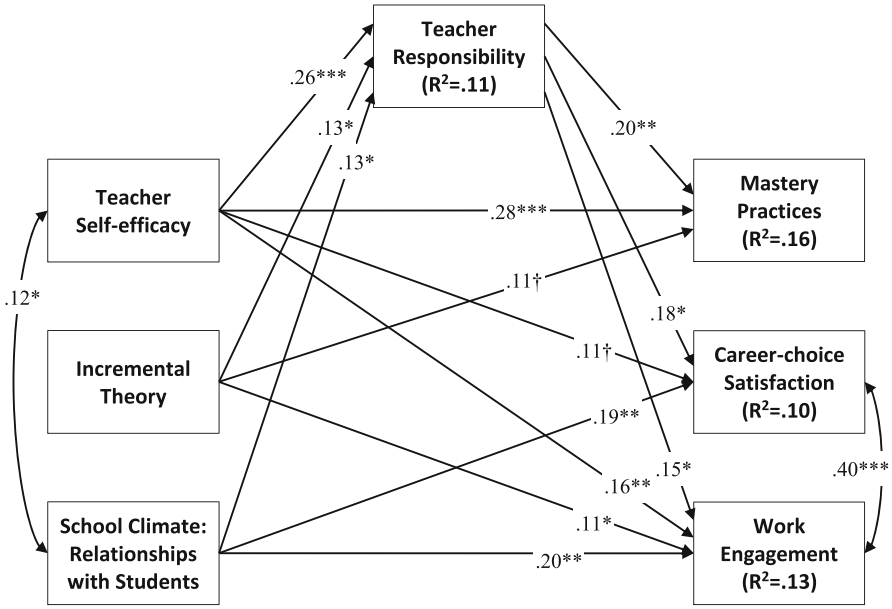

Fig. 1 Path model (M1-Revised). Standardized coefficients are shown †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$ (*two-sided*)

practices, career-choice satisfaction, and work engagement. As shown in Table 3, teacher responsibility significantly mediated the predictive effects of all three of our hypothesized predictors on all three of our hypothesized outcomes; none of the estimated bias-corrected bootstrapped 95% CI for these indirect effects included zero (lower bounds $\geq$ .001, see Table 3), although the estimated effect sizes are small (ranging from .02 to .05, with an indirect to direct effects ratio of 0.10–0.41; see Table 3).

Furthermore, as shown in Fig. 1, teachers' personal sense of responsibility was directly positively predicted by teachers' self-efficacy beliefs, by their incremental theory of intelligence, and by their perceptions of the school climate. In addition, teachers' personal sense of responsibility directly and positively predicted teachers' endorsement of mastery practices, their career-choice satisfaction, and work engagement. Similar to the bivariate correlational patterns reported at the beginning of the results section, these multivariate analyses support our Hypotheses 1a–1c and 2a–2c. With regard to our mediation hypothesis (Hypothesis 3), we found that, in addition to their indirect predictive effects via teacher responsibility (see Fig. 1; Table 3), (a) teachers' perceptions of the school climate had an additional significant positive direct predictive effect on career-choice satisfaction (and self-efficacy had a marginally significant direct effect); (b) teachers' self-efficacy, incremental beliefs, and perceptions of the school climate had significant positive direct predictive effects on work engagement; and (c) teachers' self-efficacy and perceptions of the school climate had significant positive direct predictive effects on mastery practices (and incremental beliefs had a marginally significant direct effect;

Table 3 Direct predictive effects of self-efficacy, intelligence beliefs and school climate on career-choice satisfaction, work engagement and mastery practices and indirect predictive effects via teachers' responsibility in Model M1-Revised

Predictor variables	Outcome variables	Unstandardized indirect effects [95% CI]	Standardized indirect effects	Unstandardized direct effects [95% CI]	Standardized direct effects
Self-efficacy	Career choice satisfaction	.111 [.020, .257]	.045	.278 [−.029, .561]	.111
	Work engagement	.090 [.019, .222]	.038	.384 [.136, .638]	.163
	Mastery practices	.057 [.019, .110]	.051	.312 [.182, .442]	.275
Incremental theory	Career choice satisfaction	.023 [.003, .061]	.023	–	–
	Work engagement	.018 [.003, .056]	.020	.095 [.011, .190]	.105
	Mastery practices	.012 [.002, .028]	.027	.048 [−.003, .096]	.109
School climate	Career choice satisfaction	.037 [.002, .095]	.023	.296 [.101, .497]	.187
Relationships with students	Work engagement	.030 [.002, .085]	.020	.294 [.108, .495]	.197
	Mastery practices	.019 [.001, .045]	.026	–	–

Path coefficients for indirect and direct effects are presented with bias-corrected bootstrapped 95% confidence intervals. If the unstandardized 95%-CI does not include zero, the effect is significant at $p < .05$. A total effect can be computed as the sum of the direct and indirect effects

see Fig. 1 and Table 3). These effects were not mediated via teacher responsibility, so that only a partial mediation was supported (Hypothesis 3). All direct paths in M1-Revised and their corresponding standardized coefficients are illustrated in Fig. 1 and are reported in Table 3.

Our findings in Model M1-Revised remained unchanged when demographic variables (age, gender, teaching experience) were included as control variables.

6 Discussion

From a theoretical perspective, this study corroborates the validity of the TRS and its applicability across educational systems and settings (e.g., Lauermann and Karabenick 2013), and contributes to a better understanding of conditions that are likely to influence and be influenced by teachers' personal sense of responsibility. Importantly, the study contributes to a better understanding of the factors that can potentially influence teachers' endorsement of personal responsibility and of the relations between this construct and possible outcomes. We hypothesized a positive relation between teachers' sense of responsibility and self-efficacy beliefs (Hypothesis 1a), incremental beliefs of intelligence (Hypothesis 1b), and perceived positive relational climate in the school (Hypothesis 1c). Moreover, we hypothesized teacher responsibility to be positively related to career choice satisfaction (Hypothesis 2a), work engagement (Hypothesis 2b) and mastery instructional practices (Hypothesis 2c).

The results supported both the first and the second hypothesis, confirming the expected positive associations between teachers' sense of personal responsibility for educational outcomes and the investigated context- and person-related variables. Furthermore, we investigated the process through which teacher responsibility would be related to the studied outcomes, since previous studies have found that (a) teachers' responsibility is a mediator between teachers' personal beliefs and their endorsement of mastery-focused instructional practices, at least with regard to responsibility for teaching culturally diverse students (Kumar et al. 2015), (b) teachers identify personal responsibility as an antecedent of personal and job satisfaction in qualitative research (Lauermann 2014), and (c) responsibility has already been found to be a challenge demand which has the potential to promote work engagement (Guglielmi et al. 2016). Therefore, we assumed that teacher's responsibility may also, at least in part, have a mediating role between the investigated antecedents and outcomes. This hypothesized mediated relation was in part confirmed as teacher responsibility partially mediated the relations between the studied variables. Specifically, teacher responsibility partially mediated the predictive effects of (a) teachers' self-efficacy, (b) school climate concerning relationships with students, and (c) incremental beliefs about intelligence, on the outcome variables mastery-focused practices, work engagement and career-choice satisfaction.

These findings demonstrate that personal and contextual factors have the potential to shape teachers' sense of personal responsibility for educational outcomes. Teachers who believed to be able to influence students' outcomes (i.e. high level of self-efficacy), who viewed students' intelligence as malleable (i.e.

incremental beliefs), and who perceived their relationships with students as positive and collaborative were more likely to assume personal responsibility for educational outcomes. Furthermore, teachers who were willing to accept personal responsibility for work-related outcomes were more likely to report a sense of satisfaction with being a teacher (i.e. career-choice satisfaction), and a positive, fulfilling, work-related state of mind (i.e. work engagement).

Teachers who accept responsibility for educational outcomes also endorse mastery-focused practices in their classroom, which have been deemed effective in motivating and supporting students' academic success. These findings corroborate and expand upon previous research showing that teachers' self-efficacy beliefs have the potential to influence their instructional behavior (Woolfolk Hoy et al. 2009), and their level of work engagement (e.g., Betoret 2006; Simbula et al. 2011). Indeed, the direct paths identified in the tested path analysis confirmed a direct effect of self-efficacy on instructional behavior and on work engagement, as well as on career-choice satisfaction. Moreover, the findings enlarge our knowledge by also demonstrating a mediated effect of self-efficacy on the same outcome variables, via teachers' personal sense of responsibility.

In this study incremental beliefs were correlated with teachers' sense of responsibility and, in the path analysis, also indirectly predicted all three of our outcome variables, via its associations with teachers' responsibility. This result confirms existing literature, which revealed that teachers with an incremental theory are likely to focus more on students' strategy and effort in learning (Lee 1996) and to establish motivational climates consistent with a mastery classroom goal structure (Bråten and Strømsø 2004; Leroy et al. 2007; Trouilloud et al. 2006). Moreover, our results contribute to a better understanding of the process of connecting teachers' implicit theories of intelligence to their behavior, which was not clearly demonstrated by previous research (Deemer 2004; Matteucci 2007; Matteucci et al. 2008). Indeed, according to our results, teachers' beliefs about the malleability of intelligence may boost their feeling of being responsible for educational outcomes (e.g. for student achievement) and, consequently, impact their behavior in terms of such instructional practices as encouraging students' motivation, supporting and assisting students where they stumble, recognizing their effort and emphasizing their personal improvements (i.e., mastery-oriented practices). Hence, our data may contribute toward clarifying the complex relations between teachers' beliefs and practices (e.g. Fang 1996), by suggesting that feeling able to produce positive outcomes as a teacher, and also considering themselves personally responsible for those outcomes, may consequently affect instructional decisions.

Another construct that we proposed may potentially influence teachers' acceptance of personal responsibility for educational outcomes is the perceived positive school interpersonal climate. Lauermann and Karabenick (2013) already deemed necessary to recognize that teachers' professional responsibility is embedded in a variety of contexts, since teachers may feel different degrees of responsibility depending on their school's characteristics. Our findings indicate that teachers' sense of professional responsibility is associated with a positive school climate concerning their relationships with students. In turn, teachers' sense of responsibility functions as a mediator between the perceived positive relationships

with students and such outcome variables as mastery orientation, career-choice satisfaction and work engagement. Even though the identified effect sizes were relatively modest, these results are aligned with recent research findings that suggest (a) a positive relation between teachers' interactions with pupils and work engagement (Runhaar et al. 2013), and (b) that teachers' relationships with students are a source of teachers' wellbeing (Milatz et al. 2015). In addition, positive relationships with students have been found to be the most important source of enjoyment and motivation for teachers (Hagenauer et al. 2015; Hargreaves 2000) and several researchers have confirmed the importance of positive teacher–student relationships for the wellbeing of teachers (for a review, see Spilt et al. 2011). Moreover, the teachers' perception of a positive teacher–student relationship climate has been associated with students' performance in school (for a review, see Wentzel 2010), but the existing research has insufficiently addressed the potential impact of positive teacher-student relationships on teachers' intended or actual behaviors. Our results expand upon previous studies by showing that a perceived positive relational climate between teachers and students can function as a positive predictor of their sense of responsibility for educational outcomes, as teachers who feel involved with their students are more likely to endorse personal responsibility for educational outcomes. In turn, this perceived positive climate predicts both directly and indirectly—via teacher responsibility—outcome variables concerning teachers' wellbeing (i.e. career-choice satisfaction and work engagement), thus adding new insights to our understanding of variables related to establishing healthy and satisfactory relationships with students.

As for the outcome variables, previous research has established that teachers' career choice satisfaction and sense of personal responsibility were positively and significantly related to each other (Eren 2015), and career-choice satisfaction has been found to be related to work engagement (Timms and Brough 2013) and self-efficacy (e.g., Dacre Pool and Qualter 2013). Our results contribute to a better understanding of teachers' career choice satisfaction, firstly, by showing its positive correlation with teachers' sense of responsibility, perceived positive relationships with students, work engagement and mastery practices. Moreover, the performed path analyses confirmed that teacher responsibility may at least partially mediate the effects of the investigated antecedents on teachers' career-choice satisfaction. Thus, personal and contextual factors that encourage teachers to accept personal responsibility for educational outcomes may also foster work-related wellbeing.

The research focusing on the teachers' role in producing desirable classroom outcomes, such as motivational climates that value student effort and promote student learning and progress (i.e., a mastery classroom goal structure), has linked teachers' behavior toward students to their implicit beliefs about intelligence (e.g., Lee 1996). However, using Dweck and Henderson's (1989) scale, Deemer (2004) did not find any relation between teachers' beliefs about intelligence and their instructional practices. The present findings improve the knowledge on this issue as path analyses suggested a significant (albeit weak) relationship between implicit beliefs and instructional practices, mediated via teachers' sense of responsibility. Thus, considering students' abilities and capacities as malleable encourages teachers to accept personal responsibility in determining positive outcomes (or

avoiding negative ones) and, therefore, these beliefs may inspire teachers to adopt instructional strategies that foster a mastery-oriented classroom. The present findings may contribute to the understanding of the relation between intelligence beliefs and practices, suggesting a possible role of teacher responsibility as a mediator of this connection. Finally, by confirming previous findings on the mediator role of teachers' personal sense of responsibility for teaching on the endorsement of mastery practices (Kumar et al. 2015), the results can also contribute to a better understanding of the processes underlying the connection between positive teacher-student interpersonal relationships and student learning outcomes (Wentzel 2010), for instance, via teacher responsibility as a mediating construct.

Concerning teachers' work-related wellbeing, our explorative results suggest that the process underlying the relationship between personal and contextual variables, work engagement and career-choice satisfaction may be better understood by including teacher responsibility as a mediating variable. Particularly, our results expand upon previous studies concerning (a) the role of self-efficacy as a determinant of work engagement (Llorens et al. 2007), (b) the effect of interpersonal-level or social aspects of the job as a resource that may foster work engagement (e.g. Bakker et al. 2007), and (c) teachers' relationships with students as a resource for the teacher's wellbeing (Milatz et al. 2015). Our findings could be interpreted within the framework of the Job-Demands Resources Model (Hakanen et al. 2006; Schaufeli et al. 2002), which suggests that there is a wide array of determinants that play an important role in influencing teachers' work engagement, namely job demands and resources. According to Schaufeli and Bakker (2004, p. 296) *"Job resources refer to those physical, psychological, social, or organizational aspects of the job that either/ or* (1) *reduce job demands and the associated physiological and psychological costs;* (2) *are functional in achieving work goals;* (3) *stimulate personal growth, learning and development"*. Therefore, teachers' personal sense of responsibility may possibly be considered a personal resource—similar to self- efficacy, which has been found to mediate the relation between job resources and work engagement (Xanthopoulou et al. 2007). Moreover, our findings confirm the correlational link between work engagement and career-choice satisfaction, recently documented in a sample of pre-service teachers (Eren 2015).

Overall, the added value of the present research is: (a) examining potential antecedents and consequences of teachers' sense of responsibility by collecting quantitative data based on existing validated scales; (b) introducing new variables which may account for differences thus far not investigated; and (c) examining the mediating role of teachers' perceived responsibility by comparing alternative models for the first time.

In addition to our main findings, it is important to acknowledge a set of limitations and directions for future research. Firstly, this study revealed only modest effect sizes in our correlational and path analyses. Nonetheless, such effect sizes are not uncommon in educational/psychological research (Hemphill 2003; Meyer et al. 2001), and it is important to note that our findings are consistent with our theoretical assumptions. This study can, therefore, be considered as a starting

point of a research program where the role of teacher responsibility is further investigated.

Secondly, in many cases path analysis procedures may be 'quasi' or 'exploratory' in their analyses (Byrne 1998) since, frequently, different a priori and a posteriori models are tested, evaluated, and compared with each other to determine which model fits the data best. Causal relations among variables in our study still need to be investigated with stringent tests of causation to confirm structural relations. Causal interpretations are not possible due to the correlational and cross-sectional nature of our research. For instance, although available theory and evidence generally suggests that responsibility for work-related and, more broadly, achievement-related outcomes should function as an antecedent of affective responses, including job satisfaction (e.g., see Job Characteristics Model, Hackman, 1980, or Attribution Theory, Weiner 1995), it is equally plausible to assume reciprocal links according to which occupational wellbeing might increase teachers' willingness to assume personal responsibility for their students and teaching. Such reciprocal links warrant further investigations using longitudinal (e.g., a cross-lagged design) and experimental data.

Related to this point, thirdly, it is important to consider limitations related to the study design, measurement, and modelling when interpreting these findings. First, our study was based on self-report measures, precluding determination of causality and raising questions about the influence of social desirability. Consequently, it implies a certain risk that the findings may be based on common method variance. Even if personal beliefs about students' intelligence, work engagement, self-efficacy, and career-choice satisfaction are most commonly and reliably captured through self-report, assessing both instructional practices and school climate through different methodologies (such as actual observations, open-ended interviews, and the use of dilemmas or vignettes based on concrete outcomes) will provide additional insights. Future research should seek to incorporate a wider array of data sources and, if possible, to collect data from other actors in the school environment, such as students, the principal, and teaching team members. As for the data, the self-efficacy and mastery practice scales had internal reliabilities below 0.70, which is typically used as a rule of thumb for satisfactory internal consistency (Nunnally and Bernstein 1994). Even though similar values have been obtained in other studies (e.g., Greene et al. 2004), future research should adopt new measures to overcome this methodological limitation. Another methodological point that provides important context for the interpretation of our results is the sample selection. Specifically, participating teachers in the present study represent diversity in school size, school type, subject matter, and the socioeconomic level of the schools, but the present sample could be subject to self-selection biases due to the voluntary nature of this research and teachers' self-reports.

Finally, a set of intriguing questions remain for future research. First, a fine-grained analysis of single dimensions of the teacher responsibility scale may allow us to identify more in depth if teachers have a narrowly defined responsibility for specific areas of competence (e.g., responsibility for students' outcomes or responsibility only for their own teaching) or a wide-ranging sense of responsibility corresponding to the widening duties of their professional role. An examination of

each dimension of teacher responsibility would have enriched our study, but unfortunately a substantially larger sample would be needed for such detailed analyses due to the high correlations between the four facets of responsibility. Second, the psychological mechanisms through which responsibility influences teachers, their instructional practices and, subsequently, the actual consequences for students (such as students' academic success) require further investigation, including a need for experimental designs to aid the interpretation of correlational findings (e.g., whether improved relational climate results in greater personal responsibility). Finally, it is important to identify which school context characteristics (i.e., social and organizational, including accountability systems) might further influence key variables in our investigated model like teachers' personal responsibility.

In conclusion, the present study confirms the importance of studying the notion of teacher responsibility, due to its likely implications for students and teachers. Uncovering how teachers' beliefs about their professional responsibility for students' outcomes is linked to their instructional practices is important for understanding how to create effective learning environments. Furthermore, the study of professional conditions which are predictors of teachers' psychosocial wellbeing (work engagement and career-choice satisfaction) is a central challenge in improving the school context by developing a positive and healthy work environment.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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